WP 6 **Deliverable 6.3**

D6.3: Review on restoration, conservation and recovery of marine ecosystems in the four regional EU seas

Marine Ecosystem Restoration in Changing European Seas MERCES

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Abstract

The aim of MERCES Deliverable 6.3 is to perform an *ex-post* and *ex-ante* evaluation of restoration policies and practices. The analysis is based on a conceptual framework consisting of the concepts policy evaluation, types of uncertainty and discourses of marine ecosystem restoration. The *ex-post* evaluation is conducted on three levels: EU policy level, the Regional Sea Convention level and project level to find out how marine ecosystem restoration is defined and operationalized. Each level focuses on different aspects of the definition and operationalization of marine ecosystem restoration. The aim of this deliverable is to provide recommendations on how to move the EU's restoration agenda forward, based on insights gleaned from the analysis at these different levels.

The *ex-post* evaluation consist of two parts. Part A policies and Part B projects. In part A, the evaluation focuses on different EU policies and the Regional Sea Conventions. The following EU policies were selected: the EU Biodiversity Strategy, the Bird and Habitat Directives (BD and HD), Common Fisheries Policy (CFP), the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD. For the way the RSCs defined ecosystem restoration, and an evaluation of their role in coordinating and implementing restoration policy in the four regional seas we analysed OSPAR, HELCOM, the Barcelona Convention and the Bucharest Convention. We concluded that in the EU policies there are multiple interpretations of restoration, and a fragmented implementation. There is unclearness about for example which baseline should be leading for restoration activities, how to interpret the 15% goal, while the directives present only implicit definition of restorations or no definition at all. Our analysis showed a comparable situation for the Regional Sea Conventions. The Conventions do not provide comprehensive definitions of restoration but present related concepts (ecological quality (OSPA), environmental quality (Bucharest), reintroduction of species (HELCOM), sustainable exploitation of non-renewable resources (Barcelona) which could be a starting point for restoration.

Part B of the deliverable presents an analysis of the definition and operationalization of key concepts in ecosystem restoration in four case studies that focus on projects carried out within MERCES. The case are "Seagrass restoration in the Dutch Wadden Sea"; "North Sea oil and gas decommissioning"; "Restoration of the fan mussel (*Pinna nobilis*) in the Mediterranean" and "Red Coral (*Corallium rubrum*) restoration in the Mediterranean". As the policies and the RSCs, the cases show comparable shortcomings and constrains of restoration. In the Dutch Wadden Sea ambiguity exists in determining the baseline and the validity of quantitative restoration targets. The RTR case showed conflicting narratives about OSPAR's decision 98/3 (which requires the removal of structures), which will affect the operationalization and implementation of restoration activities related to RTR, while in the Pinna nobilis and the Red Coral cases restoration is facing unknown baselines and multiple uncertainties.

Based on the analyses of EU policies, RSCs and the cases we presented an *ex ante* inspired evaluation – a forward-looking type of evaluation – of restoration policies. The analysis of the EU policies, Regional Sea Conventions and the case studies identified several shortcomings and constraining conditions for restoration policies. Given these constraints for restoration at the three levels (policies, RSCs and projects), we formulated in Part C recommendations to strengthen restoration in policies and restoration practices, in order to formulate and enable the realization of EU restoration goals post 2020. Based on our research we made the following suggestion, strengthen the implementation and enforcement of restoration in EU policies, adopting common and comprehensive definitions of restoration, and developing an EU Marine Restoration Directive.

CONTENTS

1. Introduction

Biodiversity loss and other forms of global environmental change severely affect ecosystem functioning, with negative consequences for society (Cardinale et al. 2012; Hooper et al. 2012; Danovaro et al. 2008; Worm et al. 2006). Faced with increasing loss of biodiversity and persistent ecosystem degradation, the contracting parties to the Convention on Biological Diversity (CBD) adopted in 2010 the Strategic Plan for Biodiversity for the period 2011-2020 (CBD 2010). The vision articulated in this Strategic Plan represents, according to various scholars, a paradigm shift in global biodiversity policy, moving from the traditional 'preservation paradigm' or a hands-off stance to conservation, towards more active forms of intervention in nature through ecosystem restoration (Schoukens 2017). Twenty targets, collectively known as the Aichi Biodiversity targets, were formulated to achieve the goals set forth in the Strategic Plan. The new 'restoration paradigm' is most explicitly manifested in Aichi Target 15, which calls for restoration of at least 15% of degraded ecosystems by 2020 (CBD 2010).

Similarly, the European Commission has incorporated ecosystem restoration in its Biodiversity Strategy to 2020 (EC 2011). In conformity with its international commitments as a contracting party to the CBD, the **EU's 2020 Biodiversity Strategy's Target 2** also aims to restore at least 15% of degraded ecosystems by 2020 (ibid). In line with the scope of the EU's Horizon 2020 MERCES project, this report addresses several questions related to the EU Biodiversity Strategy's restoration target in relation to marine ecosystems.

According to the European Environment Agency, coastal and marine ecosystems in Europe, where centuries of human exploitation have altered coastal and marine habitats considerably, continue to decline (SOER 2015; EEA 2007, 2014). Despite the existence of more than 200 pieces of EU legislation supporting marine environmental policy and management (Boyes and Elliot 2014), a range of existing and emerging pressures continue to threaten marine biodiversity and ecosystems in the four EU regional seas (Smith et al. 2017; SOER 2015; EC 2015). Hence, calls for more ambitious policies and actions, including restoration, have been voiced to address these challenges (SOER 2015).

In order to implement (marine) restoration policy and be able to assess progress in achieving the EU's restoration targets, common understanding of various key concepts is crucial (Bekkby et al. 2017; Schoukens 2017). Restoration is defined as 'the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed' (SER 2004). This definition by the Society of Ecological Restoration is widely accepted and used in the academic literature. However, as various authors have shown, there is a wide range of interpretations of what the *process of assisting recovery of a degraded ecosystem* means in science and in management (Ounanian et al. 2018; Aronson et al. 2017; Bekkby et al. 2017; Elliott et al. 2007). Operationalization of the concept of (marine) ecosystem restoration therefore requires conceptual clarification of notions such as ecosystem *degradation* and ecosystem *recovery* (Bekkby et al. 2017; Schoukens 2017; Lammerant et al. 2013; Elliot et al. 2007). In addition, when quantitative targets are set such as the figure of "15%", it is necessary for all Member States to reach a clear and common interpretation of what this target constitutes as a pre-condition for implementation (Telesetsky et al. 2017; Kotiaho and Moilanen 2015; Lammerant et al. 2013).

The aim of this report is to explore how various key concepts related to the EU Biodiversity Strategy's 15% restoration target are defined and operationalized within this policy, but also in other relevant EU policies where marine ecosystem conservation and restoration provisions exist, and which are expected to contribute to the EU's restoration agenda under its Biodiversity Strategy. The objective of the analysis is to reveal similarities and differences in the ways the various policies approach ecosystem restoration. Moreover, an analysis of how the Regional Sea Conventions define ecosystem restoration is carried out, given their coordinating role in implementing EU policy in the four regional seas.

Based on these analyses, we evaluate whether common and unambiguous definitions and frameworks exist to guide and assess marine ecosystem restoration efforts at the national and regional sea level. We refer to such exercise as an ex post evaluation consisting of both an outcome-oriented and a process-oriented approach to evaluation (Rauschmayer et al. 2009; see Section 2.1.).

Finally, because restoration often takes place within local initiatives as part of individual projects which are not only driven top-down by policy, but also by other rationales in a bottom-up fashion (Baker and Eckerberg 2016; Hagen et al. 2015), the report examines how key concepts related to ecosystem restoration are defined and operationalized by stakeholders engaged in marine restoration projects in EU coasts and seas. Four case studies from selected working areas within the MERCES project reveal different aspects of how ecosystem restoration is interpreted and put in practice.

The analysis is therefore conducted at three levels: a EU policy level, a Regional Sea Convention level and a project level, each focusing on different aspects of the definition and operationalization of marine ecosystem restoration. Ultimately, the goal of this report is to provide recommendations on how to move the EU's restoration agenda forward, based on insights gleaned from the analysis at these different levels.

In previous work we proposed that restoration discourses – constructed on arguments of how and why to restore ecosystems- and how uncertainties are addressed in collective decision-making processes, influence the possibilities for governing marine ecosystem restoration (Ounanian et al. 2018). In this report, we build from these arguments and, drawing from the literature on policy evaluation, we provide an appraisal of selected issues within the EU Biodiversity Strategy. At the policy level, an *ex post* outcome-oriented policy evaluation is conducted of several actions linked to Target 2 of the EU Biodiversity Strategy. In this analysis, the uncertainty type referred to as "ambiguity" occupies a central position. Moreover, the role of the Regional Sea Conventions (RSCs) as coordinating units in the implementation of marine ecosystem restoration at the regional level is assessed. At the project level, the analysis centers on how stakeholders deal with different types of uncertainty, and how the dominant restoration discourses define problems and solutions in the realm of marine ecosystem conservation and restoration.

The main research question addressed in this report is: *How is marine ecosystem restoration defined and operationalized in the selected policies, RSCs* and *projects?* The methods used to answer this question consisted of a review of EU legal and policy documents, RSC documents and the academic and grey literature. Additionally, semi-structured interviews were conducted with key stakeholders associated with the four case studies, as well as with representatives from two Directorate Generals at the European Commission and with (former) members from the SER (see Annex 1).

The report is structured as follows: Section 2 presents our conceptual framework as well as conceptually refined (sub) research questions for the policy-level, RSC-level and project-level analyses. Section 3.1 examines how the EU Biodiversity Strategy defines and operationalizes the key concepts related to ecosystem restoration, and evaluates *ex post* specific actions under Target 2. In addition, section 3.2 analyses the most relevant EU directives and policies expected to contribute to reaching the 15% restoration target: the Birds and Habitats Directive, Water Framework Directive, Marine Strategy Framework Directive and Common Fisheries Policy. Moreover, section 3.3 presents an analysis of how the Regional Sea Conventions define ecosystem restoration, and an evaluation of their role in coordinating and implementing restoration policy in the four regional seas. Section 4 presents the case studies: seagrass restoration in the Dutch Wadden Sea; North Sea oil and gas decommissioning; and the fan mussel (*Pinna nobilis*) and red coral (*Corallium rubrum*) restoration in the Mediterranean. Finally, based on the analyses presented in the previous sections, Section 5 draws conclusions and provides a future outlook- through a brief *ex ante* evaluation- suggesting possible ways to progress in order to enable The EU to pursue its Biodiversity Strategy's vision to 2050.

2. Conceptual Framework

This section presents and defines the concepts employed to guide the analysis carried out in this report. First, the policy evaluation concepts are introduced and the difference between process-oriented and outcome-oriented evaluation is explained. Then, the typology of uncertainties is clarified and finally the four discourses of marine ecosystem restoration are elucidated. The section ends with the research questions related to the policy-level, RSC-level and project-level of the analysis.

2.1. Policy evaluation concepts

An evaluation is "…the process of determining the merit, worth or value of a *process*, or *product* of that process…" (Scriven 1991:139, quoted in Mickwitz 2003: 420). Distinguishing between process and product is important, as will become evident when process-oriented and outcome-oriented policy evaluation approaches are explained below.

Policy evaluation is defined as the "scientific analysis of a certain policy area, the policies of which are assessed for certain criteria, and on the basis of which recommendations are formulated" (Crabbé and Leroy 2008:1). The most common criterion for evaluation is effectiveness, which is based on the so-called goal achievement model and poses the question "are the results in line with the goals?" (Scriven, 1991:178). Other evaluation criteria include legitimacy, acceptability, participation, and coherence, among others (Rauschmayer et al. 2009; Crabbé and Leroy 2008).

Two main types of environmental policy evaluation can be distinguished based on the timing of the evaluation: *ex ante* and *ex post* evaluations. *Ex ante* evaluations, or forward looking, are conducted before policy is introduced or implemented. Environmental impact assessments are an example of *ex ante* evaluations which have expanded from assessing the expected environmental impact of projects, to assessments of policies and programs as well (Mickwitz 2003). *Ex post* evaluations, or backward looking, are conducted after policy has been implemented and there are measurable effects (Crabbé and Leroy 2008; Mickwitz 2003). Policy can also be evaluated while ongoing in mid-term or *ex nunc* evaluations (Crabbé and Leroy 2008). *Ex post* and *ex nunc* evaluations are useful for policy learning, adjustments and improving effectiveness (Rauschmayer et al. 2009; Crabbé and Leroy 2008).

There are two different approaches to evaluation: outcome-oriented and process-oriented evaluation (Rauschmayer et al. 2009). Both assess policy and governance outcomes and processes *ex post* or *ex nunc*. Outcome-oriented evaluation focuses on the "products" of a policy. It looks at a) the *outputs* or direct results or effects of a policy or governance process, for instance producing a management plan for a protected area, and b) the consequences, or *impacts*, of those outputs respective to the objectives, for instance improved ecosystem condition in the protected area (ibid).

As Gysen et al. observe, outputs "do not necessarily have an automatic or direct relationship with policy performance" (2006:97). In other words, outputs do not indicate that the ecosystem is improving. However, outputs provide an indirect indication of the intended policy effects and, in practice, are the easiest effects to monitor as they are tangible and often occur in the short-term (ibid). Impacts, on the other hand, are only visible in the long term, and establishing a causal link between the outputs of a policy and the observed changes in ecosystem condition is no easy task, due to the high degrees of complexity and uncertainty inherent to social-ecological systems (Rauschmayer et al. 2009; Gysen et al. 2006; Mickwitz 2003), as well as alternative or competing explanatory factors (Gysen et al. 2002).

Process-oriented evaluation focuses on the features of the process itself (Rauschmayer et al. 2009). The underlying assumptions are that "good" processes are linked to improved quality of the outputs through enhanced knowledge management and learning effects, as well as improved implementation of the outputs through perceived legitimacy and acceptability of the policy or the governance process (Rauschmayer et al. 2009; Crabbé and Leroy 2008). Thus, criteria of evaluation for a process-oriented evaluation include knowledge management (e.g. for dealing with complexity and uncertainty), coherence and legitimacy, among others (Rauschmayer et al. 2009). According to Rauschmayer et al. (2009), solid procedural features can produce high quality outputs, which can reduce the uncertainty between output and impacts: "good processes reduce certain uncertainties and thereby improve the reliability of outcome-oriented evaluation" (2009:168). In the next sub-section, the concept of uncertainty as understood in this report will be elaborated.

2.2 Perceptions of uncertainty in policymaking

Uncertainty, and how actors deal with it, is a key aspect of policymaking and governance processes (Brugnach et al. 2008). Drawing from Brugnach et al. (2008), Van den Hoek et al. (2014) and Floor et al. (2018), we understand uncertainty as constructed in interaction between actors in particular decision-making settings. According to Van den Hoek et al., "an uncertainty has no meaning in itself, but acquires meaning when the decision-maker establishes a knowledge relationship with the system he or she aims to manage [including other actors]. Thus, uncertainty refers to *the situation in which there is not a unique and complete understanding of the system to be managed* (2014: 374). The authors go on to explain that, based on this understanding, three kinds of uncertainty can be distinguished: incomplete knowledge, unpredictability, and ambiguity (Fig. 2.1). Incomplete knowledge and unpredictability reflect the underlying concern of "not knowing enough," but uncertainty can also originate from "knowing differently" - in this case uncertainty arises from ambiguity (Van den Hoek et al. 2014).

Incomplete knowledge refers to a situation in which knowledge is imperfect and there is an expectation that conducting more research will reduce this imperfection. Nonetheless, attempts to complete knowledge do not always decrease uncertainty, as new discoveries usually reveal new knowledge gaps, which lead to new uncertainties (Wheaton et al. 2008; Gross 2010). Unpredictability refers to the uncertainty that arises due to the inherently complex, dynamic, and non-linear behavior of the system to be managed, be it a natural, technical, or social system. Unpredictability refers to what we *cannot* know given the current state of science and issue complexity, hence, doing more research will not reduce this kind of uncertainty. Ambiguity arises when different, and often conflicting, views emerge on how to understand the system to be managed. Ambiguity is defined as "uncertainty due to the presence of multiple knowledge frames or different but (equally) sensible interpretations of the same phenomenon, problem or situation," (Van den Hoek et al. 2014:375).

Frames are sense-making devices that actors use to define issues, prioritize actions, and mobilize other actors and/or resources (Buijs 2009; Dewulf et al. 2005). ‘Frames’ are related to ‘discourses’ theoretically and methodologically. As Hope observes “frame analysis is a discourse analysis method that is principally concerned with dissecting how an issue is defined and problematised, and the effect that this has on the broader discussion of the issue” (2010:2). The next section elaborates the notion of discourses in relation to marine ecosystem restoration.

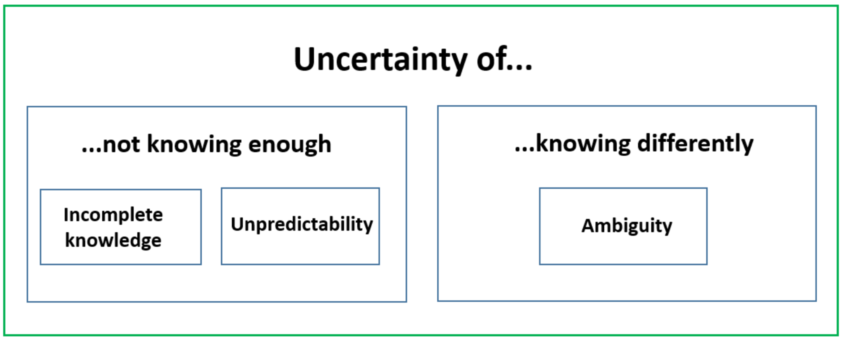

Figure 2.1 Types of Uncertainty (from van den Hoek [31], 73; Brugnach et al. [30]; Floor et al., [25]).

2.3. Marine ecosystem restoration discourses

Discourse entails the views and narratives of the actors involved: their norms, values, definitions of problems, and approaches to solutions (Liefferink 2006). The ways actors define and operationalize restoration through their “restoration discourses” is important in decision-making, as the dominant discourses and related coalitions determine the rules of the game and the availability of resources (Martín-López et al. 2009). Discourse coalitions draw on knowledge to make themselves legitimate and persuasive and deal with uncertainty in different ways, which ultimately affects decision-making (Floor et al. 2018; Carballo-Cárdenas 2015).

Ounanian et al. (2018) show that multiple interpretations exist of the notion of restoration and distinguish different discourses, based on two key dimensions that shape how actors conceptualize this phenomenon: the how and why of restoration. Each of these two axes represents opposing poles along a continuum: 1) from low to high degree of human intervention in nature and (2) the motivations for restoration, ranging from eco-centric to anthropocentric motives or rationales that underpin such intervention.

The intersection of these axes generates four distinct ideal-typical discourses of restoration (Figure 2.2): Putting Nature First; Bringing Nature Back, Helping Nature support Humans and Building with Nature. “**Putting Nature first**” is characterized by a low degree of human intervention and by motivations that centre on ecosystem-oriented outcomes in and of themselves. “**Bringing Nature back**” encapsulates the dominant discourse among restoration ecologists and practitioners, whereby humans see it as their duty to intervene in nature by placing installations or species at sea, also driven by eco-centric motivations to return nature to a pristine or ‘natural’ state. “**Helping Nature support Humans**,” is typified by a low degree of human intervention in nature, concerned with creating the boundary conditions for an ecosystem to recover by itself, driven predominantly by anthropocentric motivations and expressed by the vocabulary of ecosystem services. "**Building with Nature**," exemplifies high degrees of human intervention, is also largely motivated by anthropocentric needs and an ecosystem services rationale.

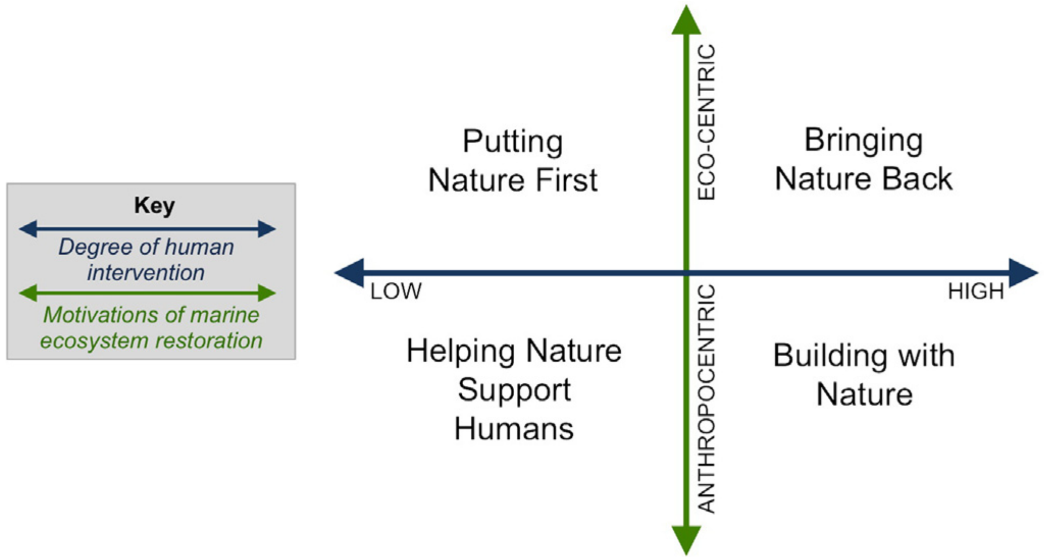

Fig. 2.2 Discourses of Marine Ecosystem Restoration, A dominant marine ecosystem restoration discourse fills each of the four quadrants based on the degree of human intervention (x-axis) and the motivation underlying the intervention (y-axis).

2.4. Research questions: policy-level, RSC-level and project-level analyses

In this section, conceptually refined research questions are formulated for our policy-level, RSC-level and project-level analyses. Before articulating these questions, background information is necessary to understand the relevance of these questions and how they relate to the overall research aim of this report.

2.4.1 Policy-level analysis: the issues

Under Target 2 of the EU's Biodiversity Strategy to 2020 (EU 2020 BDS), three actions are specified (Box 1). From these, Action 5 and Action 6a will be the focus of our analysis and evaluation given their obvious significance to the actual implementation of ecosystem restoration. To begin with, a shared definition of ecosystem *types* and agreement on methodologies to map and assess ecosystem *condition* should be accomplished by 2014, as established under Action 5 (see Box 1). This would feed into Action 6a, which states that "By 2014, Member States, with the assistance of the Commission, will develop a strategic framework to set priorities for ecosystem restoration at sub-national, national and EU level."

For Member States (MS) to be able to develop this common mapping and assessment methodologies and their strategic prioritization frameworks, establishing common understanding of ecosystem restoration and various interrelated key terms is a necessary first step. The definitions and interpretations of *ecosystem degradation* and *ecosystem recovery* should be dissected and agreed upon. To asses recovery, the reference point or *baseline* (in comparison to which the restoration target should be evaluated) likewise should be settled. The meaning and scope of the "15% restoration target" should be decided by all MS. e.g. whether the 15% restoration target should be applied separately to terrestrial and marine systems or all ecosystem types should be combined in the assessment, and whether the 15% target should be strived for within each MS national territory, or at the level of biogeographic regions. Finally, prioritization criteria should be established (Lammerant et al. 2013).

Box 1. EU Biodiversity Strategy to 2020

Target 2 – Maintain and Restore Ecosystems and their Services

By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15 % of degraded ecosystems.

Action 5: Map and assess the state and economic value of ecosystems and their services in the entire EU territory; promote the recognition of their economic worth into accounting and reporting systems across Europe.

Action 6: Restore ecosystems, maintain their services and promote the use of green infrastructure.

6a: Strategic framework to set priorities for ecosystem restoration at sub-national, national and EU level

6b: Green Infrastructure Strategy to promote the deployment of GI in the EU in urban and rural areas

Action 7: Assess the impact of EU funds on biodiversity and investigate the opportunity of a compensation or offsetting scheme to ensure that there is no net loss of biodiversity and ecosystem services.

Source:
http://ec.europa.eu/environment/nature/biodiversity/strategy/target2/index_en.htm
https://biodiversity.europa.eu/mtr/biodiversity-strategy-plan/target-2-details/#_act6a

Nature and environmental legislation that exists in the EU has direct links to the restoration agenda. The Birds and Habitats Directives (BHD), the Water Framework Directive (WFD), and the Marine Strategy Framework Directive (MSFD) are domains where there is a legal obligation to conserve and restore biodiversity, and for which frameworks have been established for the identification of priorities at MS level, as well as for monitoring and evaluation of progress (Schoukens 2017; Lammerant et al. 2013). In addition, provisions under the Common Fisheries Policy (CFP) exist to protect and restore marine stocks, habitats and ecosystems, contributing thus to the MSFD's overarching goal of "protecting more effectively the marine environment across Europe[1]".

Target 1 (related to BHD) and Target 4 (related to CFP) of the EU 2020 BDS are therefore related to the achievement of Target 2 (Box 2). Accordingly, it has been proposed that, with respect to marine ecosystems, the 15% restoration target should include (coastal/marine) Natura 2000 targets and other environmental targets relevant to restoration under the WFD and the MSFD (Lammerant et al. 2013). The question here is whether a common approach is used by all MS to apportion all of these different nature and environmental targets towards the figure of "15%" restoration of degraded ecosystems under Target 2 of the EU's Biodiversity Strategy, and if so, how this approach looks like.

Box 2. EU Biodiversity Strategy to 2020

Target 1 and Target 4

Target 1: Halt the deterioration in the status of all species and habitats covered by EU nature legislation and achieve a significant and measurable improvement in their status so that, by 2020, compared with current assessments: (i) 100 % more habitat assessments and 50 % more species assessments under the Habitats Directive show an improved conservation status; and (ii) 50 % more species assessments under the Birds Directive show a secure or improved status.

Target 4: Achieve Maximum Sustainable Yield (MSY) by 2015. Achieve a population age and size distribution indicative of a healthy stock, through fisheries management with no significant adverse impacts on other stocks, species and ecosystems, in support of achieving Good Environmental Status by 2020, as required under the Marine Strategy Framework Directive (MSFD).

Source:
The Mid-term review of the EU Biodiversity Strategy to 2020 (EC 2015)

2.4.2 Policy-level analysis: the research questions

The main research question addressed in this section is: *How is marine ecosystem restoration defined and operationalized in the selected policies?* As mentioned above, the focus of our analysis are Action 5 and Action 6a under EU 2020 BDS, which essentially require MS to articulate a definition and operationalization of ecosystem restoration by the year 2014. As also seen above, achieving Action 6a depends on achieving other related actions under other Targets

[1] http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm.

of the EU 2020 BDS. The research questions and sub-questions for our policy-level analysis are therefore:

1. To what extent is there a common definition and operationalization of marine ecosystem restoration to achieve Target 2 of the EU 2020 BDS?
   a) How is marine ecosystem restoration defined in the EU 2020 BDS?
   b) How are marine *ecosystem types* defined, and is there a common methodology for the mapping and assessment of ecosystem condition? (Action 5)
   c) How do Member States set priorities for marine ecosystem restoration? (Action 6a)
   d) How is marine ecosystem restoration defined and operationalized in EU Directives relevant for the implementation of Target 2? (Action 6a)
   e) How do Member States apportion the different nature and environmental targets towards the figure of "15%" restoration of degraded ecosystems under Target 2 of the EU 2020 BDS? (Action 6a; Targets 1,4, MSFD, WFD)

2.4.3 RSC-level analysis: the issues

The MSFD is by far the largest attempt by the EU to improve the health of European oceans and seas (Freire-Gibb et al. 2014) and its implementation is expected to play an important role in the overall achievement of the EU 2020 BDS goals in its marine waters (Lammerant et al. 2013). In turn, the Regional Seas Conventions (RSCs) occupy a key role in most steps of the MSFD's implementation (Cavallo et al. 2016; Cavallo et al. 2017). The RSCs "should be the fora where regional coordination, coherence, consistency and comparability in relation to monitoring and data generated from monitoring is ensured. Additionally, cooperation across RSCs is needed to allow, to the extent possible, interregional comparability and coherence" (Zampoukas et al. 2014:11).

2.4.4 RSC-level: the research questions

The main research question addressed in this section is: *How is marine ecosystem restoration defined and operationalized in the RSCs?* The research questions for our RSC-level analysis are therefore:

1. How do the RSCs define and operationalize marine ecosystem restoration?

2. How are the RSCs performing in their coordinating role to facilitate implementation of the MSFD, and therefore achieve Target 2 under the EU 2020 BDS?

2.4.5 Project-level analysis: the issues

Four cases from selected working areas within the MERCES project will be presented in this report. Each one highlights a different aspect of the main research question posed above. We start by outlining the rationale for case selection and then move to the research questions.

Case selection was conducted during a Work Package 6 meeting that took place in Amsterdam in January 2018. The main selection criteria were as follows: data/information accessibility was an important consideration in case selection (hence our decision to focus on working areas within MERCES); the cases should show some variation in terms of habitat type represented and their geographic location to cover at least two of the EU Regional Seas; also, some variation in terms of the main EU policies or Directives illuminated by the case studies was sought. Furthermore, we used our model of "restoration discourses" to select cases which we **hypothesized** would represent each of the four discourses identified in Ounanian et al. (2018) (See Figure 2.3). Through a preliminary literature review and exploratory interviews, several interesting issues were identified for each case to refine the research questions specific to each one.

2.4.6 Project-level analysis: the research questions

The concepts presented in sections 2.2 (typology of uncertainties) and 2.3 (typology of restoration discourses) were applied in the project-level analysis to explore the main research question: *How is marine ecosystem restoration defined and operationalized in the selected projects?* Across all cases, this question is translated using the vocabulary of discourses of ecosystem restoration to ask:

1. What is the dominant ecosystem restoration discourse that can be distinguished in this case?
2. How are the main uncertainties perceived by actors dealt with in implementing marine ecosystem restoration?

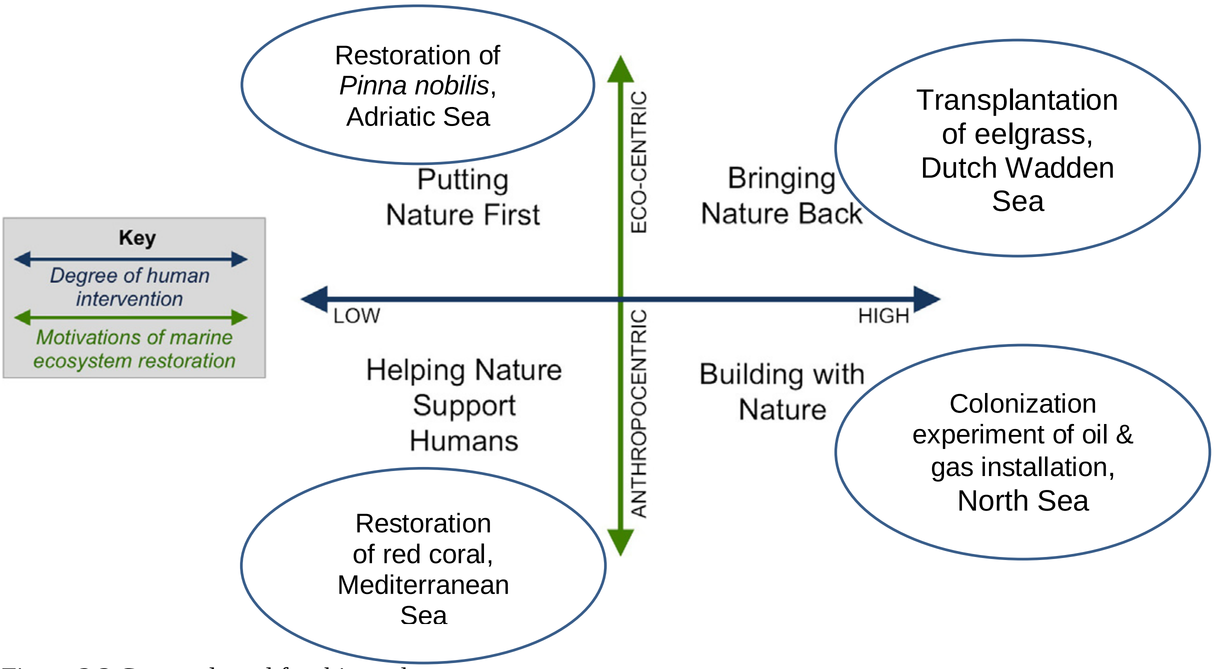

Figure 2.3 Cases selected for this study.

Furthermore, as explained in section 2.4.1., key concepts that form the cornerstone of ecosystem restoration include the notions of ecosystem *degradation*, *recovery* and *baseline.* Therefore, sub-research questions highlighting the way these concepts were defined and operationalized are formulated per case:

Seagrass restoration in the Dutch Wadden Sea

> How was the baseline selected when the Wadden Sea seagrass restoration targets were established under the Water Framework Directive?

Colonization experiment of an oil and gas installation in the North Sea

> How may the concept of rigs-to-reefs cast the OSPAR's decision 98/3 into new light?

Pinna nobilis and *Red coral restoration in the Mediterranean*

> How are the notions of restoration baseline, territorial scope of restoration and the "15% target" understood by Pinna and red coral restoration experts?

3. Part A: EU Policies and the Regional Sea Conventions

International and EU legislation and policies interact with each other in an intricate web and affect marine biodiversity and ecosystems in different ways (Rouillard et al. 2018; EC 2016; Schoukens 2017; SOER 2015; Boyes and Elliot 2014). The most important policies affecting marine biodiversity and ecosystems in European coasts and seas are listed in Figure 3.1. The starting point of the analysis is Target 2 of the European Union's Biodiversity Strategy to 2020, depicted in the center of the concentric circles in Figure 3.1. Subsequently, the interactions of Target 2 with a selected number of directly relevant EU Directives (in inner circle) are examined. Finally, the role of the Regional Sea Conventions in coordinating implementation of Target 2 is assessed (outer circle). The following sub-sections address each of the "circles" in the stated order.

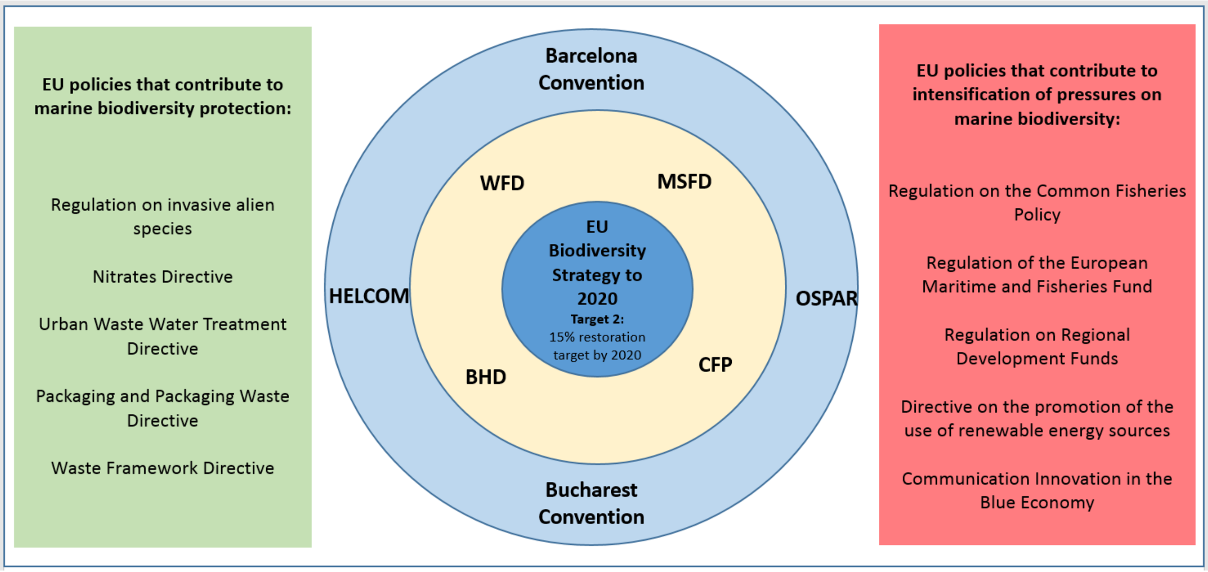

Figure 3.1. Key EU environmental and sectoral policies relevant to the achievement of EU Biodiversity restoration targets in marine ecosystems, (inner circle) as well as the four EU Regional Seas Conventions (outer circle). The policies depicted in circles are the focus of the analysis; the policies listed outside the circles either contribute to biodiversity protection or intensify pressures leading to biodiversity loss (adapted from Rouillard et al., 2018).

3.1. EU Biodiversity Strategy 2020's Target 2: restoring at least 15 % of degraded ecosystems by 2020

In this sub-section we begin to answer the main research question addressed in this report, which examines how (marine) ecosystem restoration is defined and operationalized in key EU policies; we start by addressing the question of how marine ecosystem restoration is defined in the EU Biodiversity Strategy to 2020. On the 3rd of May 2011, the European Commission published the communication "Our life insurance, our natural capital: an EU biodiversity strategy to 2020" (EC 2011), referred to as EU 2020BDS in this report. The EU 2020BDS articulates the following headline target: "*Halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and* ***restoring*** *them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss.*" Further, the EU 2020BDS has the following vision: *"By 2050, European Union biodiversity and the ecosystem services it provides – its natural capital – are* *protected, valued and* ***appropriately restored*** *for biodiversity's intrinsic value and for their essential contribution to human wellbeing and economic prosperity, and so that catastrophic changes caused by the loss of biodiversity are avoided."* To achieve the headline target by 2020 and its longer term vision on biodiversity and ecosystems, the EU 2020BDS has formulated six interrelated targets (Fig. 3.2), and twenty actions, from which Target 2 explicitly focuses on ecosystem restoration.

Protect species and habitats - Target 1
By 2020, the assessments of species and habitats protected by EU nature law show better conservation or a secure status for 100 % more habitats and 50 % more species.

Maintain and restore ecosystems - Target 2
By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15 % of degraded ecosystems.

Achieve more sustainable agriculture and forestry - Target 3
By 2020, the conservation of species and habitats depending on or affected by agriculture and forestry, and the provision of their ecosystem services show measurable improvements

Make fishing more sustainable and seas healthier - Target 4
By 2015, fishing is sustainable. By 2020, fish stocks are healthy and European seas healthier. Fishing has no significant adverse impacts on species and ecosystems.

Combat invasive alien species - Target 5
By 2020, invasive alien species are identified, priority species controlled or eradicated, and pathways managed to prevent new invasive species from disrupting European biodiversity.

Help stop the loss of global biodiversity - Target 6
By 2020, the EU has stepped up its contribution to avert global biodiversity loss.

Figure 3.2 Targets of the EU Biodiversity Strategy (Source: http://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm)

Target 2 states that *By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and* ***restoring at least 15% of degraded ecosystems***. The EU 2020BDS communication does not provide a definition of ecosystem restoration, but its accompanying document proposes the following definition: "The restoration of ecosystems and their services is understood as actively assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed, although natural regeneration may suffice in cases of low degradation. *The objective should be the return of an ecosystem to its original community structure, natural complement of species, and natural functions* to ensure the continued provision of services in the long term, although in cases of extreme degradation, the focus on specific services may be justified" (EC 2011a; emphasis added).

A study on the financing needs of restoration under Target 2 of the EU 2020BDS concluded that this definition is "extremely ambitious", as full restoration of an ecosystem to its original state or condition "would require very expensive and technically difficult actions" (Tucker et al. 2013). *Furthermore, "restoration will be constrained by the absence of component* species or even by the global extinction of some species", and "it is reasonably certain that all these constraints on restoration will be exacerbated by climate change" (quoted in Lammerant et al. 2013:13). For these reasons, a report assigned by the European Commission to a contractor to aid member states in the prioritization of ecosystem restoration, suggests instead the following definitions, which do not require a return to an "original state" (Lammerant et al. 2013):

> SER (2004) defines ecological restoration as *"The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed."*
> The CBD (2011) defines restoration as **"***The process of actively managing the recovery of an ecosystem that has been degraded, damaged or destroyed as a means of sustaining ecosystem resilience and conserving biodiversity.*"

Lammerant et al. (2014) observe that, while the SER's and CBD's definitions in reality do not **define** restoration, both highlight that restoration is a *process* of recovery towards a desired state, which is considered more pragmatic than attempting to return an ecosystem to its "original state" – usually conceptualized as a pre-human degradation state (Kotiaho et al. 2016). The next step is then to clarify the *process* of restoration. For this purpose, Lammerant et al. (ibid) developed a 4-level model for ecosystem restoration, based on two principles: "restoration is a process", and "restoration requires modification of abiotic and biotic factors" (ibid: 15). The model conceptualizes ecosystem state or ecosystem condition as a continuum from poor (level 4) to excellent (level 1). Level 4 corresponds to "heavily modified or heavily degraded ecosystems" while level 1 corresponds to ecosystems in Good Ecological Status (according to the WFD), Good Environmental Status (according to the MSFD) and marine habitats and species in Favourable Conservation Status (according to the Birds and Habitats Directives).[2]

Restoration of a degraded ecosystem according to the 4-level model "is then any climbing between the levels into a less degraded state (as defined for each habitat)" (Hagen et al. 2015:25), and "any significant improvement that moves an area to a better state or condition should be regarded as a contribution to the 15% restoration target" (Schoukens 2017: 128). For each level, descriptors should be defined as well as thresholds of change between levels, and the assumption is that these are quantifiable (Hagen et al. 2015; Lammerant et al. 2013). An illustrative example for a member state, with fictitious percentages, is provided by Lammerant et al. (2013:16-17) and shown in Annex 2 of this report. The model assumes that the 15% target is to be achieved by each Member State within its national territory, and it takes 2010 as the baseline situation, as this year is seen as the start of the EU Biodiversity Strategy. The model also considers both the 2020 as well as the 2050 horizons in assessing progress towards the "desired state" of an ecosystem.

Further, the working group that consisted of the Commission, supported by the contractor, the member states and stakeholders decided that the 15% restoration target should be applied separately to terrestrial and marine systems – that is, restoration of 15% of degraded terrestrial ecosystems and restoration of 15% of degraded marine ecosystems should be carried out by each member state (Lammerant et al. 2013; EC 2014). The next step in the operationalization of ecosystem restoration is the classification of ecosystem *types* in order for

[2] As Borja et al. (2010) suggest, there is potential confusion between terms in using GES for Good Ecological Status in the Water Framework Directive and Good Environmental Status in the MSFD. The authors propose the use of the acronyms GEcS and GEnS, respectively, and these abbreviations will be used in this report.

member states to be able to map them in their national territories and to assess their *condition* (Action 5). This leads us to the next sub-research question:

3.1.1 How are marine ecosystem types defined, and is there a common methodology for the mapping and assessment of ecosystem condition? (Action 5)

In this sub-section we conduct an *ex post* outcome evaluation of Target 2's Action 5 of the EU 2020BDS. We compare the progress made against the stated goal under Action 5, which reads as follows:

> *Member States, with the assistance of the Commission, will map and assess the state of ecosystems and their services in their national territory by 2014, assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020.*

In this report, we focus on whether common understanding exists of marine ecosystem *types* and whether common approaches are followed for the *mapping* and assessment of ecosystem *condition*. The notions of ecosystem services, accounting and reporting are left out of the analysis.

On ecosystem types and common mapping methodologies

The working group MAES (Mapping and Assessment of Ecosystems and their Services) was created to develop an analytical framework to be applied by the EU and its member states to ensure consistent approaches (MAES 2018). As part of the effort to establish links among existing European, national and/or regional marine assessments and maps, a partnership led by the European Topic Centre on Biological Diversity (ETC/BD) conducted a comparison of European marine habitat typologies to support MAES in the harmonization of ecosystem definitions and mapping (Evans et al. 2014). The typologies examined were those listed in Annex 1 of the EU Habitats Directive, the Marine Strategy Framework Directive's predominant habitat types, EUNIS (European Nature Information System) and EUSeaMap, a European scheme for consistent seabed broad scale habitat mapping. So-called crosswalks, which aid in the translation between different habitat classifications, were identified among the different typologies by the ETC/BD partnership and presented in their report. According to the report's authors "It is clear that the relationships between the different habitat classifications can be complex" (Evans et al. 2014:14). In other words, despite efforts to harmonize ecosystem type definitions, different typologies exist and are still used by different European Directives, which potentially creates confusion and ambiguity during member state reporting.

MAES defines marine ecosystems as those "encompassing all marine waters, including waters at the land/sea interface with salinity higher than 0.5‰" (Maes et al. 2018:49). A typology of four marine ecosystem classes –based on broad-scale habitats- was produced: marine inlets and transitional waters, coastal, shelf and open ocean (MAES 2018). The former two classes fall mainly under the provisions of the Water Framework Directive (WFD), up to one nautical mile in seaward direction, while the latter two classes fall under the provisions of the MSFD (ibid). One of the problems here is that these four broad-scale habitat types are much broader than Habitat Directive types, which makes comparisons difficult. For instance, habitat-forming species such as Corallium and Zostera/Posidonia and Pinna would correspond to a EUNIS habitat level 5, whereas the MAES 'shelf' and 'open ocean' habitat types are closer to

EUNIS habitat level 1. The Habitats Directive includes approximately 10 habitat codes, which in turn are different to EUNIS.

The need for maps of the seabed has increased in recent years in order to fulfil reporting obligations on the state of the marine environment under various EU policies and legislation.[3] While significant progress has been made in mapping the seabed in many European seas through EMODNET and EMODNET[4] projects and harmonising MSFD habitat assessment requirements with EMODNET outputs (based on new MSFD/EUNIS classification, Evans et al. 2016), large gaps still exist in mapping marine habitats, the extent of degraded habitats and anthropogenic pressures acting on these habitats (Dailianis et al. 2018; Gerovasileiou et al., submitted).

We can conclude, then, that Action 5 did not meet its goal with respect to establishing a shared understanding among Member States of marine ecosystem types nor a common methodology to map them by the year 2014 (for example, large parts of the Mediterranean were not mapped before 2016). Furthermore, MAES habitat types are too broad, and large gaps in the mapping of the seabed still remain at present.

On a common methodology for the assessment of ecosystem condition
Indicators to assess the condition of the marine ecosystem types identified by MAES are state indicators as defined by the WFD for transitional waters and marine inlets (ecological status), and by the MSFD for coastal, open and shelf ecosystems (environmental status). Furthermore, biodiversity indicators for coastal, open and shelf ecosystems correspond to the MSFD's descriptors 1, 2, 3, 4 and 6 (see section 3.2.4 on MSFD), and to SEBI's 02 Red List Index for European species[5].

In creating the marine ecosystem typology, MAES drew from the list of MSFD predominant habitat types to be able to use MS reporting on MSFD implementation for the MAES assessments. The reasoning behind this is that the MSFD's reporting "should be the widest ranging reporting in terms of the state of marine ecosystems" (Evans et al. 2014:15). Nonetheless, the ETC/BD report noted that "the extraction and analysis of Member States reporting of MSFD Article 8 (Initial assessment) by the EEA [and its European Topic Centre/Integrated Coastal Management] in the context of the MSFD Article 12 process shows too many divergences for this to happen in 2014 when considering the whole of the EU" (Evans et al. 2014:15).

Again, the conclusion is that Action 5 did not meet its goal related to establishing a common methodology for the assessment of marine ecosystem condition by the year 2014. A comprehensive review of the "State of the knowledge on European marine habitat mapping and degraded habitats" carried out by the MERCES consortium in 2017 concluded that "a common understanding and interpretation on how to assess degradation (and thresholds of change) across habitats is lacking" (Bekkby et al. 2017:4).

[3] http://ec.europa.eu/maritimeaffairs/policy; http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm; http://ec.europa.eu/maritimeaffairs/policy/marine_knowledge_2020
[4] European Marine Observation and Data Network http://emodnet.eu
[5] https://biodiversity.europa.eu/topics/sebi-indicators

3.2. How is marine ecosystem restoration defined and operationalized in EU Directives relevant for the implementation of the EU 2020BDS Target 2?

As stated before in this report, Action 6a under the EU 2020BDS required MS to articulate their operationalization of ecosystem restoration. This sub-section is structured as follows: first we conduct an *ex post* outcome evaluation of Target 2's Action 6a by examining whether the stated goal was attained. Then we examine how the relevant EU Directives define and operationalize marine ecosystem restoration, and we end by assessing whether shared understandings of how to define and operationalize marine ecosystem restoration exist.

The goal of Action 6a was formulated as follows: *By 2014, MS, with the assistance of the Commission, will develop a strategic framework to set priorities for ecosystem restoration at sub-national, national and EU level.*

During the working group discussions on EU 2020BDS implementation it was decided that the focus of these restoration prioritization frameworks (RPFs) would be on terrestrial ecosystems (Lammerant et al. 2013). MS were thus requested to develop and submit their national prioritization frameworks for restoration of terrestrial ecosystems by the year 2014. However, "all MSs failed to honour their commitment to deliver a sound national restoration prioritization framework by the end of 2014, an initiative intended to improve the quality, scale and consistency of ecosystem restoration" (Cortina-Segarra et al. 2016). According to one respondent affiliated to the Society for Ecological Restoration, although efforts were undertaken to reach common understandings through the working group discussions and the report prepared under the auspices of the European Commission, the output of such process was unsuccessful in meeting Action 6a's goal: "(...) despite the agreement of the MS on the value of this report, the MS finally failed to produce national RPF reports" by the 2014 deadline (personal communication, SER).

According to the 2015 mid-term review of the EU Biodiversity Strategy (EC, 2015), few comprehensive restoration strategies at national and sub-national levels were developed by 2015 in some of the MS (France, Finland, the UK), often in response to legislation such as the WFD, the MSFD, and the HBD. The Netherlands and Germany being the only countries which –at the time the report was written- had provided the Commission with RPFs as requested by Action 6a (EC, 2015; Telesetsky et al., 2017). Another respondent affiliated with SER notes that, as of end 2018, "only a few MS have made any progress towards developing national RPFs."

But what about prioritization frameworks for marine ecosystem restoration? Schoukens observes that, as the 15% restoration target put forward by the EU 2020BDS is not legally binding, "it needs to be assessed to what extent the existing EU environmental directives, as well as the [Common Fisheries Policy] (CFP)..., already comprise further legal obligations as to ecological restoration..." (2017:47). Indeed, given that EU nature and environmental legislation such as the Birds and Habitats Directive (BHD), the WFD, the MSFD and the CFP contain legal obligations for biodiversity conservation and restoration, during the working group discussions on EU 2020BDS implementation it was proposed that the 15% marine ecosystem restoration "**includes Natura 2000 targets ...** as well as **all other environmental targets which are relevant in the context of restoration**, such as progress made towards the attainment of Good

Ecological Status under the WFD and Good Environmental Status under the MSFD" (Lammerant et al. 2013:20; emphasis in original source).

The EU-commissioned report "Implementation of 2020 EU Biodiversity Strategy: Priorities for the restoration of ecosystems and their services in the EU" clarifies the decision not to include marine ecosystems in the national RPFs:

> "The WFD and the MSFD are the real drivers to restore degraded freshwaters and marine waters, meaning that the prioritisation framework for these ecosystem types is established through the legislation... This being the case, there is indeed no point in including lakes and rivers, as well as marine ecosystems into the RPF work other than to make sure that progress towards the objectives of the WFD and the MSFD can be properly accounted for in the context of Target 2 of the Biodiversity Strategy (Lammerant et al. 2013: 25-26)."

The report clearly notes that the 15% target should be applied separately to marine waters (Lammerant et al. 2013). Several questions remain, however, about how progress towards the objectives of the BHD, CFP, WFD and the MSFD is or should be accounted for in relation to the EU 2020BDS Target 2 (Lammerant et al. 2013:63). At the core of this uncertainty lies the ambiguity regarding how marine ecosystem restoration should be interpreted within these EU nature and environmental directives. In the sub-sections below we examine how each Directive defines ecosystem restoration and the interrelated concepts of ecosystem degradation, recovery, baseline and restoration targets.

3.2.1 Birds and Habitats Directive

Together, the Birds (2009/147/EC) and the Habitats Directives (92/43/EEC) constitute the backbone of the EU's biodiversity policy, as they protect Europe's most valuable species and habitats. The protected areas designated under these directives configure the Natura 2000 network. Although a restoration duty is expressed in both directives, no definition of restoration is provided (92 / 43 / EEC), nor generally applicable restoration priorities or standards are laid out. As Schoukens observes (2017), the lack of a legal definition of restoration is not surprising given the 'old' age of these directives, initially adopted in 1979 and 1992, respectively, when the notion of ecosystem restoration had not yet penetrated the lexicon of nature conservation and environmental law (Richardson 2016).

Although an explicit definition of restoration is lacking, the overall objective of both directives is "to ensure that the species and habitat types they protect are maintained, or restored, to a favourable **conservation status** throughout their natural range within the EU.[6]" (emphasis added).

The concept of 'favourable conservation status', which distinguishes levels in relation to conservation condition for Natura 2000 species and habitats ("favourable", "unfavorable – inadequate", "unfavorable – bad") is considered in the EU 2020BDS-commissioned report to reflect the 'restoration' level (Lammerant et al. 2013), akin to the 4-level conceptual model introduced in section 3.1. In other words, these distinctions of conservation status seem to be indicative, according to the EU-commissioned report, of the level of ecosystem degradation and/or recovery.

[6] https://publications.europa.eu/en/publication-detail/-/publication/7230759d-f136-44ae-9715-1eacc26a11af

With respect to the notion of baselines, or reference conditions, the BHD's approach is flexible, as it does not necessarily require a return to an undisturbed, or "natural" situation. Schoukens (2017) points out for instance, that the definition of 'natural habitat' in the Habitats Directive includes both 'entirely natural' and 'semi-natural'. These directives, according to Schoukens, "provide relatively little guidance for the establishment of a baseline scenario, for instance in the context of Natura 2000 sites, against which the applicable conservation objectives are to be determined" (2017: 324). Regarding conservation or restoration targets, MS enjoy some flexibility as well in terms of setting concrete population and habitat range targets. The use of concepts such as 'minimum viable population' levels and 'favourable reference population' denote that the Directives goal for protected species and habitats "(...) is therefore more than just halting their further decline or disappearance; the aim is to ensure that the species and habitats recover sufficiently to enable them to flourish over the long-term."[7]

3.2.2 Common Fisheries Policy

The CFP is the EU's instrument for the management of fisheries and aquaculture and falls under the exclusive competence of the EU. In its early stages in the 1970s, the common measures taken in the fisheries sector focused on granting equal access to all European waters to all MS, the organization of a common market and structural measures to modernize the fishing fleet. Throughout the years, these measures extended to cover other aspects, such as resource conservation and management. Since its origin, the conservation policy of the CFP has given rise to the most divisive debates among MS and harsh criticism from the public. The reason for the former is that the new principles and measures established under the conservation policy impinged on MS's traditional freedom, not only in terms of what fish and how much may be caught but also where, when and how it may be done (Carballo-Cárdenas 2010). The reason for the latter is the poor state of the fish stocks in Europe, which testifies to the limitations of the conservation policy: today, approximately 74 % of fish and shellfish stocks in Europe's seas are not in GEnS.[8]

The CFP has been reformed on three occasions, the last time in 2013. Article 2(2) of Regulation no. 1380/2013, stipulates that the aim of the CFP is to 'ensure that exploitation of living marine biological resources **restores** and maintains populations of harvested species above levels which can produce the maximum sustainable yield [MSY]'.[9]

No comprehensive definition of restoration is provided by the CFP, although implicitly, restoration entails achieving levels above MSY for harvested species. It must be recognized, however, that the target of maintaining and restoring fish stocks to levels that can produce MSY is a fisheries management objective rather than a nature conservation policy objective.[10]

[7] https://publications.europa.eu/en/publication-detail/-/publication/7230759d-f136-44ae-9715-1eacc26a11af/language-en

[8] based on the level of fishing mortality and reproductive capacity https://www.eea.europa.eu/airs/2017/natural-capital/marine-fish-stocks

[9] Regulation no. 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC [2013] 354/22.

[10] Opinion of the European Economic and Social Committee Communication from the Commission: Our life insurance, our natural capital: an EU Biodiversity Strategy to 2020 COM(2011) 244 final.

Furthermore, attention should be paid to the "shifting baseline syndrom" when evaluating stocks and deciding MSY levels and other management tools (Pauly 1995).

Fisheries affect marine ecosystems not only through (over)exploitation of targeted stocks, but also through unsustainable fishing practices that affect non-target species and habitats. One interesting aspect to consider here is the intersection between the CFP and the BHD. Schoukens notes that this relationship was ambivalent for a long time. Whereas MS, in order to comply with marine Natura 2000 obligations "might be obliged to ban certain forms of destructive fishing practices such as beam trawling, which might seriously compromise the recovery of several marine habitat types listed under Annex I to the Habitats Directive, the exclusive nature of the EU's competence in the field of CFP seemed to hinder such recovery policies or at least render them troublesome given the many procedural hurdles" (2017:97).

One of the innovations introduced in the 2013 CFP reform is Article 11, which lays out provisions that enable MS compliance with conservation obligations under Art. 13(4) of the MSFD, Art. 4 of the Birds Directive and Art. 6 of the Habitats Directive. Essentially, Article 11 relates fisheries policy (EU competence) with conservation policy within marine protected areas (MS competence) in European Union seas (ClientEarth 2014). As Ribeiro puts it "the balance established by Regulation No. 1380/2013 between the exclusive competence of the European Union for the conservation of fisheries resources and, in the domain of the shared competences, the competence of the coastal MSs for the protection of marine biodiversity is highly controversial "(2017: 66). Schoukens explains further (2017:97):

> "Since the text of the said provision refers to Article 6 of the Habitats Directive in its entirety, passive and active restoration measures with an impact on existing fishing practices in order to foster the recovery of degraded marine habitats are also included. The said regulation explicitly enables MSs to implement restoration measures beyond 12 nautical miles. This implies that MSs can adopt measures which restrict fishing practices in their marine Natura 2000 sites that are located inside their Exclusive Economic Zone (EEZ). Still, the possibility to autonomously adopt such conservation measures is effectively restricted to measures not affecting fishing vessels of other MSs. Where such measures might affect fisheries interests of other MSs, the power to adopt such measures is granted to the European Commission by Article 11(2) of Regulation no. 1380/2013".

3.2.3 Water Framework Directive

The Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy, or Water Framework Directive (WFD), was adopted in October 2000. Article 4 of the WFD establishes the legal obligation for MS to reach "Good Ecological Status" (GecS) of all surface waters, including marine waters up to 1 nm from shore, by 2015 (extension to 2027 is possible) (Hering et al. 2010). MS must protect, enhance and **restore** all bodies of surface water in accordance with the provisions laid down in Annex V of the Directive.

Once again we see no clear or comprehensive definition of restoration put forward by the WFD, but measures taken to reach GEcS can be interpreted to in fact include or consist of restoration measures, related to a number of underlying descriptors. GEcS is defined as a status where "the values of the biological quality elements for the surface water body type show low levels of distortion resulting from human activity, but deviate only slightly from those normally associated with the surface water body type under undisturbed conditions" (Van Hoey et al. 2010:2188). The baseline scenario of "undisturbed" or pristine conditions suggests a pre-human degradation status and as such puts forward ambitious reference conditions. These reference conditions are type-specific, meaning that they differ according to the different types of rivers, lakes or coastal waters in order to take into account the wide diversity of eco-regions in Europe.

The WFD requires classification of all European surface waters in terms of their ecological status. A comprehensive array of indicators, criteria and descriptors has been developed for this purpose. The WFD's classification scheme for ecological status includes five classes: high, good, moderate, poor and bad. 'High status' corresponds to GEcS as it is the best status achievable, or the benchmark. The ecological status of a water body is determined according to the extent of deviation from the benchmark, as defined by the WFD: 'good status' means 'slight' deviation, 'moderate status' means 'moderate' deviation, and so on. When classifying the water bodies, the 'one out, all out'-principle should be applied. This translates as follows:

> "(…) the lowest score throughout the different applicable subcategories for a water body – and thus not their average value – determines the final status class of a body of surface water. This entails that if one subcategory – for instance fish habitats – is in bad condition, the overall status is to be categorized as 'poor', even if other factors are in better condition" (Schoukens 2017:16).

Although biological quality elements are the focus of the definition in GEcS, and biodiversity indicators are central for defining what constitutes high and good ecological status, the WFD does not as such aim to protect particular species, communities, biotopes or habitats. The WFD does not list any particular species in terms of its needs for conservation, protection or restoration. The WFD attempts to apply an ecosystem-based approach (Van Hoey et al. 2010).

The way the concepts of ecosystem degradation and recovery are expressed in the WFD, according to the report commissioned by the EU to aid MS in the implementation of the 2020 EUBDS, are congruent with the 4-level model proposed by this working group:

> "The WFD foresees different levels of ecosystem condition (high, good, moderate, poor and bad); this fits well with the multi-step approach of the 4-level concept, e.g. improvements in water quality from bad to moderate, moderate to good and good to high" (Lammerant et al. 2013:20).

The process of interpreting GEcS and translating it into a set of measurable environmental targets and associated indicators, however, has been a long and complicated task (Van Hoey et al. 2010; Hering et al. 2010). This process has been carried out for WFD at the MS level, and hence required intercalibration of the entire process between the MS of certain geographic regions. This entailed that the definitions of GEcS and 'reference conditions' were harmonized so that MS could reach common understanding and similar levels of ambition of water quality in the regions (Cavallo et al. 2016). For the MSFD, the process of interpreting and translating GEnS has been carried out in a regional setting, because the MS have to define common indicators per descriptor for GEnS at the Regional Sea level (Salomon, 2006; Rice et al., 2010).

3.2.4 Marine Strategy Framework Directive

The MSFD constitutes the environmental pillar of the Integrated Maritime Policy for the EU[11]; it aims at achieving a "good environmental status" (GEnS) for all EU seas by 2020, following an ecosystem-based approach (Berg et al. 2015). The MSFD covers all marine waters from the coastline up to the limit of the Exclusive Economic Zone (EEZ, 200 nm) and extended continental shelf. The MSFD defines GEnS as ''the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are intrinsically clean, healthy and productive, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations'' (EC 2008).

Under the MSFD (Article 1), MS should prepare and implement marine strategies in order to protect and preserve the marine environment, prevent its deterioration or, where practicable, restore marine ecosystems in areas where they have been adversely affected. The MSFD does not have a strong explicit focus on restoration, but does reference it in connection to the integrity, structure, and functioning of ecosystems to "be maintained or, where appropriate, restored."[12] It seems that the first inclination of the policy is to protect and prevent deterioration of the marine environment, but when needed invokes restoration. In addition, it is relatively unambitious in regard to restoration when it qualifies "where practicable" and "in areas where they have been adversely affected."

Mitigation and remediation tools are also explicitly referred, as the tools which guide activities to restore "damaged *components* of marine ecosystems," (MSFD, Annex VI, Programme of Measures; emphasis added). Thus, there is little evidence of the intention to govern ecosystem-wide restoration, but to restore components that re-establish the functioning, structure, and integrity of marine ecosystems.

Maintaining biodiversity is one of the primary motivations of the MSFD and once again parameterizes restoration as the final, remaining solution after protection and preservation have been implemented and "where practicable."[13] In the fisheries domain, the MSFD calls to the CFP namely in integrating environmental concerns and in connection to spatial management tools and enabling the integrity of ecosystems to be maintained or restored to safeguard spawning, nursing, and feeding grounds (MSFD preamble 9 and 39). There are no explicit definitions of restoration or what constitutes restored in the MSFD, beyond links to the 11 descriptors of GEnS (Borja et al. 2013). As in the WFD, the underlying assumption is that, if measures lead an ecosystem to reach a "good" environmental status, these measures can be interpreted as being constitutive of restoration.

> "The ecological concept behind both directives is, in principle, very simple, and consists of comparing the current state of an area with that which would be expected under minimal or sustainable human use of that area and, in case of degradation, intervening to bring it back to the desired good status" (Van Hoey et al. 2010: 2187).

Operationalization of this intervention to bring back an area to the desired good status and interpretation of such "desired good status" in scientific terms remains challenging (Berg et al.

[11] http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm
[12] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN
[13] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN

2015; Borja et al. 2013). Borja et al. point out that “there is (...) little understanding of what to consider as a meaningful quantitative definition of GEnS for a marine area, despite the stipulation in the MSFD that GEnS is an expression of the desired condition of the environment” (Borja et al. 2013, 17). Indeed, Schoukens observes that “irrespective of the apparent restoration rationale, additional provisions to further implement the MSFD objectives remain somewhat ambiguous" (2017: 32-33).

Our last sub-research question at the policy level pondered how MS apportion the different nature and environmental targets towards the figure of “15%” restoration of degraded ecosystems under Target 2 of the EU 2020 BDS (Action 6a; Targets 1,4). No information could be found on the issue whether MS have clearly and unambiguously articulated their strategic priorities for marine ecosystem restoration within the aforementioned Directives.

One of our respondents, affiliated with DG Environment and working on the promotion of accounting systems, said the following when asked how MS are implementing Target 2 with respect to marine ecosystems, including how they were apportioning the various targets from EU Directives towards the “15%”target, and what the expectations were of the MS reports on Target 2 before the 2020 deadline:

> “We’ve had some challenges. It’s quite complex, how to measure restoration... Frankly, it hasn’t worked very well....We’re not going to get much on marine, only a few MS will probably report, for example Finland, the Netherlands, Belgium, maybe Germany... It will not be terribly successful.” (personal communication, DG ENV).

In addition, the following questions were asked to another respondents, who is affiliated with DG JRC and was involved in the MAES working group: Is the 15% restoration target referring to <u>all</u> restorable marine ecosystems per MS? In other words, does the 15% target refer to all marine ecosystems together, or 15% of all types of ecosystems should be restored (e.g 15% of coastal, 15% of shelf, 15% of open ocean ecosystems, according to the MAES typology)? Must **each** MS reach 15% or is the target EU wide, or per regional sea? How is prioritization of ecosystem restoration being carried out by the MS? How to find the 2010 baseline for specific ecosystems in specific spatial areas of each MS? How to decide that 15% has been restored?

Our respondent answered: “According to me none of these questions have been solved due to political difficulties and disagreement” (personal communication, DG JRC).

Summary

As we have seen in section 3.2, the working group convened to assist MS in implementation of Target 2 of the EU 2020 BDS has proposed to operationalize marine ecosystem restoration based on existing EU nature and environmental legislation (Lammerant et al. 2014). Sub- sections 3.2.1-3.2.4 show that each Directive defines (often implicitly) restoration in different ways, and approaches the notions of ecosystem degradation/recovery and of baseline/reference conditions differently. This complicates a common understanding of how to apportion the different nature and environmental targets towards the figure of “15%” restoration of degraded marine ecosystems under Target 2 of the EU 2020BDS and will result in ambiguous reporting to the European Commission for the final evaluation of the EU Biodiversity Strategy’s Target 2 assessment.

3.3. Regional Seas Conventions: defining ecosystem restoration and implementing the MSFD

The MSFD is the most comprehensive marine directive and links other directives and policies under its framework. Hence, achieving the 15% restoration target seems to be heavily dependent on MSFD implementation. Indeed, according to an interview with a biodiversity policy officer affiliated with DG Environment:

> "For prioritisation by MS, it means **restoration of habitats under MSFD is priority one** and also under Water FD and Habitats Directive, etc, which in total should be 15% " (personal communication, DG ENV, emphasis added).

It is important to keep in mind that the overall structure of the MSFD as a framework directive encourages actions to originate in the MS and when necessary coordinate regionally. Article 5 states that MS should develop national marine strategies that are specific for their waters, but these strategies should also reflect the overall approaches of the marine region or sub-region concerned. The MSFD relies on the regional institutions' ongoing work in terms of the methodological standards, criteria and tools used for regional assessments. In particular, the Regional Seas Conventions (RSCs), as existing cooperation and coordination structures at the regional sea level, have been put forward as the main coordinating forums at the regional level for implementing the MSFD (Van Tatenhove et al. 2014; Van Leeuwen et al. 2012; Borja et al. 2010). The aim of this section is two-fold: to examine how the RSCs define and operationalize ecosystem restoration, and how the RSCs are performing in their role of coordinating units for the implementation of the MSFD -and hence ecosystem restoration- in the four EU regional seas.

The MSFD establishes European marine regions and sub-regions based on geographical and environmental criteria. The four regions are the North-East Atlantic Ocean, the Black Sea, the Baltic Sea and the Mediterranean Sea; the North-East Atlantic and Mediterranean regions are further divided in four sub-regions each (Figure 3.3). These regions correspond to the four RSCs: the Oslo-Paris Convention (OSPAR) for the North-East Atlantic Ocean, the Helsinki Convention (HELCOM) for the Baltic Sea, the Barcelona Convention (UNEP MAP) for the Mediterranean Sea and the Bucharest Convention (BSC) for the Black Sea. As stated above, the RSCs have been given a crucial role in the implementation of the MSFD. In the following sub-sections an overview is provided of how the four RSCs define and operationalize ecosystem restoration. The chapter concludes with an *ex post* evaluation, with both an outcome- and process-oriented focus, of how the RSCs have performed in their role of coordinating units for the implementation of the MSFD.

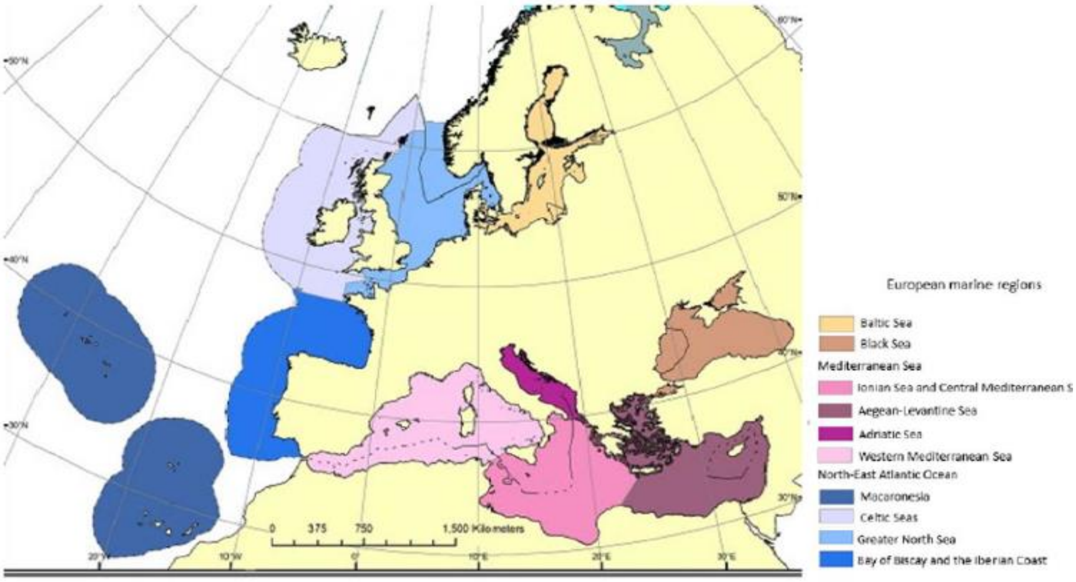

Figure 3.3 European marine regions and sub-regions (source EEA)

3.3.1 OSPAR Convention

The overarching goal of the OSPAR Commission is "to conserve marine ecosystems and safeguard human health and, when practicable, **restore** marine areas which have been adversely affected in the North-East Atlantic by preventing and eliminating pollution and by protecting the maritime area against the adverse effects of human activities" (OSPAR 2010-3) [14]. The Commission intends to apply the ecosystem approach to manage human activities that affect the maritime area.

In line with the Convention on Biological Diversity's (CBD) Aichi targets, OSPAR's Biodiversity and Ecosystems Strategy has as main goal "to halt and prevent by 2020 further loss of biodiversity in the OSPAR maritime area, to protect and conserve ecosystems and **to restore**, where practicable, marine areas which have been adversely affected." (OSPAR 2010-3). OSPAR intends to achieve this goal by improving the status of threatened or declining species and habitats, and by establishing a coherent network of well-managed marine protected areas (MPAs), consistent with the CBD targets for MPAs.[15]

Through the establishment of an MPA network, multiple objectives are strived for, including restoration: "Within OSPAR, MPAs are understood as areas for which protective, conservation, restorative or precautionary measures have been instituted for the purpose of protecting and conserving species, habitats, ecosystems or ecological processes of the marine environment".[16]

Although OSPAR does not provide a clear, comprehensive definition of restoration nor clear guidelines of how restoration should be enacted, the following definitions of 'ecological quality', 'ecological quality reference level' and 'ecological quality objective' provide a starting point for the operationalization of the concept of ecosystem restoration:

[14] https://www.ospar.org/site/assets/files/1466/biodiversity_strategy.pdf
[15] https://www.cbd.int/sp/targets
[16] https://www.ospar.org/work-areas/bdc/marine-protected-areas

a. “ecological quality” is an expression of the structure and function of the ecological system taking into account natural physiographic, geographic and climatic factors as well as biological, physical and chemical conditions including those from human activities;
b. “ecological quality reference level” is the level of ecological quality where the anthropogenic influence on the ecological system is minimal;
c. “ecological quality objective” is the desired level of ecological quality relative to the reference level (OSPAR 2010-3:25).

As the MSFD, OSPAR has committed to apply an ecosystem approach. OSPAR’s Biodiversity and Ecosystems Strategy and the marine strategies developed by the MS to implement the MSFD are separate but interlinked processes, with similar objectives and considerable overlap in the science being used to monitor and report on the sea areas covered by both OSPAR and the MSFD (Cavallo et al. 2017). The geographic area of responsibility is different between the two: OSPAR covers the Wider Atlantic and Arctic waters, which the MSFD does not. Moreover, the legal status of the MSFD and the OSPAR Strategy differ: whereas the MSFD has a legal basis, the OSPAR Strategy does not.

3.3.2 Helsinki Convention (HELCOM) and restoration

HELCOM’s attention to restoration comes in through its Baltic Sea Action Plan and the following ministerial orders. However, there is not an explicit definition of restoration, and seldom is restoration invoked in the context of marine ecosystems. Threats are isolated, which tie restoration to the ultimate objective of the “sustainable utilization of the marine goods and services provided by the Baltic Sea.” Restoration is connected to water quality and salmon/trout or migratory fish species.

Wetland restoration is one of the proposed means of improving water quality and the protection against nutrient losses in the Baltic. Restoration is specified in the objectives and related measures (actions in the HELCOM nomenclature) under Municipal Wastewater Treatment and On-site Wastewater Treatment for individual homeowners, small businesses, and small settlements. In the case of Municipal Wastewater Treatment, Article 3 of the Convention is invoked and calls for individual and joint legislative and administrative measures to prevent and abate pollution “to promote ecological restoration.” For the On-Site Wastewater Treatment, dioxin and other hazardous substances are referenced.

In HELCOM, the restoration of migratory species—explicitly salmon and sea trout—is a central focus. In connection to these fisheries, restoration of habitat and stocks are connected to multiannual management plan efforts at the EU level (CPH Declaration). Habitat restoration refers to riverine and estuarine waters. Nonetheless, restoration is also linked to reintroduction of species (stocking practices included) and data collection of users, namely recreational fishers. Eel management has also come onto HELCOM’s agenda with explicit links to plans developed in connection to the EU Habitats Directive. For these migratory fishery species, the emphasis on joint, regional, or international cooperation is high. Finally, restoration is also referenced to broader biodiversity goals. HELCOM documents cite the 1979 Bonn Convention and focus on seafloor integrity maintenance and restoration “at a level that safeguards the functions of the ecosystems.”

3.3.3 Barcelona Convention and Restoration

In 1975 the Mediterranean Action Plan (MAP) was approved by 16 countries and the European Community under the United Nations Environmental Programme (UNEP) Regional Seas Programme. The MAP was the instructional framework for cooperation in addressing common challenges of environmental degradation with the objective of assisting Mediterranean governments to assess and control marine pollution, formulate national environmental policies and improve their capacities for development and allocation of resources (UNEP-MAP, 2015). In 1976, UNEP convened the Barcelona Conference where Mediterranean country representatives adopted the legal support needed to implement the MAP Programme. The Barcelona Convention was the resulting international agreement concerning the protection of the Mediterranean Sea against pollution. The convention currently has 22 Contracting parties, 21 coastal Mediterranean states plus the European Community. Eight of the states are EU members (Albania, Algeria, Bosnia and Herzegovina, *Croatia*, *Cyprus*, Egypt, the European Community, *France*, *Greece*, Israel, *Italy*, Lebanon, Libya, *Malta*, Monaco, Montenegro, Morocco, *Slovenia*, *Spain*, Syria, Tunisia, Turkey). The Convention has adopted 7 protocols concerning particular aspects of environmental conservation, several of which have been amended/replaced:

- The Protocol for the Prevention of Pollution in the Mediterranean Sea by Dumping from Ships and Aircraft (adopted in 1976, amended in 1995);
- The Protocol concerning Cooperation in Preventing Pollution from Ships and, in Cases of Emergency, Combating Pollution of the Mediterranean Sea (adopted 2002, replacing the related Protocol of 1976);
- The Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities (adopted in 1980, amended in 1996);
- The Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (adopted in 1995, replacing the related Protocol of 1982) and Annexes (adopted in 1996, amended in 2009, 2012, and 2013);
- The Protocol for the Protection of the Mediterranean Sea against Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil (adopted in 1994) ('Offshore Protocol');
- The Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal (adopted in 1996);
- The Protocol on Integrated Coastal Zone Management in the Mediterranean (adopted in 2008).

The Barcelona Convention is a general agreement for environmental protection, with more specifics given in the subsequent protocols. UNEP through MAP carries out secretariat functions in the framework of the implementation of the Convention (convening and preparing meetings, coordination, etc.) with specific actions relating to the protocols covered by regional activity centres (RACs) and Strategic Action Programmes (SPA).

Recently, the Mediterranean Strategy for Sustainable Development 2016-2025 (UNEP(DEPI)/MED IG.22/28) provides an integrative policy framework and a strategic guidance for all stakeholders and partners to translate the 2030 Agenda for Sustainable Development at the regional, sub regional and national levels. This will ensure sustainable development, promote resource management and assist in the transition to Blue and Green Economies. The Strategy strengthens Convention protocols, implementation and compliance, pushing the transposition of protocols and action plans into national policies and supporting conservation initiatives by national governments examples of this include:

- implement the Ecosystem Approach Roadmap to achieve healthy marine ecosystems and conserve marine biodiversity.
- implement the Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean region (SAP BIO), and its related national action plans

Although implicit, the only reference to restoration concerns fish stocks for maximum sustainable use, and also in relation to "sustainable exploitation of non-renewable resources and related post-extraction ***restoration***".

Restoration and related activities are not defined in the Barcelona Convention or any of the Protocols. The principal of restoration and related activities appears at the level of the protocols, but in a very light way in that restoration may be required following degradation.

- The Mediterranean Pollution Assessment and Control Programme (MED POL) promotes "implementation of national action plans, including programmes and measures, for the reduction and gradual elimination of pollution, the mitigation of the impacts of pollution and the ***restoration*** of systems damaged by pollution"
- Protocol concerning Specially Protected Areas and Biological Diversity (SPA/BD) within area/species protection/conservation develops the aspect of "Protecting habitats that are in danger of disappearance or are necessary for the survival, reproduction and ***restoration*** of threatened or endemic species"
- The Offshore Protocol had led to three EU countries (Cyprus, Spain and Croatia) in their national legislation requiring either a plan for, or some form of restoration/recuperation or rehabilitation after cessation or removal of gas/oil infrastructure.
- The Protocol on Integrated Coastal Zone Management (ICZM) has a set of principles to guide the contracting parties which includes "damage to the coastal environment shall be prevented and, where it occurs, appropriate **restoration** shall be effected."

At a more specific level with particular agreements below the protocols, restoration and related activities become more active:

- A 2012 memorandum of understanding between the UNEP/MAP-Barcelona Convention and the General Fisheries Commission of the Mediterranean promoting ecosystem-based approaches for the conservation of marine and coastal environment and ecosystems, and the sustainable use of marine resources includes two specific sustainable development goal targets:
  - 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their ***restoration*** in order to achieve healthy and productive oceans
  - 14.4: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to ***restore*** fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
- In harmonising with the EU policies (in particular the Water Framework Directive and Marine Framework Strategy Directive) and towards implementation of an Ecosystem Approach two programmes have been co-financed with the EU. Strategic goals include:

1. To protect, allow recovery, and where practicable, **restore** the structure and function of marine and coastal ecosystems – thus also protecting marine biodiversity – in order to achieve and maintain good ecological status allowing for sustainable use.
2. To reduce pollution in the marine and coastal environment so as to ensure that there are no significant impacts or risks to human and/or ecosystem health and/or on the uses of the sea and the coasts.
3. To preserve, enhance, and **restore** a balance between human activities and natural resources in the sea and the coasts and reduce their vulnerability to risks.

The most recent project was in 2012: "*Implementation of the Ecosystem Approach (EcAp) in the Mediterranean by the Contracting parties in the context of the Barcelona Convention for the Protection of the Marine Environment and the Coastal region of the Mediterranean and its Protocols*". This on-going work to allow UNEP/MAP to develop the EcAp in full coherence with the MSFD with and requirements towards initial coastal and marine environmental assessment, setting targets towards Good Environmental Status, monitoring programmes, measures for implementation of EcAp and overall governance.

To mirror EU legislation on the "polluter pays" principle for environmental liability (EU Directive 2004/35/EC), in 2008 the Barcelona Convention adopted the "Guidelines for the Determination of Liability and Compensation for Damage resulting from Pollution of the Marine Environment in the Mediterranean Sea Area". The guidelines cover the cost of compensation and in relation to restoration include (Scovazzi, 2009):

- the cost of the re-establishment of the condition that existed before the pollution (primary remediation),
- the cost of compensation by equivalent action to be taken elsewhere if the polluted environment cannot fully return to its previous condition (complementary remediation)
- the cost of any action taken to compensate for interim losses of natural resources and/or services that occur from the date of damage occurring until primary remediation has achieved its full effect (compensatory remediation or interim compensation)

The Guidelines do not provide for "subsidiary liability" of the Contracting Parties, but the Explanatory Text to the Guidelines recommends broad liability for private actors. Non-EU Contracting Parties are asked to consider adopting national legislation mirroring as far as possible the provisions of the EU Environmental Liability Directive

There are many ambiguities in general in the Convention process concerning such steps as adoption, ratification, and implementation as well as the use of phrases in documentation such as "as soon as possible". This is also amplified by the needs or ability to transpose into national legislation. There is also little information on the scope of any restoration activity or detail that may be required beyond the guidelines for Liability and Compensation from pollution/damage by private parties. MAP have reviewed the targets regarding biodiversity and fisheries adopted within the framework of global, regional and other multilateral agreements applicable to the Mediterranean Sea (UNEP-MAP, 2013) and the areal extent marine targets for restoration of the CBD Strategic Plan for Biodiversity 2011-2020 and EU Biodiversity Strategy to 2020, but there is no equivalency or transposition into the Barcelona Convention.

3.3.4 Bucharest Convention

The governance framework for marine ecological restoration in the Black Sea is multilateral, regional and national in scope, with a strong European Union (EU) dimension in relation to Bulgaria and Romania. In the context of the law of the sea, the Black Sea is a semi-enclosed sea and subject to the general scheme of maritime spatial governance set out in the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and related instruments, with various rights and obligations vested in coastal, flag and port States. This includes the obligations to protect and preserve the marine environment including fragile marine ecosystems, as well as the habitat of depleted, threatened or endangered species and other forms of marine life, in accordance with Part XII of the Convention.[17] Similar to other regional seas worldwide, it is also subject to specific regional arrangements including those adopted under UNEP's regional seas programme, which was agreed in Bucharest in 1992, namely the Convention for the Protection of the Black Sea against Pollution, which has 6 States Parties.[18]

The Bucharest Convention and its constituent operating systems provides the principal legal framework for regional cooperation and is supplemented by additional protocols with more detailed rules adopted for the purpose of protecting the marine environment from land-based sources, combatting oil pollution and other harmful substances in emergency situations, and from dumping. Moreover, it needs to be emphasised that the Preamble of the Convention mentions expressly the duty placed on Contracting Parties under the Charter of Paris for a New Europe to 'intensify their endeavours to protect and improve their environment in order to restore and maintain a sound ecological balance in air, water and soil'.[19] Since its adoption, the scope of the Convention has since been broadened by the adoption of a protocol on the protection of biodiversity and landscape. The initial design of the regulatory and governance framework was informed largely by the requirements of meeting the needs of the Black Sea Environmental Programme and responding to the results of the Transboundary Diagnostic Analysis, which provided the initial scientific basis for the adoption of further environmental protection including rehabilitation measures.

Over the years since the adoption of the Bucharest Convention, rehabilitation of marine ecosystems has slowly come to the fore on the regulatory and policy landscapes. At the time of its adoption, the Black Sea was at the cusp of environmental collapse and the regional governance arrangements under the Bucharest Convention provided a relatively weak legal basis and governance arrangements for States Parties to arrest the catastrophic decline in the quality of the marine environment and the resources that it supports.[20] This lacuna was further compounded by the unwillingness of States Parties to effectively implement the conservation and sustainable use obligations arising under international law and regional instruments. The principal impetus towards the adoption of conservation and restorative measures was derived initially from the 1995 Strategic Action Plan for the Rehabilitation and Protection of the Black Sea and more recently from the Black Sea Integrated Monitoring and Assessment Program 2017-2022. In particular, the lack of robust regional arrangements for fisheries management has undermined the capacity of Contracting Parties to achieve this objective. Nonetheless, the 1996 Black Sea

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[17] Article 194(5), UNCLOS.
[18] Russia, Turkey, Ukraine, Georgia, Bulgaria and Romania.
[19] Preamble, Convention for the Protection of the Black Sea against Pollution.
[20] N. Oral, *Regional Co-Operation and Protection of the Marine Environment Under International Law: the Black Sea*, (Leiden/Boston: Nijhoff, 2013), *passim*.

Strategic Action Plan highlights the importance of protecting biological diversity and habitat as pre-conditions for the restoration of commercial fisheries including spawning and nursery grounds. Important progress has been made with the Bucharest Declaration for an enhanced regional cooperation towards sustainability of fisheries and aquaculture in the Black Sea, as well as the adoption of he Regional Plan of Action to fight illegal, unreported and unregulated (IUU) fishing. Most notably, progress has been made by the General Fisheries Commission for the Mediterranean (GFCM) in assisting and leading in many instances the Black Sea multilateral cooperation in relation to fisheries and the conservation of Black Sea turbot in particular. Furthermore, specific measures have been successfully implemented under the Strategic Action Plan to ensure the rehabilitation of marine mammals.

The institutional structure for stewardship of the marine environment of the Black Sea is fairly typical of arrangements under UNEP's regional seas programme worldwide and is comprised of the Black Sea Commission, which is responsible for implementing the Convention and is made-up of representatives from the State Parties. The work of the Commission is supported by a Permanent Secretariat and many of the key functions on implementing the substantive conservation and rehabilitation obligations arising under the Convention and associated instrumented are delivered by 7 advisory groups,[21] as well as an ad-hoc working group on the implementation of the Water Framework Directive (WFD). Crucially, the Advisory Group on the Management of Fisheries in the context of marine living resources is tasked with the function of coordinating activities and providing technical support for the protection and restoration of marine ecosystems. Working in tandem, the Advisory Group on Biological Diversity is tasked with providing advice on cost effective measures for the protection and rehabilitation of the Black Sea ecosystem including interactions with other frameworks and stakeholders including the ACCOBAMS and BSC Secretariats, as well as with industry, the public, NGOs and local biodiversity conservation groups. In all instances, the mandate of the various groups is advisory in scope and the practical obligation of implementing the recommended advisory measures rests with the governance framework established under the 1982 UNCLOS, namely: flag, coastal and port States. The EU is an important partner of the Black Sea Commission and provides substantial funding for the operational programme.

The institutional setting for the EU Member States Bulgaria and Romania is different from other Contracting Parties to the Bucharest Convention and accords with the general scheme set down by the EU legal order. Clearly in this regard, a full range of restorative obligations arises under EU law pertaining to the marine environment in relation to Bulgaria and Romania. Although not party to the Bucharest Convention as a Contracting Party its own right, the EU has reinforced the practical obligations arising under the Convention framework and related instruments through the articulation of a 'Communication on Black Sea Synergy – A new regional cooperation initiative', along with the EU's Integrated Maritime Policy for the Black Sea. Moreover, the enclosed sea is one of nine biogeographic regions established under the Habitats Directive, and is a particular focus for measures giving effect to the EU's biodiversity strategy. With a view to supporting the effective implementation of EU law, the European

[21] These include advisory groups on the following: Environmental Safety Aspects of Shipping; Pollution Monitoring and Assessment; Control of Pollution from Land Based Sources; Information and Data Exchange; Development of Common Methodologies for Integrated Coastal Zone Management; Conservation of Biological Diversity; and Environmental Aspects of the Management of Fisheries and other Marine Living Resources.

Commission provides considerable financial support for projects related to marine and coastal environmental monitoring of the Black Sea, as well as for the implementation of the Marine Strategy Framework Directive (MSFD) in Bulgaria and Romania, along with more specific projects such as the Black Sea Seabirds Project. The implementation of both the WFD and the MSFD are very significant in the broader context of implementing a viable scheme of conservation and restorative measures for the Black Sea because of the substantive obligations that arise under both instruments to restore the marine and coastal environments to a favourable conservation status. Furthermore, a key aspect of EU policy that is influencing ecological restoration of the marine environment is the firm position that it has taken on port state control in relation to vessel source pollution. Important developments in improving the scientific basis for decision-making and governance systems in relation to ecological restorative measures may be derived from the EU's BlackSea4Fish project, to address specific scientific needs of the Black Sea. Other EU initiatives directly applicable to marine ecological restoration under the MSFD that merit consideration include the Black Sea Integrated Monitoring System, which is aimed at protecting and restoring the environmental quality and sustainability of the Black Sea in Romania, Bulgaria and Turkey. Complementary measures with a strong environmental dimension have been adopted within the framework of the Transport Corridor Europe-Caucasus-Asia (TRACECA) – Maritime Safety and Security II projects.

The regulatory and policy setting is fragmented and in marked contrast to the considerable progress that has been made in other European regional seas including the Baltic Sea, the Mediterranean Sea and the North-East Atlantic, the regional arrangements directed at ecological restoration in the Black Sea are less mature and not sufficiently robust for addressing environmental degradation in a systemic and efficient manner.[22] In particular, the regional arrangements for ensuring compliance with rehabilitation obligations do not lead to implementation actions across the Black Sea in its entirety. Much remains to be done to enhance coordinated action at the regional level with a view to advancing the ecological restorative agenda. In this regard, according to the EU's Communication on Black Sea Synergy, the EU has a specific interest in developing a sustainable and ecological oil dimension to its co-operation in the region.[23] EU accession to the Bucharest Convention on the Protection of the Black Sea against Pollution thus remains a priority.[24] Under the Burgas Declaration towards the Common Maritime Agenda for the Black Sea adopted in May 2018, the EU fully supports the broader vision for the Black Sea, which is founded on environmental sustainability, social cohesion and viable economic development. In the latter regard, the EU is keen to support the adoption of a Common Maritime Agenda for the Black Sea in 2019. Due to political difficulties relating to security matters, it is difficult to anticipate how EU and cooperation with neighbouring States in this region will evolve in the coming years on governance matters that are fundamental to marine ecological restoration including matters concerning the Common Implementation Strategy of the EU marine legislation such as the MSFD. Nonetheless, the Bucharest Convention and its operating mechanisms remain the primary instruments for coordinating and implementing restoration policy in the Black Sea.

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[22] N. Oral, *Regional Co-Operation and Protection of the Marine Environment Under International Law: the Black Sea*, (Leiden/Boston: Nijhoff, 2013), *passim*.

[23] European Commission, Communication on Black Sea Synergy – A new regional cooperation initiative' COM at p.5.

[24] European Commission, SWD(2015) 6 final, Brussels, 20.1.2015.

3.3.5 RSCs as coordinating units for the implementation of the MSFD: institutional ambiguity and the paradox of coherence

As mentioned in Section 3.2.4, coordination at the regional level is important for effective MFSD implementation. In the text of the MSFD, the RSCs are put forward as the main coordinating units at the regional level. Yet, as van Hoof et al. (2012) observe, since regional coordination was not foreseen in the European Treaty, the Treaty does not recognize the regional level as a governing level: only individual MS and EU institutions exert formal competence in EU policy. Hence, bringing RSCs into the realm of EU policymaking and implementation represents a new phenomenon, and "[i]t is therefore expected that a situation of institutional ambiguity will emerge, as [RSCs] have to renegotiate their institutional settings to adapt their practices to facilitate the implementation of the MSFD" (Van Leeuwen et al. 2012: 638).

In the early stages of MSFD implementation, Van Leeuwen et al. (2012) identified different levels of institutional ambiguity within each of the four RSCs. In general terms, higher levels of institutional ambiguity were observed for the two regionals seas in Southern Europe (Mediterranean, Black Sea) than for the other two in Northern Europe (North Sea, Baltic). This assessment was based on: (1) the mismatch between how environmental quality is aimed at by the RSC and by the MSFD and (2) the perceived institutional change required of the RSC to become the regional coordination unit for the MSFD (ibid).

The differences in institutional ambiguity levels among regional seas were partly explained by the membership in the RSCs: whereas OSPAR and HELCOM largely consist of EU MS, which enables coordination and cooperation, there are greater challenges for the Barcelona and Bucharest Conventions, which largely consist of non EU-MS (Loizidou et al. 2016). Moreover, the perceived urgency of implementing the MSFD also explained the differences observed by van Leeuwen et al. (2012).

In 2016, a survey among members of the European Union Marine Strategy Coordination Group (MSCG), a platform of the Common Implementation Strategy (CIS) for the MSFD, showed that the RSC were ranked as the most effective coordinating platforms, followed by the CIS (Cavallo et al. 2017). Cavallo et al. (2017) note regional differences: OSPAR and HELCOM were considered more effective than the Mediterranean and Bucharest RSCs, which can be related to the findings by van Leeuwen et al. (2012). As respondents to the survey point out: "coordinating actions are more difficult in those marine regions where EU countries are the minority (8 out of 21 in the Mediterranean region and 2 out of 6 in the Black Sea). The non-EU countries usually have a less well-developed history and capability of marine environmental protection." (Cavallo et al. 2017:208). Moreover, to improve effectiveness, Boyes et al. (2016) recommend the continual adaptation of CIS through consultation with MS, RSCs and research actors such as DG JRC and ICES.

Both Van Leeuwen et al. (2012) and Cavallo et al. (2017) observe the tensions inherent to the framework character of the Directive and the need to coordinate regionally. As a framework, the MS are allowed a certain degree of flexibility and freedom to implement the MSFD based on the principle of subsidiarity. However, at the same time, the Directive calls for coordination and coherence at the regional sea level. Cavallo et al. (2017) refer to this situation as the "paradox of coherence." Flexibility has resulted in disparate definitions of GEnS by all MS, and the establishment of different targets, criteria and indicators within the regions and sub-regions, indicating different levels of ambition (Cavallo et al. 2016; Cavallo et al. 2017). Cavallo et al. state that "[t]his can be regarded as a fundamental flaw in having a 'Framework Directive' instead of the greater control in a 'Directive'" (2016: 114). Boyes et al. (2016: 11 & 12) consider the framework nature of the directive a weakness that allows different interpretation of the text by the MS noting also that the prevailing economic/political interests may prevent achieving environmental objectives (for example by financial ministers prioritising Blue Growth initiatives over environmental constraints). A lack of political will of national governments to cooperate regionally and achieve GEnS can compromise the aim of the MSFD (Cavallo et al. 2016; Cavallo et al. 2017). The authors propose a better use of the coordinating structures in the decision-making phase in order to achieve more coherent implementation of the MSFD during the second cycle.

Summary

None of the RSCs provides clear and comprehensive definitions in terms of restoration or guidelines on how restoration should be carried out. Definitions are given which could be seen indicative of target levels to reach (e.g OSPAR's definitions on ecological quality reference and objective), or restoration as a tool to reach specific goals (e.g HELCOM's objectives on water quality or species). Given the situation of institutional ambiguity, RSC's role as coordinating units for ecosystem restoration might be an unexploited one. As with the achievement of GEnS, attainment of ecosystem restoration goals will rely again on the political will of national governments to take advantage, not only of the RSCs as coordinating forums, but also as sources of marine-specific information for the regional seas. These elements - in conjunction with the (indirect) restoration requirements included in the EU Directives (WFD, MSFD, HBD), could be seen as the driver for action –in legal terms-, that different actors could use to start restoration processes. A continuous calibration process is thus needed between RSCs and EU Directives to make sure that their goals and actions are coherent and complementary.

4. Part B. Analysis and evaluation of the case studies (project-level)

Part B presents the analysis of the definition and operationalization of key concepts in ecosystem restoration in four case studies that focus on projects carried out within MERCES (Sea grass restoration in the Dutch Wadden Sea (4.1); North Sea oil and gas decommissioning (4.2); Restoration of the Mediterranean Fan Shell (4.3) and Red Coral restoration in the Mediterranean (4.4). The main research questions formulated for Part B are:

1) What is the dominant ecosystem restoration discourse that can be distinguished in this case?
2) How are the main uncertainties perceived by actors dealt with in implementing marine ecosystem restoration?

Next to these, specific questions were formulated per case, related to the key concepts examined in this report, including the issue of establishing a restoration baseline, territorial scope of restoration and the understanding of the "15%" target to restore degraded habitats. In addition, a question related to the rigs-to-reef debate was articulated.

For the seagrass case, the sub-research question addresses the question of how the baseline for seagrass restoration targets was chosen under the Water Framework Directive. The subquestion for the oil and gas decommissioning is: How may the concept of rigs-to-reefs cast the OSPAR's decision 98/3 into new light? Finally, for the restoration projects in the Mediterranean, the sub-research question explored how do *Pinna nobilis* and red coral restoration experts understand the notions of restoration baseline, territorial scope of restoration and the "15% target"?

4.1. Seagrass restoration in the Dutch Wadden Sea

4.1.1 Introduction: general background

Seagrass meadows are recognized as critically important for coastal biodiversity, as they provide a habitat for countless species (Waycott et al. 2009). Moreover, seagrass meadows play other key ecological roles in coastal ecosystems such as in primary productivity, sediment trapping, nutrient cycling, and organic carbon production and storage, among others (Waycott et al. 2009; Orth et al. 2006). Over the last two hundred years, large-scale loss of seagrass meadows has been experienced worldwide due to anthropogenic influences, global warming and disease – and the rate of loss is accelerating (Waycott et al. 2009). This ongoing decline places seagrass meadows among the most threatened ecosystems on Earth and has led to calls for seagrass protection, monitoring, management, and restoration, as well as for awareness raising among the public (Jones et al. 2018; Van Katwijk et al. 2009; Orth et al. 2006).

In the Wadden Sea, seagrass decline has also been observed and various restoration actions have been conducted throughout several decades (Van Katwijk et al. 2009; De Jonge et al. 2000). Located in the south-eastern part of the North Sea and bordered by the Netherlands, Germany and Denmark, the Wadden Sea is a shallow estuarine area consisting of tidal flats and wetlands. The Wadden Sea has undergone major transformations due to human activities such as large engineering works, fisheries and pollution from upstream activities. This has resulted in changes of the numbers of biological communities, including seagrasses (De Jonge et al. 2000; De Jonge and De Jong 2002; Den Hartog and Polderman 1975).

Two seagrass species exist in the Wadden Sea: common eelgrass (*Zostera marina*, sometimes referred to as *Z. angustifolia*) and dwarf eelgrass (*Zostera noltii*). *Z. marina* has two phenotypes, a flexible annual plant (i.e. grows from seeds every year) found in the intertidal or littoral zone, which means that it is partly exposed to the air; and a robust perennial plant (i.e. lives multiple years) found in the subtidal or sublittoral zone and is hence permanently submerged. *Z. noltii* grows in the littoral zone and is an annual plant as well (Figure 4.1). Before the 1930s, sublittoral *Z. marina* had a coverage of approximately 8,000 - 15,000 ha., while both littoral species covered a maximum of approximately 500 ha (Wanink and Van der Graaf 2008; De Jonge et al. 2000).

In the Dutch Wadden Sea, sublittoral *Z. marina* completely disappeared during the early 1930s due to a combination of factors - including a disease caused by the parasite *Labyrinthula macrocystis* Cienkowski, the construction of a large dam (the *Afsluitdijk*), and summers with low sunlight levels (Van Katwijk et al. 2009; De Jonge et al. 2000; De Jonge et al. 1996). Although sublittoral *Z. marina* never recovered and was thought to be extinct, in 2015 a field was discovered near the *Afsluitdijk* (Floor et al., 2018).

In addition, both littoral species almost disappeared from the Wadden Sea during the 1970s due to eutrophication (Folmer et al. 2016). Throughout the last few decades, both species have undergone periods of decline and recovery and nowadays still occur in the middle, eastern, and northern parts of the Wadden Sea, corresponding to the German and Danish coasts (Floor et al. 2018; Van Katwijk et al. 2009; De Jonge et al. 2000; Den Hartog and Polderman 1975). Improved water quality seems to have contributed to eelgrass recovery in those areas, but not in the Dutch part (Folmer et al. 2016). Although fluctuations of the eelgrass populations in the Wadden Sea can be considered as normal (Den Hartog and Polderman 1975), the lack of recovery of eelgrass in the Dutch Wadden Sea has triggered various conservation and restoration efforts (Floor et at 2018; Folmer et al. 2016).

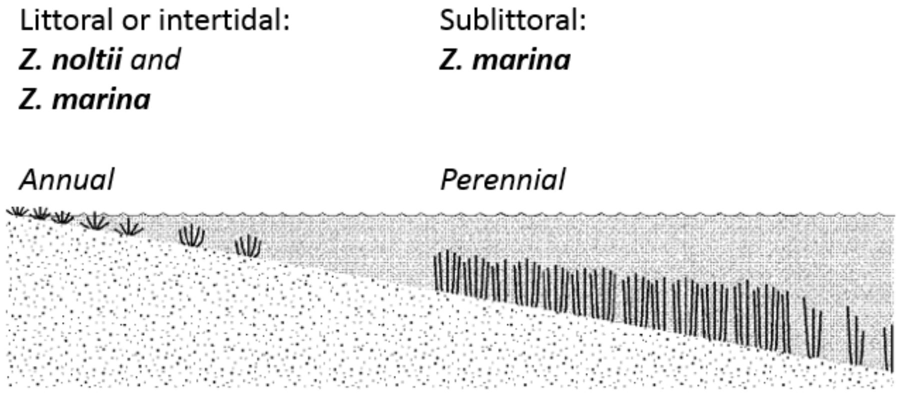


Figure 4.1 Adapted from Van Katwijk et al. (2000)

In the Dutch Wadden Sea, restoration attempts led by ecologists started in the 1950s, when seagrass from France was transplanted, without success (Den Hartog and Polderman 1975). In the 1970s, policy goals for the Wadden Sea shifted from having mainly an economic focus towards placing more emphasis on nature conservation, bolstered by the trilateral cooperation agreement among the three bordering countries (Wadden Sea Secretariat, n.d). One of the targets of this trilateral agreement was to improve eelgrass coverage (Wanink and Van der Graaf 2008). *Rijkswaterstaat* (the Dutch implementation agency of the Ministry of Infrastructure and Water Management), is responsible for monitoring within the Trilateral Monitoring and Assessment Program and as such became involved in seagrass restoration and monitoring efforts (Wanink and Van der Graaf 2008).

In the 1980s, more structured restoration actions were started, originally directed at both littoral species (Van Katwijk et al. 2009). Inspired by the concept of sustainable development as introduced in the Brundtland report "Our Common Future" (1987), the Dutch national government stated in a 1989 policy document entitled "Water for today and in the future" its aspirations for a sustainable Wadden Sea. Among other policy goals, the recovery of eelgrass populations in the Wadden Sea was deemed possible by a combination of passive measures (e.g. decreasing pressures on the ecosystem and improving the biotic and abiotic conditions) and active small-scale seagrass transplantation (V&W, 1989).

By the late 1990s scientists concluded that due to the altered hydrodynamic conditions, restoration of sublittoral *Z. marina* was unattainable (De Jonge et al., 1996). Hence, the bulk of restoration efforts in subsequent decades focused on littoral *Z. marina*, which had to be reintroduced from suitable donor populations (Floor et al. 2018; Van Katwijk et al. 2002; De Jonge et al. 2000). Only recently, experimenting with restoration of the sublittoral phenotype has been considered (Natuurmonumenten, 2013).

Floor et al. (2018) provide an overview of the various activities and projects carried out around eelgrass restoration in the Dutch Wadden Sea in the period between 1989 and 2017. Several techniques for transplantation and for promoting plant growth and increasing stability, including the construction of artificial mussel banks, have been tested (Van Duren 2014; Bos and Van Katwijk 2005; Van Katwijk et al. 2002). Also, methods to treat infected seeds and to store them in winter have been developed (Govers et al. 2017; Govers et al. 2016).

While scientists have been leading the restoration efforts, the role of two environmental NGOs (eNGOs), the Wadden Society and later the Dutch Society for the Preservation of Nature, (*Natuurmonumenten* in Dutch), has been crucial (Floor et al. 2018; Natuurmonumenten 2017, 2015 and 2013; Wadden Society 2010). *Rijkswaterstaat*, as manager of the Wadden Sea, has the mandate to set up management measures and occupies therefore a key role in governing eelgrass restoration.

In the Netherlands, legal obligations for seagrass conservation and restoration currently exist. *Z. marina* is strictly protected under the Flora and Fauna Act (Wanink and van der Graaf 2008). Moreover, the Water Framework Directive (WFD) classifies the Wadden Sea as a natural water body, with seagrass fields as a quality status indicator (Van der Molen and Pot 2007). Quantitative targets for seagrass coverage have been established, which means that the Netherlands "is obliged to improve the habitat quality in the Wadden Sea and implement measures that increase the population of Eelgrass (*Z. marina*) and of Dwarf eelgrass (*Zostera noltii*)..." (Van Duren 2014:1 of 16). *Rijkswaterstaat* is responsible for reporting to the WFD (Van Duren 2014; Van der Molen and Pot 2007).

According to Floor et al. (2018), the case of seagrass restoration in the Dutch Wadden Sea can been characterized as a relatively long-term and continuous restoration effort that is directed at a specific type of vegetation (i.e. littoral eelgrass) in a political and ecological environment characterized by change and uncertainty. Against this background, we describe the MERCES restoration activities in the Dutch Wadden Sea in the next section, followed by an overview of the most important policies influencing eelgrass restoration in the Dutch Wadden Sea. Next, an analysis of the dominant restoration discourses will be provided, as well as a reflection of how uncertainty perceptions are being dealt with by the key actors currently engaged in eelgrass restoration. Such analysis is relevant, as understanding how the different actors define eelgrass restoration through the different restoration discourses, and how these actors address the uncertainties related to these discourses, sheds light on the different conditions that enable and constrain eelgrass restoration in the Dutch Wadden Sea. Finally, we draw conclusions.

4.1.2 Description of MERCES restoration project activities

Within MERCES, a number of field experiments and modelling work are being carried out, each trying to answer its own set of research questions. The different experiments build on ongoing restoration efforts in a number of locations in the Wadden Sea. Main actors are scientists affiliated with the Radboud University in Nijmegen, the University of Groningen and the Royal Netherlands Institute for Sea Research (NIOZ), the eNGO *Natuurmonumenten* and the Fieldwork Company, a consultancy and technology-development firm specialized in ecological field research.

Originally, one of the main research interests was to test the interaction between seagrass and bivalves in both artificial and natural mussel beds, as well as in control areas. The hypothesis was that mussel beds affect environmental conditions (such as waves, currents, sediment dynamics) and this in turn facilitates seagrass growth and survival. So-called BESE-elements (Biodegradable EcoSystem Engineering Elements), which are biodegradable 3D-structures for ecosystem restoration made from potato waste, were tested in the field as well. BESE-elements fulfil a similar function as the mussels by stabilizing the soil and providing shelter for the small plants, thereby increasing the chance of seagrass survival and growth. The advantage of using BESE-elements compared to mussels is the possibility of large-scale seeding experiments, without having to depend on mussel survival and growth.

In April 2017 thousands of seeds were planted in the intertidal of the Western Dutch Wadden Sea (south of the island of Griend) in a large-scale experiment testing the combined restoration of mussel beds (*Mytilus edulis*) and annual eelgrass (*Z. marina*). To this end, sixteen 20x9m plots where established (Fig. 4.2), after which artificial mussel establishment structures (BESE-elements) where constructed on half of the plots. Next, seagrass seeds were injected into the sediment behind BESE- and control-plots in 1-m^2 plots, nesting 3 different seeding treatment and testing the use of added sediment stabilization: (1) unmanipulated control plots, (2) belowground BESE plots, aboveground BESE plots.

While the experiment demonstrated a high potential for mussel bed restoration using BESE, seagrass results are less promising. Despite the use of a habitat suitability map to select the site for these seeding experiments, protection by the BESE-establishment structures from waves, and sediment-stabilizing BESE-treatments, heavy storms nevertheless washed away the seeds and only one patch remained. Currently, seagrass experiments focus on identifying suitable sites and optimization of seeding injection techniques. Thus far, these optimizations have yielded a 15x decrease in seed loss. In addition, *Z. noltii* will be tested in 2019 as a structure-forming element - a natural counterpart of the BESE-element, so to speak- in experiments comparing how seeding performs inside and outside *Z. noltii* meadows.

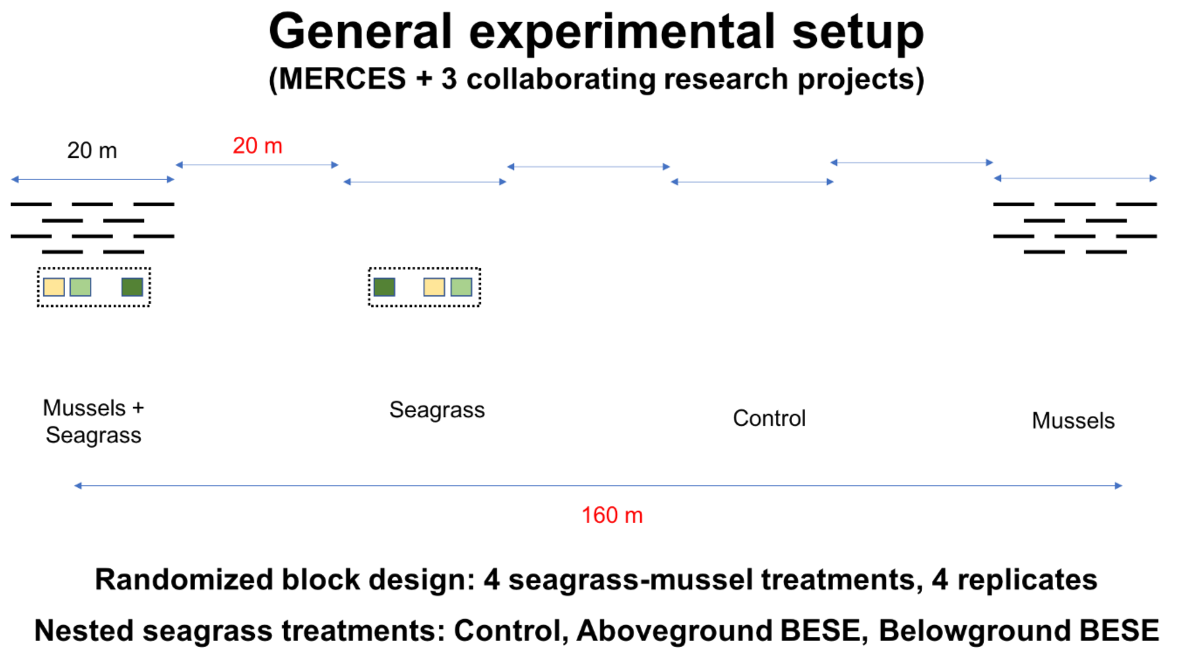


Figure 4.2 MERCES experimental setup

The BESE-element is not considered optimal for the littoral zone, because the small plants can become exposed if the structures are not buried deep enough, resulting in dessication. In collaboration with MERCES partners in Scandinavia and Estonia, experiments are being planned to test different combinations of BESE, mussel and seagrass in the sublittoral zone. As the other MERCES partners work with sublittoral seagrass, the Dutch experiments will be conducted under water as well to make them comparable to the other partners' experimental conditions. These experiments will not take place in the Wadden Sea, but in the south part of the Netherlands.

Another research aim consists of comparing the conditions in the German Wadden Sea with the conditions in the Dutch part. Eelgrass has experienced a strong recovery in the German coast, and MERCES scientists want to identify which factors have contributed to this recovery. Nutrient loads are one possible explanatory factor. Although nutrient levels are decreasing in the Netherlands, if levels are identified as an issue – and hence a bottleneck for seagrass recovery in the Dutch Wadden Sea-, another scientist interviewed said that most likely the Dutch government will try to further decrease nutrient levels. "But of course I can't predict at what rates, how motivated our government will be..." (Personal communication, scientist).

Other possible bottleneck for sublittoral eelgrass recovery, according to the same scientist, is that most of this area is open for fisheries (as opposed to the littoral, which is mostly closed for fisheries):

> "Especially there is a large shrimp fishery, so what you can see is that there is no square meter in the subtidal that it is not disturbed by bottom trawling every year; that's an issue.... There are efforts to get the shrimp fisheries out in some areas."

A small pilot experiment was carried out in which sublittoral *Z. marina* was seeded, and in the opinion of the scientist interviewed, it was difficult for the restoration team to convince the shrimp fishers not to fish in that area.

An important uncertainty is finding suitable sites for seeding. "I think that right now the most obvious thing is the site selection, and we're trying now to mitigate that risk by actually selecting sites where Z. noltii is already growing, so in general the site should be better, and we're running the small scale experiment to identify proper sites" (Personal communication, scientist).

Next to field experiments, MERCES scientists conduct modelling studies, with the aim to better understand the feedback processes, which limit eelgrass restoration. One of the insights provided by these models is that competition and proximity may be important factors when selecting an area for restoration. The model suggests that, for instance, eelgrass patches compete with each other for sediments and that establishing eelgrass in very small patches would create unfavorable conditions. According to a scientist: "It's better to create a large big patch than many small patches."

As stated by another scientist working on the models, the main uncertainty is that the theory is not validated. "The model is based on assumptions that are realistic, but we don't know if it will work." The next step is to validate the model findings, using input such as aerial images from other MERCES partners. For both scientists working with the models, acquiring understanding of ecological processes in coastal ecosystems is a personal motivation to engage in the topic of seagrass restoration, but also the possibility of creating knowledge that is useful for "the real world" is appealing.

4.1.3 Policy landscape regarding eelgrass restoration in the Wadden Sea

The legal framework for conservation and restoration activities of *Z.nolti* and *Z.marina* in the Netherlands consists of EU Directives (the Water Framework Directive (WFD) and the Habitats Directive (HD)) as well as national legislation (See Table 4.1).

	Wadden Sea				
	Water Framework Directive (Wadden Sea as a *natural* water body)		**Habitats Directive**		
			As plant associated to a protected habitat		
Seagrass	As species to restore	As bio-indicator	1140 "Mudflats and sandflats not covered by seawater at low tide"	1110 "Sandbanks which are slightly covered by sea water all the time"	1130 "Estuaries"
Z.marina (littoral: partly exposed)	10,000 ha by 2028, with. Min. coverage area of 5%. This area should	One of the most investigated seagrass species in terms of their potential as	Eelgrass communities (11.3[25]) are included in this habitat type (EC, 2013: 11)	Not mentioned (EC, 2013:8)	Not mentioned (EC, 2013:10)
Z.marina (sublittoral: permanently				Not mentioned (EC, 2013:8)	Not mentioned (EC,

[25] 11.3 is a "PAL.CLASS": "Code(s) based on "A classification of Palaearctic habitats" 1995 version"

submerged)	consist of both *Z. noltii* (about 2/3) and *Z. marina*, 1/3) with no distinction between sublittoral and littoral eelgrass (Korporaal et al. 2016)	bioindicators of environmental quality (García-Marín, P et al., 2013)			2013:10)
Z.noltii (littoral: partly exposed)	Good ecological status: 150 ha in the Wadden Sea (after Foden, 2007)	Its suitability as bioindicator has been recently evaluated (García-Marín, P et al., 2013)		Mentioned (EC, 2013:8)	Mentioned (EC, 2013:10)

Table 4.1: Legal framework associated to seagrass (as a species to restore and preserve, and as bio-indicator of environmental quality) Adapted after Foden 2007

According to the WFD, each Member State had to designate water bodies as *natural*, *artificial* or *heavily modified*, and while *natural* bodies need to reach a “good status”, for *artificial* and *heavily modified* a “good potential” suffices (Liefferink et al. 2011). The Netherlands classified the Wadden Sea as a *natural* water body (Van der Molen and Pot 2007; Floor et al., 2018) and defined that the characteristics of *good status* for the Wadden Sea were to include seagrass fields based on the Wadden Sea’s historical reference (situation before 1930s) (Korporaal et al., 2016; Floor et al., 2018). Table 4.2 presents a summary of the Dutch seagrass metrics and boundary conditions for ecological status.

Metric	Parameter	Ecological status class				
		P-REF	P-GES	Moderate	Poor	Bad
Species	Z. angustifolia[26] and Z. noltii	2 spp.	1 spp.	spp.	-	-
Area	Wadden Sea	250 ha	150 ha	<25% below P-GES	25–50% below P-GES	>50% below P-GES
	Oosterschelde	1000 ha	750 ha			
	Ems-Dollard	100 ha	50 ha			
	Westerschelde	3 ha	2 ha			
Coverage	Z. angustifolia	≥30%	≥20%	≥10%	≥5%	≤5%
	Z. noltii	≥60%	≥40%	≥30%	≥20%	≤20%

*

Table 4.2 Seagrass metrics and boundary conditions for ecological status classes. Seagrass occur in only four Dutch water bodies and reference conditions were developed individually for each of these (Foden 2007; after de Jong, 2004)

Quantitative targets for seagrass coverage have been established (Van Duren 2014). An area of 10,000 ha of seagrass in the Wadden Sea is expected for 2028, corresponding to a minimum coverage area of 5%. This area should consist of both small seagrass (*Z. noltii*, about 2/3) and large seagrass (*Z. marina*, about 1/3) with no distinction between sublittoral and littoral eelgrass.

[26] Zostera angustifolia is the same species as Zostera marina with Z marina the accepted name26 (de Jong, D. 2018)
P-REF: Potential reference condition; P-GES: Potential Good ecological status

In achieving this goal, the Ecological Quality Ratio (EQR) for Angiosperms is leading (Korporaal et al., 2016:4). As previously mentioned, this objective is based on the reference situation of before 1930.[27]

Based on this it can be said that the WFD obliges *Rijkswaterstaat* to improve the status of seagrass in the Wadden Sea (Wanink and Van der Graaf 2008) and that "Restoration actions are necessary because of juridical obligations of the WFD" (Floor et al., 2018).

The Habitats Directive protects seagrass indirectly. Its protection is associated to the protected habitat where it grows (de Jong, D. 2018). Although existing literature states "*Zostera noltii* […] constitutes habitats included in the European Directive Habitats for protection (e.g., Habitat code 1140)" (García-Marín, P et al., 2013: 47), *Z. noltii* is not included as such in the Annex I of the Habitats Directive. Seagrass protection is in relation to the protected habitats type 1110, 1130 or 1140 in which the seagrass grows.

The document "Interpretation Manual of European Union Habitats. EUR28" (EC, 2013) which aims to help clear ambiguities in the interpretation of the Annex 1, presents additional lists of characteristic animal and plants species associated to the habitats. *Z.noltii* is included in the description of plants given for 1110 "Sandbanks which are slightly covered by sea water all the time" and 1130 "Estuaries".

For 1110 it is written:

> "Plants: North Atlantic including North Sea - Zostera sp., free living species of the Corallinaceae family. On many sandbanks macrophytes do not occur. Central Atlantic Islands (Macaronesian Islands) - Cymodocea nodosa and Zostera noltii." (EC, 2013: 8).

For 1130 it is written:

> "Plants: Benthic algal communities, Zostera beds e.g. Zostera noltii (Zosteretea)" (EC, 2013:10)

Z. marina is also not included as such in the Annex I of the Habitats Directive, or is explicitly mentioned –as *Z.noltiit does*, in the Interpretation manual (EC, 2013). However, its protection might be associated to the text written for 1140 "Mudflats and sandflats not covered by seawater at low tide":

> "The diverse intertidal communities of invertebrates and algae that occupy them can be used to define subdivisions of 11.27, eelgrass communities that may be exposed for a few hours in the course of every tide have been listed under 11.3, brackish water vegetation of permanent pools by use of those of 11.4. Note: Eelgrass communities (11.3[28]) are included in this habitat type" (EC, 2013: 11)

[27] Ook voor de Kaderrichtlijn Water (KRW) zijn beleidsdoelen met betrekking tot zeegras geformuleerd (STOWA, 2012). Het streven is in 2028 circa 10.000 ha zeegras in de Waddenzee te hebben gerealiseerd, met een minimale bedekking van 5%. Dit areaal dient te bestaan uit zowel klein zeegras (circa 2/3) en groot zeegras (circa 1/3) waarbij geen onderscheid tussen sublitoraal en litoraal zeegras wordt gemaakt. Bij het behalen van deze doelstelling is de Ecologische Kwaliteits Ratio (EKR) voor Angiospermen leidend. Deze doelstelling is gebaseerd op de referentiesituatie van voor 1930. Rijkswaterstaat is verantwoordelijk voor het behalen van de doelstellingen

[28] 11.3 is a "PAL.CLASS": "Code(s) based on "A classification of Palaearctic habitats" 1995 version".

On the other hand, *Z. marina* is strictly protected under the Flora and Fauna Act (Wanink and Van der Graaf 2008).

Protection of seagrass is also dependent on its presence during nomination of certain area as a habitat to be protected. If seagrass is present in the area at the time of nomination of such habitat as protected, then seagrass becomes –indirectly, a protected species, unless it is specifically mentioned in the nomination act that protection does not include the seagrass species. Seagrass will not be protected if it is absent in the area at the time of nomination, unless it is explicitly decided to make an effort to have the species back in the area (personal communication, former *Rijkswaterstaat* civil servant).

In addition to this, seagrass fields are used as a quality status indicator in the Wadden sea (Van der Molen and Pot 2007). The high sensitivity of seagrasses to environmental deterioration (e.g., decline of water transparency, eutrophication, erosion, warming) make seagrasses useful "miner's canaries" of coastal deterioration (Marbà, N et al., 2013). Seagrass (angiosperms) – along phytoplankton, macroalgae, fish fauna and microbenthic fauna, is one of the Biological Quality Elements (BQE) which has been established to assess the quality of European water bodies in terms of its ecological character (Foden, 2007; Neto et al. 2013; García-Marín, P et al. 2013). This ecological assessment, as well as a hydromorphological and physicochemical one, is part of the process of evaluating the quality of the water bodies in the route to achieving a good qualitative and quantitative ecological status in all European water bodies, as mandated by the WFD.

Z. marina –along with *Posidonia oceanica* and *Cymodocea nodosa* have been the most investigated seagrass species in terms of their potential as bio-indicators of environmental quality (García-Marín, P et al., 2013). The suitability of *Z. noltii* as a biological quality element to assess the environmental quality of water bodies has been recently evaluated (García-Marín, P et al., 2013). It is to note that in the Netherlands, it is *Z.noltii* the one used as parameter indicator (see Table 4.2).

The use of seagrass as a status indicator under the WFD means that a target has to be set for each water basin in which seagrasses might be expected to be present, even for basins in which seagrass has disappeared since some time (personal communication, former *Rijkswaterstaat* civil servant). In an (almost) natural water basin this target should be the natural area; in a highly modified basin this should be the highest possible area that can be expected to be present in the present situation[29]. Efforts are then carried out by the Member State in order to reach the target. If such target cannot be reached, but it can be proved that dedicated research has taken place in order to reach the targets, the Member State can request the EU to reset the original targets into more realistic ones (personal communication, former *Rijkswaterstaat* civil servant).

The Wadden Sea was classified as a *natural* water body and this brings a set of questions regarding the possibility of reaching such target, the process of setting the reference points (see sub-section on dealing with uncertainty) and the possibility of resetting the targets to different (more realistic) levels.

[29] The present situation must be at the best possible level within the unnatural physical boundaries and human use.

4.1.4 Restoration discourses and dealing with uncertainty

Building on the typology of discourses on marine ecosystem restoration developed by Ounanian et al. (2018), information from 10 key informant interviews and a literature review was categorized according to three main discourses which have dominated restoration efforts of eelgrass in the Dutch Wadden Sea. Moreover, applying the typology of uncertainties relevant in marine governance (Floor et al., 2018; Ounanian et al., 2018), this section ends with an analysis of how uncertainty perceptions have been dealt with by the key actors and how this has influenced restoration efforts.

Bringing Nature Back

The dominant restoration discourse in our analysis can be characterized as "Bringing Nature Back" (active human intervention, eco-centric), given the emphasis on attempts to recreate nature as it existed in the Wadden Sea by reintroducing eelgrass, a valuable and historically authentic ecosystem component.

Overall, the actors engaged in eelgrass restoration are motivated by a mix of a personal desire to better understand ecological processes and try out new techniques, as well as the wish to contribute to a "healthier" or "richer" Wadden Sea by bringing this species back to the ecosystem. Many respondents referred to the abundant eelgrass fields that existed in the Wadden Sea before the 1930s, and pointed out that its recovery in the German and Danish coasts suggests that its return to the Dutch coast could be attainable. In line with Floor et al.'s (2018) findings, the respondents consider eelgrass as an important part of the ecosystem that is missing in the Dutch Wadden Sea ("missing pillar").

Furthermore, since the early 2000s scientists, nature organisations and the government have framed seagrass as an "ecosystem engineer," (Floor et al. 2018) emphasizing the important functions that seagrass fulfils in the ecosystem - mostly as providing a habitat for numerous species and in the stabilization of sediments (Van Katwijk et al. 2002). Our respondents also underlined the value of seagrass for such ecological processes.

Some scientists expressed a moral obligation to do something when asked about their motivation to engage in seagrass restoration, despite the poor outcomes of the restoration efforts of the last thirty years. For one scientist, compensating for human impact on the Wadden Sea was important:

> "Right now if you look at it, [the Wadden Sea] is quite disturbed, even though it is a World Heritage site, it's lost the seagrasses, mussel beds have been doing bad although they're recovering now, that was an issue; there is all sorts of fish species that are doing very poorly. The system is full of crabs, it is not functioning healthy. That doesn't mean... it is still an ecologically very valuable system, and I think it is also our responsibility as humans to try and improve that again, because, in my opinion we messed up quite a bit." (personal communication, scientist)

The discourse of "Bringing Nature Back" fits within the vision of *management of nature*, or active intervention in nature, which is modelled from terrestrial management approaches, where for instance active mowing, invasive species removal and restoration activities are common. This vision is exemplified by the practices of *Natuurmonumenten*, a key eNGO involved in seagrass restoration in the Wadden Sea, which applies land conservation and management principles to the Wadden Sea.

Main actors engaged in restoration efforts are Rijkswaterstaat, scientists and eNGOs, which mobilize financial, knowledge and human resources. However, most respondents characterize the current role of *Rijkswaterstaat* as low-key; the agency co-finances some projects and participates in workshops and joint publications, but is not driving the restoration efforts. In fact, as will be explained below (under "Helping Nature Support Humans"), voices within *Rijkswaterstaat* are calling for a shift to another management vision for the Wadden Sea, with repercussions for the place of ecosystem restoration on their agenda.

Building with Nature

In the mid-2000s, the notion of eelgrass as an ecosystem engineer -in particular its function in stabilizing sediments- was linked to a project directed at climate change adaptation, which was funded by the Dutch government and was called "Climate Buffer." Eelgrass was framed as a natural climate buffer, which could serve as a tool for adaptation to sea level rise given its sediment stabilization function (Floor et al. 2018). This conceptualization of eelgrass as an ecosystem engineer delivering a regulating ecosystem service fits with the "Building with Nature" discourse (active human intervention, anthropocentric). The latter discourse, however, was short lived; it lasted while the project was ongoing but did not become dominant. Although our respondents mentioned the possible function of eelgrass in protecting the coast from sea-level rise, this argument is mostly subordinate to the dominant view of bringing seagrass back in order to enrich and improve the health of a disturbed Wadden Sea ecosystem.

Helping Nature Support Humans

The new Nature Conservation Act that took effect on January 1st, 2017 in the Netherlands assigns a stronger role to *Rijkswaterstaat*, the owner of 95% of the Wadden Sea, as its most important manager. Prior to this change in the law, management of the Wadden Sea was more fragmented. The management vision of *Rijkswaterstaat* focuses on *management of human activities* (framed as ecosystem-based approach), and not on direct intervention in nature. The main goal within this ecosystem-based approach, as stated by a *Rijkswaterstaat* representative interviewed, is to create boundary conditions within which nature can exist, by making human activities more sustainable. This ensures that the ecosystem can still deliver services for humans.

Such a view signifies a discursive shift from "Bringing Nature Back" towards "Helping Nature Support Humans", which entails a move from eco-centric towards anthropocentric motivations, and from a high level to a low level of human intervention in nature. In the latter discourse, restoration is perceived as "passive" in the sense that the drivers and pressures are addressed, but no active restoration (e.g. transplantation/seeding experiments) is carried out.

By framing the dynamic nature of the Wadden Sea as a socio-ecological system, certain solutions are perceived as more legitimate. For example, dredging practices and fisheries are activities that could become more sustainable by adapting practices to the ecosystem dynamism of the Wadden Sea (personal communication, *Rijkswaterstaat* civil servant). Instead of constant dredging to open the shipping lane for ferries, which disturbs the sediments (and hence the eelgrass plots), a boat schedule more attuned to the natural tidal flows would require less dredging and therefore would be considered more sustainable and conducive to eelgrass recovery.

Crucially, the “Helping Nature Support Humans” discourse advanced by (some important actors within) *Rijkswaterstaat* accepts the potential outcome of seagrass not coming back even after the boundary conditions of the Wadden Sea have been improved by greening human activities. Seagrass recovery is not the primary goal here, but attaining more sustainable human activities within the Wadden Sea ecosystem. This discourse accepts humans as integral part of the ecosystem, whereas “Bringing Nature Back” proponents often plead for the exclusion of humans in ecosystems in order enable a comeback of nature.

Rijkswaterstaat is planning an internal reorganization which will involve funnelling of resources to a new body in charge of nature conservation management. A new vision for management of the Dutch Wadden Sea may shift the power balance among actors engaged in governing nature restoration, and thereby reduce the resources available for seagrass restoration efforts in the region.

So far, however, funding has been secured for the next few years for a new project entitled “Tinkering with seagrass restoration” (*Sleutelen aan Zeegrasherstel*, Wadden Funds 2017) that uses a “learning by doing” approach. The aim of this project is to address the key factors which would enable a successful, long-term, and large-scale eelgrass restoration in the Dutch Wadden Sea. For this purpose, a two-fold objective was been articulated: 1) develop sustainable seed and seagrass plant cultivation methods to enable sustainable seeding and transplantation without endangering parent populations, and 2) unravel the key bottlenecks preventing the development of high-density eelgrass fields, focusing on prevention of seed and plant loss. An important element in this project is the emphasis on the *cost-effectiveness* and *sustainability* of restoration, expressed by the goals of establishing a profitable eelgrass nursery and job creation within an envisioned restoration industry in the Wadden Sea.

The dominant discourse embodied in these new projects is still “Bringing Nature Back,” and still frames seagrass as an ecosystem engineer. The project highlights the ecological function of seagrass and the contributions of this species to a richer food web in the Wadden Sea ecosystem. The recent accent placed on the desired social and economic benefits of a restoration industry, however, adds an anthropocentric ingredient to the mix.

Dealing with uncertainty

In the discourse “Bringing Nature Back”, Ounanian et al. (2018: 141) note that “the question remains of bring back to *what*?”, pointing to the issue of determining a restoration baseline. Indeed, establishing a baseline or reference point in comparison to which the restoration target should be evaluated is often problematic. Challenges are linked to *uncertainties* derived from data gaps concerning historical conditions - and when data are available- to potential *ambiguity* in the interpretation of such data. As Floor et al. (2018) observe the framing of seagrass as an essential component of the authentic Wadden ecosystem has been strengthened by the uptake of seagrass as an ecological indicator within the WFD for which restoration targets have been set. This leads us to the question of how the reference point was selected for the Dutch Wadden Sea eelgrass restoration targets under the WFD.

According to one of our respondents, a former civil servant at *Rijkswaterstaat* who was involved in the development of the first WFD ecological target for littoral eelgrass in the Wadden Sea, originally a target of 100 ha was proposed. He explained that, given the high level of transformations in the conditions of the Wadden Sea, and a number of assumptions (e.g. the dikes remaining in place), 100 ha was considered as a feasible target. A habitat suitability map was used, which included variables such as exposure time, current velocity, wave energy, salt and ammonium, which in his view (and of other specialists) were the important abiotic parameters.

Under the WFD, the reference situation (RS) assumes an "undisturbed" or pristine condition, or a pre-human degradation status. Our respondent observed that for The Netherlands – as a man-made country – this was a very challenging condition to meet:

> "You have to go back to a situation far before 1000 AD, let's say the Roman period. This a completely unrealistic situation for our country because large parts were tidal areas or peat situations or forest covered situations. But, you have to describe that situation (without any data available except sometimes pollen analyses) extensively because it is the situation to refer the present situation to. When the human influence is so great that you cannot use this RS you may describe the present situation, but as close as possible to the RS" (personal communication, former *Rijkswaterstaat* civil servant).

Nonetheless, other civil servants -ecologists working on setting targets for freshwater systems for the WFD- thought that it was not appropriate to set the reference condition at 100 ha as this coverage did not reflect the pre-human degradation status of the Wadden Sea ecosystem. These freshwater ecologists knew that, prior to the 1930s, large sublittoral eelgrass beds of approximately 10,000 ha existed in the Wadden Sea. Hence, they chose to take the 10,000 ha as the WFD target for both littoral and sublittoral seagrass and for both species.

For the rivers system and lake IJssel, the present situation was selected as a proxy RS with parameter boundaries conforming with such present situation. However, for the tidal areas the freshwater ecologist selected the (almost) natural situation as might have been around AD 400. This resulted in very high target areas for salt marshes and seagrasses, which according to all our respondents is no longer realistic. Our respondent concludes: "I think that the WFD-target is an impossible target and in due time the civil servants will come to the same conclusion and will have to change to a lower target, with lots of discussion with the EU as a result. Whether this leads to sanctions from the EU I do not know but it might be possible... This is what happens when non-specialists decide outside their domain and ignore the specialists" (personal communication, former Rijkswaterstaat civil servant). In our analysis, we understand this discrepancy as ambiguity due to different interpretations of the status of the Wadden Sea (natural versus highly modified), and of the available data on eelgrass populations.

Other uncertainties have also been identified in this case study. Notably, despite the many persisting uncertainties (see also Floor et al. 2018), for these actors it is worth to continue their eelgrass restoration efforts, as this scientist puts it:

> "Seagrass is an important part of the Wadden Sea ecosystem. Do we conclude simply because we don't know... that we don't want to study it anymore simply because we don't think it will come back? It is not for me to conclude that. So I don't know if it will come back. I think that it's important to try." (personal communication, scientist).

One of the scientists conceded that "scientists always want to do more research," which adds an anthropocentric dimension to the motivations underlying these restoration efforts. The scientist added:

> "I definitely would not say that we should stop doing research. We should try to get the seagrass over a threshold – if a threshold at all exists."

This shows that, notwithstanding the inherent uncertainty of seagrass restoration success, actors are willing to carry on with restoration efforts. Uncertainty is perceived mostly as "not knowing enough" about the natural and technological systems, and the main response is to propose new research to fill knowledge gaps. In addition, unpredictability of the natural system is dealt with by spreading risks in time and space in the experimental set-ups. According to a scientist who has been involved in eelgrass restoration since the 1980s, this has been a key achievement:

> "I thought it a nice and interesting accomplishment that managers and policymakers could be convinced (i.e. all the people that were involved in the final assignment) to repeat things in space, but particularly in time. This is not how our minds work (scientists, managers, policymakers, everybody alike), as we are more inclined to 'learn' from a failure and change the approach consequently. Here the management adapts to the unpredictability of nature in an elegant way."

In both the "Bringing Nature Back" and "Helping Humans Support Nature" discourses ambiguity plays also a role. Conflicting views center around, on the hand a coalition positing that filling knowledge gaps is getting them closer to unravelling the bottlenecks of eelgrass restoration, while on the other hand a coalition accepting the possibility of eelgrass not returning to the Wadden Sea even if passive restoration measures are enacted.

4.2. North Sea oil and gas decommissioning: does restoration bring new light to the rigs-to-reefs debate?

4.2.1 Introduction

General background

Over the coming decades numerous offshore oil and gas installations in the North Sea will reach the end of their production life and will be due for retirement, also referred to as *decommissioning* (WEC 2017). The estimated decommissioning costs for the North Sea infrastructure, which consists of more than 5,000 wells, 500 platforms and 10,000 km of pipelines, range between €80-€100 billion (WEC 2017; OSPAR 2010). The majority of the costs will be borne by the United Kingdom, Norway and the Netherlands, the three countries with the largest oil and gas industries operating in the North Sea. A large proportion of the costs will be passed on to society, as decommissioning costs are tax deductible (WEC 2017; Fowler et al. 2014). In order to reduce decommissioning costs, stakeholders in these countries are considering various options to prolonging life and re-purposing of offshore oil and gas assets. Conversion of rigs and platforms into artificial reefs, the so-called rigs-to-reefs (RTR) concept, is one of the options being considered (IFOME 2018; WEC 2017; Jørgensen 2012). Figure 4.3 illustrates potential reefing methods.

An important argument for RTR is the protection or enhancement of the marine ecosystem based on the presumed ecological value of rigs as reef habitat (Fowler et al. 2014; Macreadie et al. 2011; Jagerroos and Krause 2016). The most common goals of RTR initiatives include creation of new habitat, restoration of damaged habitat and protection of valuable habitat (Jagerroos and Krause 2016). It is acknowledged that during an installation's productive life, significant numbers and sorts of marine species live on and around the submerged structure. RTR conversion preserves much of this marine life and allows further growth. It is debatable, however, whether artificial reefs boost production of biomass or merely serve as marine life aggregation devices, and whether the environmental benefits of RTR projects exceed their impacts (Jagerroos and Krause 2016; Macreadie et al. 2011).

Some of the obstacles regarding RTR conversion include costs (e.g. cleaning, partial removal, maintenance, monitoring), liability issues (e.g. risk of leakage from wells, safety risks for navigation), local pollution levels near installations and risks of spreading marine invasive species (Baine 2002; Schroeder and Love, 2004; Macreadie et al. 2011; Jagerroos and Krause 2016). Besides leaving structures in place intact, there are several ways in which rigs can be converted into reefs (See figures, Dauterive 2000), each involving costs and risks to different stakeholders (Fowler et al. 2014; Schroeder and Love, 2004).

The RTR program has existed for several decades in the Gulf of Mexico (Kaiser and Pulsipher 2005), where environmental and socio-economic interests view RTR conversion as a win-win situation, given that most converted structures support ecologically, recreationally and commercially important marine species (Jørgensen 2009, but see Salcido, 2005 for a critical appraisal). In California, after more than a decade-long opposition to RTR policies, a recent bill was passed that allows RTR conversion if industry can demonstrate a net benefit to the environment (Macreadie et al. 2012). The California case is discussed in more detail later in the section.

In the North Sea, OSPAR banned the disposal at sea and toppling of all steel platforms in July 1998[30] (OSPAR 98/3 on the Disposal of Disused Offshore). Moreover, OSPAR's policy related to artificial reefs rules out all non-virgin materials as acceptable reef construction materials (OSPAR, 1999). The policy landscape in the North Sea has thus been unfavorable towards RTR programs over the past twenty years. Recently, however, calls for more flexibility in North Sea decommissioning policy are increasingly frequent (WEC 2017; North Sea futures; Fowler et al. 2014; Pearce 2018; Harrabin 2018). It is argued that blanket regulations are unlikely to yield optimal environmental, economic and social outcomes in all situations and, therefore, decommissioning decisions should be made on a case-by-case basis (Fowler et al. 2014; Schroeder and Love 2004).

Currently, an RTR pilot project is being carried out in the North Sea. The next section provides a brief description of this demonstration project, followed by an overview of the international legal and policy framework governing the disposal of installations at sea and use of (non) virgin materials for reef construction. Next, we present our analysis of how RTR is framed by proponents and opponents of this decommissioning option in the North Sea. We close the chapter with concluding thoughts on whether and how RTR debates may cast the OSPAR 98/3 decision into new light.

[30] Certain structures may be exempted from removal, such as steel jackets weighing more than 10,000 tonnes, gravity-based concrete installations, floating concrete installations and concrete anchor based installation.

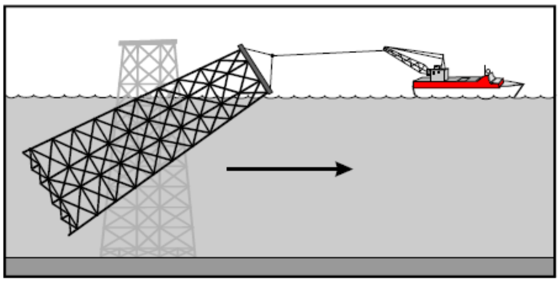


Figure 4.-The tow-and-place platform reefing method

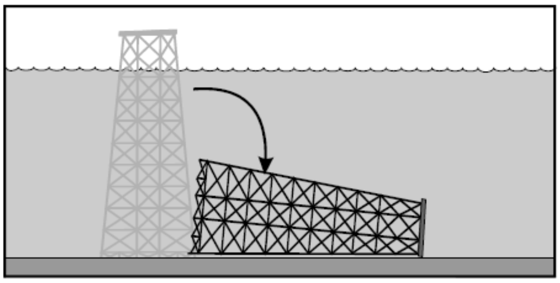


Figure 5.-The topple-in-place platform reefing method

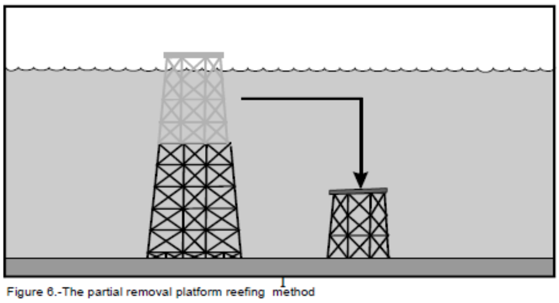


Figure 6.-The partial removal platform reefing method

Figure 4.3 Rigs-to-reefs: reefing methods (Source: Dauterive, 2000)

4.2.2 Description of MERCES restoration project

In focus here is an oil and gas installation in the North Sea, roughly 100 km north of the UK in the Faroe-Shetland Channel. More specifically, the oceanographers in this case are investigating the colonialization of flora and fauna on a fishing protection structure, which is the area of 5 m2 of steel sitting on the seafloor at 150m depth. While 150m depth is comparatively shallow in the context of average ocean depth (4000m global average), the structure is outside the photic zone, making it a salient case site for deep-sea investigations.

The case study comes out of collaboration between research and the offshore oil and gas (O&G) industry, as part of the Scientific and Environmental ROV Partnership using Existing industrial Technology (SERPENT) project. Scientists benefit in the collaboration by lowering cost and opening access to equipment necessary for investigating the ocean at great depth, namely Remotely Operated Underwater Vehicles (ROVs). The industry benefits from knowledge exchange and best available science, contributing to its license to operate. The case looks at a 5 m^2 steel fishing protection installation in order to look at potential deep sea ecosystem restoration through the installation of structures in the deep sea. Installation of structures to promote the propagation of key species (e.g. filter feeders) and for fish nurseries are more common in coastal zones, but less is known of the effectiveness of such restoration practices in the deep sea to promote biodiversity and/or increased biomass.

In contrast to coastal environments, large scale, widespread experimentation for marine ecosystem restoration in deep-sea environments is prohibitively expensive. Therefore, ecologists and oceanographers working in the deep sea are opportunistic and pragmatic in their studies, which is no different in this case. Deep-sea researchers build off industry efforts because they provide structures to observe and such structures are often equipped with observation tools. This structure was going to be submerged and recovered, allowing for researchers to make observations at multiple time points over a three-year period and create a timeseries of data. Along with another installation in the deep sea off Angola, the researchers hope to observe how communities respond to introduction of structures over a relatively short period. They categorized how the communities' structure changed over time as a result of the installation of the Fishery Protection Device (FPD). The key measurements concern biodiversity, abundance of species, and changes in biomass over time. In this section of the North Sea, the structure is in an environment that is "highly disturbed." Thus, the experiment provides insights for ecosystems that have been particularly impacted by decades, if not centuries, of human activities at sea.

In addition, a Nature Conservation Marine Protected Area (MPA) was designated around the oil and gas field, known as the Faroe-Shetland Sponge Belt in connection to the UK's implementation of the UK's Marine and Coastal Access Act, commissioned through the Joint Nature Conservation Committee (JNCC). Marine Scotland designated the Nature Conservation MPA in 2014 because of its exemplary geophysical attributes and aggregation of deep sea sponges and ocean quahogs (*Arctica islandica*), which are categorized under OSPAR as Threatened and/or Declining Habitat and Species respectively. The MPA is 5,278 km^2 in area and is in the Scottish side of the Faroe-Shetland Channel. The area is a convergence of five water masses of different temperatures resulting in a layered water column and high nutrient mixing in parts. It also features important geophysical features, including examples of iceberg scoring and ploughmarks from the last ice age. (JNCC, 2018).

Although the demonstration project does not include stakeholders as partners other than the industry and science collaboration, relevant stakeholder groups include environmental NGOs, oil and gas companies, operators of the rigs, and perhaps fishers who may be interested in RTR as feeding grounds for fish, but who may also be concerned with obstructions to gear on the seafloor (especially if at 150m depth). Moreover, it is relevant to the continuing debate over the OSPAR decision to require that oil and gas infrastructure be removed from the North Sea, except in extraordinary circumstances.

There is a key distinction for RTR in the North Sea, as opposed to the Gulf of Mexico in the American EEZ because of the safety zone requirement in the North Sea and the closer proximity to shore for many of the rigs in the Gulf of Mexico (eNGO, personal communication). In turn, the recreational fishing sector was quite active in spearheading the RTR initiative in the Gulf of Mexico (Jørgensen 2009), whereas the North Sea rigs lack that same support. Jørgensen (2009; 2013) points out that public support or opposition to the oil and gas industry depend somewhat on regional context and therefore influences the acceptance or opposition of RTR.

4.2.3 Policies and Restoration

The establishment of RTR is governed by different legislative frameworks across the world. In fact, there is no international law on the creation of artificial reefs through decommissioning, and some argue that the existing legal framework hampers the establishment of artificial reefs

(Techera and Chandler, 2015). If one is to explore the current legal regimes in their ability to set the frame for RTR, then it is the *decommissioning* and *dumping* law and policies associated to *defunct offshore installations* what must be addressed (Techera and Chandler, 2015).

To begin with, *decommissioning* is not well-defined in international legislation (Fann et al., 2018). In some occasions the expressions *abandonment, disposal, removal* are used when referring to *decommissioning*. Much of the international law is a reflection of the time when the law was written. In this case, *decommissioning* rules –now several decades old, focused on addressing the risk of marine pollution that was pressing at the time of drafting. Most of these international legal regimes favours complete removal of obsolete infrastructure, although they also leave space for identifying new uses for the structure that is to be decommissioned in situ (Techera and Chandler, 2015).

The international legal regime associated to the need to deal with defunct offshore platforms are found in the area of (i) law of the sea, and (ii) regulation of marine pollution. Both areas are governed by UNCLOS, and the second one is governed by the London Convention and Protocol (Techera and Chandler, 2015) (Fann et al., 2018). At the regional level and given the area of the explored case study, OSPAR Convention sets also the boundaries for the establishment of RTR in the North Sea area. Finally, it is worth mentioning that at a national level, Norway, UK and USA are considered as the countries having the more experience in decommissioning activities (Techera and Chandler, 2015) serving as models to follow for other countries who are in processes of developing regulations in this field (Fann et al., 2018).

1958 Geneva Convention

First international treaty addressing the disused offshore oil and gas installations: any installation that are abandoned or disused are to be entirely removed (art 5(5))

1982 UNCLOS

A fundamental principle of the law of the sea is the freedom of navigation, therefore, structures placed on the seabed may be considered as interfering with navigation and creating a shipping hazard.

The Convention provides general obligations for Coastal States in relation to prevention of marine pollution by dumping (art 210). It also provides specific provisions for offshore installations (art 60(3) and 80). In particular, it requires that abandoned or disused installations/structures are to be removed in order to ensure safety of navigation.

However, the statement "*Appropriate publicity shall be given to the depth, position and dimensions of any installations or structures not entirely removed*" (art 60(3)) signals that UNCLOS allow for partial removal of offshore installations (Techera and Chandler, 2015) (Fann et al., 2018).

Removal of abandoned or disused installations/structures is to be done "*taking into account any generally accepted international standard established in this regard by the competent international organization*" (art 60(3)). The International Maritime Organisation (IMO) was requested to develop minimum global standards applicable to the removal of offshore installations and structures. The standards were set in accordance to the developments of that –

end of 1980s, time and were set mostly from a navigational point of view (Fann et al., 2018). The IMO Guidelines, although usually considered a "soft law" instrument, became "binding" as they were explicitly mentioned and imposed as a requirement in UNCLOS's art 60(3) (Fann et al., 2018)

The document reiterated the removal of any disused installation located on any continental shelf or in any EEZ (section 1.1), at the same time that it was recognised that it may not be possible to remove large installations located in deep waters. The offshore facility can thus remain on the seabed on a case-by-case basis and following specific guidelines in terms of costs, technical feasibility, human risk and potential effects on the marine environment among others (section 2.1)(Fann et al., 2018).

Of particular importance to the framing of RTR opportunities, is the case-by-case evaluation criteria of section 2.1, as it refers to "'*determination of a new use or other reasonable justification for allowing the installation or structure or parts thereof to remain on the seabed*'". According to Techera and Chandler (2015), the reference to "new uses" is innovative as it would appear that States parties to UNCLOS are not obliged to remove all abandoned/disused offshore installations provided that a "new use" can be identified, and that it maintains consistency with the Guideline. The authors also conclude that "*UNCLOS and the IMO do not prohibit partial or in situ decommissioning*" (Techera and Chandler, 2015 p: 56).

London (1972) Convention and (1996) Protocol

The 1972 Convention is aimed at controlling pollution of the marine environment through regulating the deliberate dumping of waste at sea. *Dumping* refers to the deliberate disposal at sea of waste or other matter from –in our particular case of study, platforms or other man-made structures at sea. Intentional disposal at sea of platforms or other manmade structures at sea is also considered dumping (Fann et al., 2018).

However, the convention provides that "*placement of matter for a purpose other than the disposal*", is not considered *dumping.* According to Fann et al. (2018), the Convention allows then some room for domestic legislation to create RTR policies by considering platforms as "*other wastes or matter*" as the Convention considers that the State has the authority to grant permits of dumping of these "*other wastes or matter.*"

The 1996 Protocol expands on the definition of dumping (art 4.1.3 and 4.1.4), but again, an exception is given that dumping does not include placement of matter for a purpose other than mere disposal (art 4.2.2) (Techera and Chandler, 2015). Vessels and platforms and other man-made structures at sea are wastes part of Annex I category -for which dumping is prohibited, but, if in situ decommissioning is done with a purpose other than disposal –e.g. creation of an artificial reef, then there would not be a breach to the Convention and to the Protocol, as long of course as this decommissioning is permitted by the legal framework of the Coastal State (Techera and Chandler, 2015).

OSPAR

The OSPAR Commission protects and conserves the North-East Atlantic and its resources. It requires that States take steps to prevent or eliminate pollution from, and prohibits the dumping of, abandoned offshore installations (annex III). OSPAR applies to the EU region of 15 governments[31]

Of particular relevance to the present case study is Decision 98/3 which governs the disposal of disused offshore installations and requires the removal of the majority of all structures with only the possibility of footings remaining (very large steel jackets and concrete structures, still, subject to OSPAR Secretariat's decision) (Fann et al., 2018).

In addition, the OSPAR's Guidelines on Artificial Reefs in relation to Living Marine Resources, developed under the controversy surrounding the attempted deep-sea disposal of the Shell's O&G Brent Spar platform, rule out the potential of RTR in the North Sea as it is stated that artificial reefs may only be created from new materials rather than defunct offshore infrastructure (Techera and Chandler, 2015). OSPAR's guideline is not legally binding, yet, it sets acceptable international practice in the North Sea region and as Jørgensen (2012) writes, "as long as the guidelines contain the provision that restricts reefs to "virgin materials", rigs-to-reefs may be difficult to implement in the North Sea" (p: 60).

Treaty/Policy, Article	**Explicit Target/Purpose**	**Relevance to RTR**
1958 Geneva Convention (United Nations Convention on the Continental Shelf)		
Article 5(5)	Predecessor to UNCLOS (although largely overtaken by UNCLOS; the Convention remain in force) Installations which are abandoned or disused must be entirely removed from the continental shelf	Abandoned or disused offshore oil and gas installations must be entirely removed (art 5(5))
1982 UNCLOS (United Nations Convention on the Law of the Sea)		
Article 60(3)	Man-made installations/structures abandoned/disused shall be removed for safety of navigation, due regard to fishing, and protection of the marine environment Removal to be done taking into account international standards established by "competent international organisations" "Appropriate" announcements shall be made about installations/structures not entirely removed The breadth of the safety zones shall be determined by the coastal State, taking into account applicable international standards. Such zones shall be designed to ensure that they are reasonably related to the nature and function of the artificial islands, installations or structures, and shall not exceed a distance of 500 metres around them, measured from each point of their outer edge, except as authorized by generally accepted international standards or as recommended by the competent international organization.	Oil rigs are man-made structures and fall under article Applies to EEZ only Although not specifically named, IMO represents "competent intnl org" Safety zone is national jurisdiction
Article 80	Mirrors article 60(3), but applies to all artificial islands, installations and structures on the continental shelf	Extends to Continental Shelf (UNCLOS definition), Territorial Seas to the coastal state
Article 194	Pollution prevention, reduction, and control from	

[31] Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

	any source in the marine environment	
Article 208	Requires Coastal States (CS) to adopt laws/regulations to prevent, reduce and control pollution of marine environment in connection to seabed activities, installations and structures under jurisdiction pursuant Articles 60 & 80 Standards and regulations must not be less effective than international ones	Requirement of nations to regulate pollution from offshore installations Under CS jurisdiction = EEZ, territorial seas, internal waters, and archipelagic waters
Article 210	Addressing pollution from dumping; CS are permitted to legislate what may be dumped at sea "Marine dumping" defined in Article 1.1.5.a as "disposal of waste and other matter…at sea" National legislative framework not to be less effective than international rules and standards	
Article 214	Enforcement with respect to pollution from seabed activities: CS shall enforce laws passed as required under Article 208	
1989 IMO (International Maritime Organization)		
Guidelines & Standards for the Removal of Offshore Installations & Structures on the Continental Shelf & in the EEZ	Standards set from a safety navigation of the seas point of view Removal of disused installations on continental shelf or EEZ Paragraph 3.12 speaks directly to artificial reefs:material from removed structures that could enhance living resources, should be placed on the sea-bed away from traffic lines and in accordance with safety guidelines	Dispensation for large installations located in deep waters Structures that remain in place may be no less than 55m depth from surface Decision to allow offshore installations to remain is made by case-by-case decision by CS with jurisdiction with outlined criteria
Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter		
1972 London Convention	Defined dumping as deliberate disposal at sea of waste or other manmade structures (e.g. platforms),	Placement of matter for a purpose other than the disposal is not considered dumping. Convention allows CS legislation to create RTR policies: platforms as "other waste matter"
1996 London Protocol	An update on the 1972 Convention and clarifies artificial reefs exception in regard to dumping or toppling "for sole purpose of disposal"	Dumping of platforms is prohibited, but if in situ decommissioning is done with a purpose other than disposal (e.g. creation of artificial reef), then there is no breach of legislation –as long as is permitted by CS legal framework
(OSPAR) Convention for the Protection of the Marine Environment of the North-East Atlantic		
Decision 98/3 on the Disposal of Disused Offshore Installations	Bans the disposal of offshore installations at sea except in special instances when competent authority of the relevant Contracting Party may give permission to leave whole/parts of installations	Clear policy preferring onshore disposal
2012 Guidelines on artificial reefs in relation to living marine resources	- No materials should be used for the construction of artificial reefs which constitute wastes or other matter whose disposal at sea is otherwise prohibited (paragraph 13) - Modules for artificial reefs are generally built on land unless they consist solely of natural materials placed in an unmodified form	artificial reefs are limited to virgin material since wastes are prohibited as reef construction material

	(paragraph 14)	

Table 4.3 (After Baine, 2002; Jørgensen, 2012, Techera and Chandler, 2015, Fann et al., 201

Restoration discourses

The inclusion of RTR as an example of marine ecosystem restoration may be controversial in the eyes of some environmental advocates and restoration practitioners. Those individuals and groups object to the inclusion on the grounds that placing man-made materials in the environment does not constitute restoration. In some instances, restoration advocates and practitioners recognize that RTR lies on the continuum of restorative activities (ecological restoration expert, personal communication). Nonetheless, as established in Ounanian et al. (2018), when discussing the future of governance in this domain, a broad operationalization of ecosystem restoration is appropriate. RTR often falls under the dominant discourse of "Building with Nature," categorized as a high degree of human intervention under anthropocentric motivations (Ounanian et al. 2018). Although this holds in many ways, the following paragraphs unpack the rhetorical arguments for and against RTR primarily in the case region of the North Sea.

Dr. Dolly Jørgensen has done extensive work on RTR using discourse as a methodology, which highlights shared and diverging experiences from cases in the Gulf of Mexico (2009), coastal California (2013), and the North Sea (2012). In her work on the Gulf of Mexico, Jørgensen (2009) concluded that three discourses emerged, enabling the establishment of a RTR program in the region, "Structures increase the availability of species preferred by fishermen, the structures improve upon nature, and the structures create unique and even endangered ecosystems." The case of California demonstrated the importance of context even within a similar national regulatory and legal regime. The California case also highlighted that even with greater certainty and scientific evidence of the effects, the two sides of the RTR issue disagreed on what to do (D. Jørgensen 2013). In summary:

> If a person valued ecosystem integrity, strict legal compliance, clear ocean access, and limiting potential state liability, they would favor complete removal of the multistory steel structures currently standing off the coast of California. On the other hand, a person who valued reductions in air emissions, retaining existing biological communities, limiting costs, providing recreational fishing, and limiting impacts on water quality would favor converting the structures into fish habitat as artificial reefs (D. Jørgensen 2013, 55–56).

The California case is an example of how ambiguity, or knowing differently in terms of uncertainty, is at play when actors come to different conclusions or recommend disparate actions in questions of environmental protection and restoration. Moreover, incomplete knowledge, another type of uncertainty, was not the central issue:

> Between 2001 and 2010, a plethora of scientific articles were published on California's platform ecologies to address the lacunas in knowledge that were identified in the 2000 Select Committee report. Yet in spite of ten years of work and the publication of "better" science, the support and opposition actors used exactly the same arguments for and against the 2010 bill as they had a decade before (D. Jørgensen 2013, 67).

The California case was not simply a case of pro-environment versus pro-industry divisions, but atypical coalitions among segments of the fishing industry aligned with environmentalists, whereas other fishing groups were on the opposite side of the issue (D. Jørgensen 2013). D. Jørgensen (2013, 52) summarizes“As a whole, the debate centered on different visions of nature, rather than on scientific knowledge. Scientific knowledge in this case reinforced competing, incompatible enactments of nature.”

The following section highlights the various rhetorical arguments employed by actors and stakeholders in the North Sea in connection to marine restoration and decommissioning oil and gas infrastructure. We also examine whether concerns for wind farm decommissioning will influence debates and position in relation to the OSPAR 98/3 decision.

The cost-savings argument

Maintaining the anthropocentric orientation, a number of advocates for RTR in the North Sea, identify cost-savings as a primary motivation. This line of argument is evidenced in opinion editorials, blogs, and in popular press (A.-M. Jørgensen 2018; Goth 2017; Baxter 2017; Harrabin 2018; Sonne 2018).The cost-savings argument is not a simple concern for energy prices or direct benefits to the offshore oil and gas industry, but rather it is about the money necessary for removal could be better spent on other conservation and restoration activities of the marine environment (Goth 2017; A.-M. Jørgensen 2018). One advocate referred to the costs of removal as “dead money,” and advocated to use the funds on other conservation efforts (Goth 2017). Additionally, the cost to taxpayers and the public is also invoked with articles pointing out that in many cases the state will bear 60% of the cost due to tax deductions or reimbursements (Goth 2017; Sonne 2018; A.-M. Jørgensen 2018; Harrabin 2018). Nonetheless, some eNGOs, especially the large, multinational groups with large donation bases still see the prohibition of RTR in the North Sea as a means of keeping O&G operating costs high and do not want to appear soft on that industry for sake of donors, (eNGO, personal communication). To illustrate, Doug Parr of Greenpeace is quoted in a BBC News story stating, “We should be wary of proposals that look like a convenient way of oil companies avoiding their responsibility to clean up after themselves,” (Harrabin 2018). RTR opponents also position RTR as “greenwashing”:

> The immense potential cost savings to the petroleum industry to be gained by not removing old rigs that have made immense profits for companies over the decades has led oil interests to undertake a slick public relations campaign as they try to break their promises. Financially motivated to avoid about 50% of their obligated decommissioning costs, the drillers cleverly anointed their effort to circumvent federal decommissioning requirements with the name Rigs-to-Reefs, (Charter, n.d.).

Here, we see almost the reciprocal of the taxpayer saving argument in the 50% cost, where Charter frames the cost savings as beneficial to the oil companies. He goes on to claim there is no evidence that RTR are beneficial “for anyone but the accounting department of an oil company,” (Charter, n.d.). But some make the arguments that oil companies should not benefit from the savings, but rather the savings should be invested in renewables or marine conservation (Goth 2017; Pearce 2018; A.-M. Jørgensen 2018). Thus, the cost savings rhetoric comes for and against RTR.

Within the cost savings argument, there is a tangential concern in terms of the cost borne by the offshore renewable energy sector as some of the turbines and windfarms will soon reach the end of their lifecycles (Sonne 2018; Harrabin 2018; Baldwin 2018). There are some questions whether the offshore wind sector will be subject to OSPAR 98/3 (eNGO, personal communication; van Beuge 2016). Nonetheless, many see that the renewable sector will be subject to the same non-virgin materials rules, which will be an extra cost on a somewhat more nascent energy sector. Finally, this may emerge as a schism within the eNGO community from those more dogmatic toward OSPAR 98/3 and the opposition to fossil fuels and with a nature protection paradigm and those more pragmatic groups that do not want to impose barriers on the transition to renewables.

The rigs as habitats for (threatened) species argument

Moving beyond the economic or financial arguments for RTR in the North Sea, advocates reference many studies and research citing the benefits of oil and gas infrastructure to the production of benthic communities. Often advocates specifically name endangered or threatened species, e.g. cold water corals. Some advocates of RTR in the NS also point to the structures' provision of hard substrate, which has helped endangered cold water corals, such as *Lophelia pertusa* (Pearce 2018). Specific mentions of threatened species appear in articles (Harrabin 2018). The articles highlight the research of Claisse et al. which highlight the benefits of RTR for blue mussels and cold water corals (Coghlan 2014; A.-M. Jørgensen 2018).

Some of the rhetoric also anthropomorphizes aquatic species (Baldwin 2018; Coghlan 2014). One article features the title, "Fish Love Skyscraper-Style Living under Oil Platforms," and explains the benefits of the advantageousness of multidimensions of the rigs from Claisse et al. (2014). In another instance, authors write, "Fish have made oil rigs—in place for decades—home," (Baldwin 2018). Such a statement not only gives fish anthropomorphic agency in making a home, but also plays with the temporal component of nature with the aside that the rigs have been in place for decades. This links nicely to the man-made versus natural debate in ecosystem restoration as "Nature is what man has not made, though if he made it long enough ago—a hedgerow or a desert—it will usually be included as natural," (Williams 2008, 211). Picking up on Williams' reference to desert, there is an interesting parallel to draw with the advocates of RTR and the metaphor of the North Sea as a desert.

Oasis in the desert

As seen above, there is evidence of advocates framing the rigs as fisheries enhancement tools (Baldwin 2018; Harrabin 2018; Coghlan 2014; A.-M. Jørgensen 2018). Moreover, there are a number of instances where the North Sea is depicted as a desert, devoid of life, where the rigs offer a beacon of life, or oasis. Writing about the rigs' provision of hard substrate, A. Jørgensen (2018, author translation) refers to the findings of Jon Christian Svendsen, "These oases in the sea around Denmark." The oasis metaphor was also prominent in the Gulf of Mexico RTR debate (D. Jørgensen 2009). The argument by advocates is that the rigs provide hard substrate, which mimics the stone reefs that were once more prevalent in the North Sea and provide the hard substrate needed for blue mussels and corals to colonize (A.-M. Jørgensen 2018; Sonne 2018; Pearce 2018). Advocates refer to the research on their mimicry of natural structures (Henry et al. 2017), enhanced productivity (Fowler et al. 2018; Claisse et al. 2014), marine mammal attraction (Teilmann), and growing scientific consensus on revising artificial reef guidelines in OSPAR (Fowler et al. 2018).

What is also interesting about the oasis in the desert rhetoric is the invocation of bareness and sand as devoid of life. But some restoration ecologists have warned of the "deceptive bareness" of the sea (ecological restoration expert, personal communication). Indeed, when talking about rigs providing oases to fish species in the sandy-bottom "desert" of the ocean floor, there is an assertion that life does not exist in the sand. Nonetheless, one news article reports on the importance of soft bottom habitat for fish (Sonne 2018). In turn, this takes us to one of the central points in the debate over RTR as a means of restoration in the North Sea: is hard substrate indeed missing or is it "unnatural"?

In the conversation with an eNGO informant, references were made to the work of Han Lindeboom and Callum Roberts who delve into the discussion of what is the "natural" state or habitat of the North Sea. Indeed, some eNGOs reject the idea that there is a need for hard substrate; quoted by BBC, Greenpeace representative Doug Parr makes an interesting statement, "The North Sea is not a natural environment for hard structures and leaving rigs there is a distortion of the ecosystem—a raft of plastic bottles accumulates marine life, but no-one is arguing we should create more," (Harrabin 2018). The first element is a rejection of hard substrate as natural and then stating that it would alter natural ecosystem conditions. Secondly, the analogy to plastic in the ocean—thought of by many as pollution—tries to make the rigs be seen as pollution to be taken out of the sea. Interestingly, a similar argument was given by a researcher in the MERCES consortium during a discussion of RTR and restoration at the project's 2018 annual meeting.

The contention over what is "natural" habitat in the North Sea is at the heart of the RTR debate and connects further to the conceptions of marine ecosystem restoration. Within the eNGO community there exists a division among those NGOs that hold a conservation or protection stance and thus want to keep human activities out of the environment and those that view the sea as a place that has had and will have activity with layers of human impact and thus want to find ways to restore in connection with those activities. Furthermore, the perception of the sea as the "last wilderness" or final untouched environment feeds into these divisions. Relatedly, there is a new research paradigm highlighting and working to remove the imprint of colonialism on conceptualizations of the oceans as empty or untouched (Hofmeyr 2018). Thus, proposing the oceans as devoid of human activity erases the history of interaction between people and the environment.

Nonetheless, there still remains the question as to how much and what kind of human intervention is necessary on behalf of the environment. Opponent of RTR Richard Charter (n.d.) writes, "Ultimately allowing the marine environment to restore itself was the stated rationale for the decommissioning contracts that the drillers originally accepted and signed when they began to explore and develop the offshore sites now in question." Opponents seize upon the idea that nature knows best, advocating the restoration discourse of low human intervention seen in "Putting Nature First" (Ounanian et al. 2018).

RTR as de facto MPA argument

Interestingly, a number of proponents of RTR frame them as de facto MPAs or no-trawl zones due to their physical impenetrability for trawl gear and the legally stated safety zones (Sonne 2018; A.-M. Jørgensen 2018; Harrabin 2018). This is especially promising for decommissioned windfarms, which have a larger footprint in the seabed than single, isolated oil and gas platforms (eNGO, personal communication). Once again, the desert is invoked; one news article quotes Aarhus University research Jonas Teilmann, "The physical structures also ensure that the areas are not trawled. The heavy trawl makes the seabed into a uniform desert, where biodiversity has narrow conditions," (Sonne 2018, author translation). The case of California highlighted an "unholy alliance" of trawlers and environmentalists opposing RTR, whereas sport fishers aligned with RTR proponents because of differences in gear (D. Jørgensen 2013). Additionally, concerns over contaminants from drill cuttings also figure into this argument, as some state concern that these buried contaminants will be churned up either during removal or spread further by trawling (Pearce 2018):

> "In practice, fully removing a platform, without removing the drill cutting pile, would spread pollution over a much larger area," says Jørgensen. It might happen during decommissioning or subsequently, "when the area is opened up for trawlers," she says.

Therefore, we see that these arguments fall under a lower human intervention frame (where the intervention is understood here as the act of decommissioning), but perhaps for more anthropocentric reasons. By advocating spatial tools, RTR may fall somewhere between "Putting Nature First" and "Helping Nature Support Humans" (Ounanian 2018).

4.3. Restoration of the Mediterranean fan shell (*Pinna nobilis*)

4.3.1 Introduction: general background and relevant policies

Pinna nobilis, commonly known as the noble pen or fan mussel, is the largest, endemic bivalve mollusc found in the Mediterranean Sea. A member of the family *Pinnadae*, it typically grows to lengths of 30–50cm, but can grow to up to 120 cm. It lives up to 27 years in offshore areas at depths ranging between 0.5 m and 60m. Its main habitats are soft sediments which contain seagrass meadows (e.g., *Posidonia oceanica* or *Cymodocea nodosa*), but also unvegetated areas in estuaries (Marocco et al. 2018; Addis *et al.*, 2009) and soft bottoms of marine lakes (Katsanevakis, 2005; Vázquez-Luis and Deudero 2017). In these latter, *P. nobilis* functions as a habitat forming species by adding complexity and heterogeneity to the ecosystem.

Historically, *P. nobilis* was harvested as a source for sea silk (Katsanevakis and Thessalou-Legaki 2009), an extremely fine, rare, and valuable fabric made from the byssus (long silky filaments used by the clam to attach itself to the sea bed) secreted by a gland in the foot of mollusc shell. *P. nobilis* is an edible species. Officially it should not be harvested for human use or consumption given its current protected status (Cantanese *et.al*. 2018), however, Katsanevakis et al. (2011) demonstrated that several protected shelled mussels, including *P. nobilis*, are illegally traded in Greece and served in restaurants.

In the twentieth century, *P. nobilis* populations have greatly declined due to anthropogenic activities, including recreational and commercial fishing, poaching, ornamental harvesting, accidental killing by anchoring, bottom nets and trawlers, as well as habitat degradation or destruction (e.g. through coastal construction) and pollution (Vázquez-Luis et al., 2017; Basso et al., 2015; Katsanevakis 2005).

In the early autumn of 2016, *P. nobilis* suffered a geographically-widespread, mass mortality event (MME) throughout the Spanish Mediterranean Sea (Western Mediterranean Sea). In late 2016, MMEs of *P. nobilis* were observed around the Balearic Islands and the southeast of the Iberian Peninsula; by July of 2017, these MMEs also included all populations along the Spanish coast (with 99% mortality) and several other areas in France (Corsica) and Italy (Sicily, Apulia and Campania) (IUCN 2017). The mass mortality outbreak, resulting in 80-100% mortality of local populations, is believed to be caused by a new parasite from the genus *Haplosporidium*. Already considered endangered, following these MME, in Spain *P. nobilis* has been classified as critically endangered. In 2018, MMEs have continued to spread, causing high mortalities in the East Mediterranean with a Greek NGO describing *P. nobilis* as 'a species close to extinction'[32]

The threat that the MMEs represent for *P. nobilis* MMEs has led to increasing calls for an action plan for the protection of the species (Figure 4.4). In the wake of the MMEs, IUCN implemented a series of priority actions in 2017 to help evaluate the situation throughout the region and establish urgent measures. Recommendations included: monitoring across the coastline, avoiding translocation programs until specimens are confirmed to be free of the parasite or resistant, preparation of rescue programs, and identification of high-density *P. nobilis* hot spots as priority areas for the adoption of measures to avoid infection (IUCN 2017).

[32] http://archipelago.gr/pinna-pinna-nobilis-allo-ena-thalassio-idos-konta-ston-afanismo/

There is scientific evidence that this benthic filter feeder is a good indicator of changes in marine ecosystems providing information of biotic response to anthropogenic pressures (Alomar et al., 2015). Therefore, it has been proposed to use *P. nobilis* as a “bioindicator species” which acts as a good proxy to assess good environmental status (GES) in benthic coastal ecosystems for the MSFD (Vázquez-Luis et al. 2017).

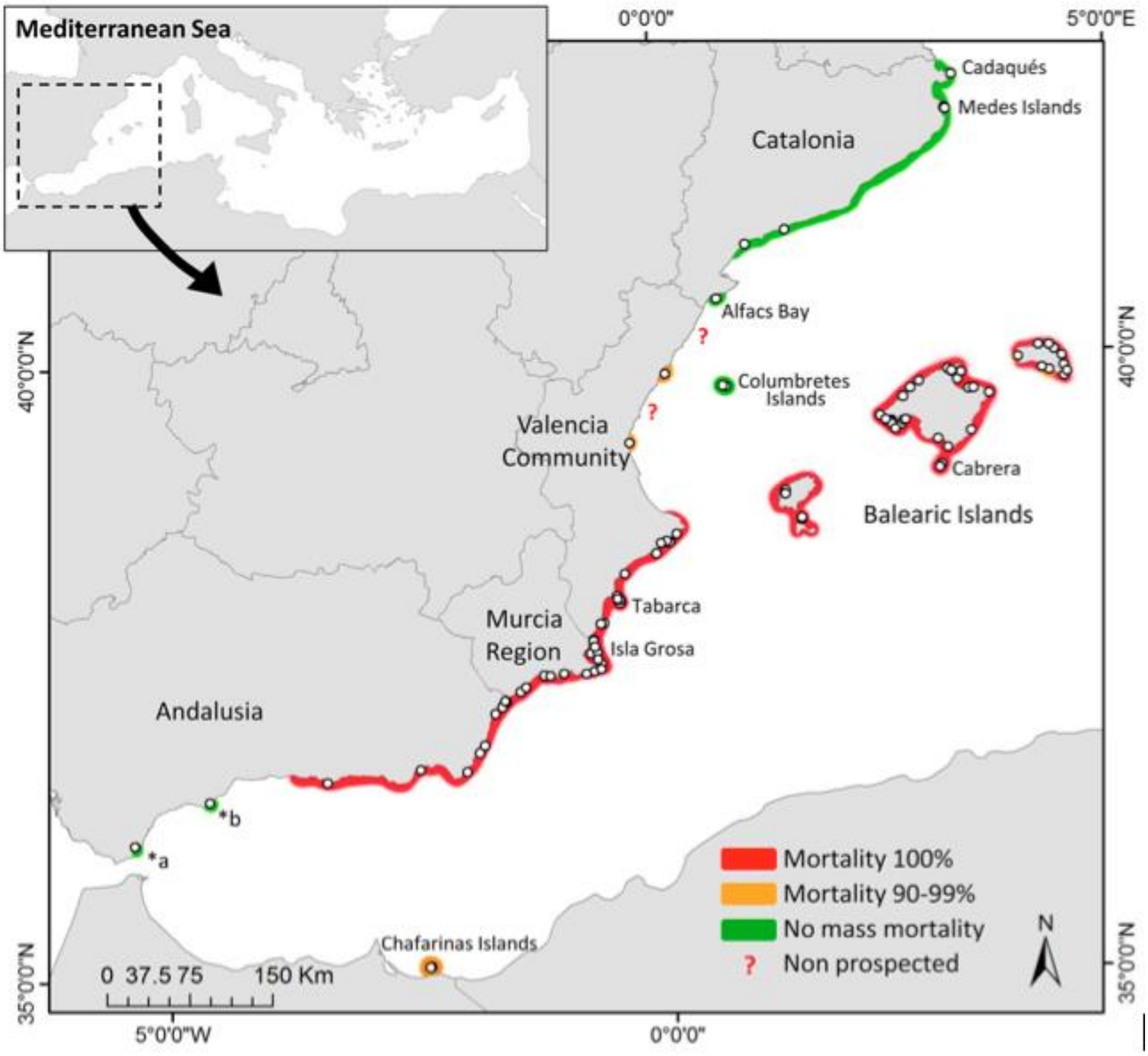


Figure 4.4 Mass mortality of *P. nobilis* in the Western Mediterranean. Source: Vázquez-Luis et al. 2017.

Even prior to the MME of 2016/17, *P. nobilis* was classified as a species of Community Interest in need of strict protection. Currently, this species is legally protected under Annex II of the Barcelona Convention (SPA/BD Protocol 1995), Annex IV of the EU Habitats Directive (EU Habitats Directive 2007), the Bern Convention and under national legislation, such as the Spanish Catalog of Threatened Species (Category: Vulnerable, Royal Decree 139/2011) (Vázquez-Luis et al. 2017).

Much of the data on *P. nobilis* comes from observational data in marine protected areas (MPAs). Also, as stated above, most of the threats are anthropogenic in nature. Consequently, MPAs could play a critical role in conservation of the species. The parameters for GES status however, need to be set, and studies which investigate the species without impacts or threats (i.e., ones in MPAs) could be useful to set these. Though since human stressors impact densities more than environmental ones, both, environmental and human stressors must be taken into account since values of GES will be obtained from pristine areas without human stressors, but the potentiality of the populations will be conditioned by environmental factors which modulate distribution, density and sizes of *P. nobilis* in a given area. It has been suggested (Marrocco *et al.* 2018) that Mediterranean coastal lagoons could be considered as "nursery ecosystems," aiding in the recruitment of the species.

Due to the critical situation of *P. nobilis* in Spain, a national rescue program has been implemented in the country, successfully preserving some individual specimens in aquariums. Italy and France, after being informed of the situation, have also strengthened their coastal observation programs and confirmed some mass mortality events in a number of locations (IUCN 2017). The status of Pinna populations in the Eastern and North-Eastern Mediterranean varies. Whereas in Greece *P. nobilis* populations currently suffer mortalities higher than 90% (personal communication, Greek scientist), in Croatia scientists working with this species believe that populations are still relatively stable and have not been affected by the parasite as of summer 2018 (personal communication, Croatian scientists).

The following section describes a project carried out in Croatia aiming to safeguard a *P. nobilis* population through translocation efforts, which took place prior to with the MMEs in the Western Mediterranean. Next, we examine which are the dominant restoration discourses surrounding *P. nobilis*, not only related to the Croatian case but to the Mediterranean as a whole. The chapter finishes with a reflection regarding what the challenges and opportunities for restoration of *P. nobilis* would be under a hypothetical selection of this species in the context of the EU Biodiversity Strategy.

4.3.2 Description of MERCES restoration project

The case examined here takes place in the shallow coastal area of the eastern part of the North Adriatic Sea in Croatia. It focuses on the translocation of *P. nobilis* from Pula Harbour to a nearby MPA, the Brijuni National park[1]. An Environmental Impact Assessment (EIA) carried out prior to a planned harbor expansion determined that construction of a new nautical center would endanger the local *P. nobilis* population and prescribed its translocation. The main stakeholders involved in this project are scientists from the Faculty of Science at the University of Zagreb, representatives from the State Institute for Nature Protection, authorities from the Public Institution Natura Histrica in Istria, project developers and local dive centers.

The translocation activities took place in 2017. Approximately twenty-five people were involved in these activities, including scientists from the University of Zagreb, volunteers from local dive centers and manager and staff associated with the MPA. The destination area within the MPA, which lies approximately 3.5 nautical miles from Pula Harbour, was proposed by scientists who knew that in this area *P. nobilis* occurs naturally. According to the scientists involved, the area could support the density of the translocated specimens (in both bare sediment and seagrass patches) and would not affect the local Pinna community.

In order for the translocations efforts to be considered effective, survival, growth and reproduction of translocated individuals should be demonstrated. Although monitoring was not prescribed by the EIA, the scientists from the Faculty of Science University of Zagreb took upon themselves this task. Following the initial transplantation success -during which no immediate mortalities were observed- regular monitoring is currently being conducted under the auspices of MERCES.

This case represents the first documented translocation of a sessile, legally protected marine species as a mitigation measure under an EIA in Croatia. Experimentally, the technique for Pinna translocation has been proven successful elsewhere (Katsanevakis 2016; Bottari et al. 2017), but had never been applied as a mitigation measure before. The scientists and the then MPA manager involved in the translocation activities consider this a "success story" which will set a precedent for other EIAs involving Pinnas. According to them, five different ministries of the Republic of Croatia were involved in the decisions and permitting process to allow the translocation and several key factors enabled the action to be a success. These include the "happy coincidence" that an appropriate location within the MPA was available nearby, that the lead scientist from the University of Zagreb is well-known and well respected and that the scientists and MPA manager knew each other and were eager to collaborate in the project. Furthermore, the lead scientist involved in carrying out of the EIA knew both the lead scientist from the university of Zagreb and the literature, which expedited the process. In sum, respondents referred to the fact that the translocation could be executed as a success on its own, referring to the favorable social, administrative and political conditions which enabled these actions. (http://www.np-brijuni.hr/en/aboutus/environmentprotection).

4.3.3. Dominant discourses and dealing with uncertainties

The endemism of *P. nobilis* - its uniqueness to the Mediterranean Sea - is a theme that runs through all the stories told by respondents and reports analysed. Moreover, the increasing anthropogenic and environmental stressors, with MMEs as an acute example, underlie all the arguments put forward to step up *P. nobilis* conservation and restoration efforts in the region. The degree of urgency differs according to the geographical context, but a comparable line of reasoning can be distinguished region-wide.

Overall, two main restoration discourses can be discerned in our analysis of how actors conceptualize and frame the problems and solutions around *P. nobilis* in the Mediterranean. The discourses are "Putting Nature First", which is characterized by eco-centric motivations and a low degree of human intervention in nature (passive restoration), and "Bringing Nature Back," characterized also by eco-centric motivations, but a higher degree of human intervention in nature (active restoration). A third discourse has been identified, based on the case examined, which is also underpinned by eco-centric motivations and endorses a specific type of human intervention: moving nature elsewhere. On the whole, the degree of human intervention to "give *P. nobilis* a hand" is thus the dependent variable in the equation. In other words, eco-centric motivations are a constant, but the support for passive versus active forms of restoration is what varies, according to actors' perceptions of the context, as well as enabling and constraining factors including the legal framework underwriting the EIA.

Respondents from Croatia distinguished between two situations regarding Pinna: "normal conditions" and conditions which pose a threat to this species. What differentiates these situations is the type of pressures known to affect Pinna populations: chronic stressors ("normal conditions") versus acute stressors, such as project development or the looming disease spreading from the Western Mediterranean.

Under "normal" conditions, measures that eliminate or minimize human impact such as boat anchoring and harmful fishing practices, which are proven to cause one of the largest disturbances to this species and its primary habitat (*Posidonia oceanica* meadows), suffice to ensure Pinna's wellbeing. As such, these views fit within the discourse of "Putting Nature First". One of our respondents observed that, in some areas in Croatia, the perception is that *P. nobilis* numbers have actually increased in recent years, perhaps as a result of a combination of stringent legislation, at least partial enforcement and/or pulses in recruitment.

In situations where additional stressors threaten Pinnas, however, our respondents think that higher degrees of human intervention are warranted. For instance, in cases where coastal development poses a threat to the existing populations, respondents argued that these populations should be translocated to an appropriate location and monitored, as in the case described above. A respondent who had been involved in the project and was associated with the recipient MPA explained his motivation to participate in the intervention, which is infused by pride of pioneering this novel conservation measure and a sense of moral duty towards nature:

> "It was an honour to be part of the project to try and save a threatened species, as this is the first time we tried to do that in Croatia. In addition to being an honour it was also in a way a moral obligation to show good willingness and facilitate the efforts as we are a Marine Protected Area, if we are not trying to help, then what are we doing here?"

Such eco-centric motivation, in combination with a high degree of human intervention – of a particular kind- arguably can be seen as a new restoration discourse to be placed on the conceptual map constructed by Ounanian et al. (2018). This new discourse corresponds to the conservation tool referred to as mitigation-driven translocation, which aims "to reduce animal mortality caused by human activities (e.g., development), by relocating individuals away from project sites" (Germano, J. M. *et al.*, 2015). Mitigation-driven translocation differs from conservation-driven translocation, as the latter aims to enhance or re-establish populations in areas where they are declining or have disappeared (ibid) and as such follows the same rationale underlying the ideas behind "Bringing Nature Back". The mitigation-driven translocation activity could be then thought of as "Bringing Nature Elsewhere."

The Croatian scientists ponder that, currently, Pinna's status is good in their country's waters, but the disease spreading from the Western Mediterranean could reach the Adriatic:

> "Although we don't have comprehensive data, the feeling is that Pinna is doing OK so far in our waters. But the situation can change in no time as the disease spreads very rapidly... We need to have Pinnas in aquaria to help prepare for the worst case scenario, and to replant [them in nature]".

This view illustrates the preparedness to develop a strategy based on the "Bringing Nature Back" discourse, and shows how scientists are dealing with the unpredictability of a new and rapidly expanding disease through an anticipatory approach.

Similarly, two Greek scientists interviewed consider that a combination of passive and active restoration measures is necessary in order to address widespread decline of Pinna populations. In contrast to the perception in Croatia, *P. nobilis* is considered threatened in Greece, even at the brink of extinction.[1] One of the scientists interviewed underscores the importance of strong enforcement of existing measures to protect remaining populations, as "[there has been] no real protection of *Pinna nobilis* in Greece. It was even marketed in restaurants..." Moreover, MMEs started to be reported in Greek waters this summer. Another Greek scientist suggests preserving live specimens in aquariums, "in order to repopulate the Mediterranean should it be required after the halt of the infection takes place".

A Marine Expert at IUCN's Centre for Mediterranean Cooperation states*: "To date, we still don't know the precise extent of the problem in the Mediterranean, and we need to understand it if we want to stay ahead of the parasite's arrival and save this species."*[33]

Research to elucidate *Haplosporidium's* life cycle and to reduce its virulence is deemed crucial to fill these knowledge gaps. Other sources of uncertainty are the data gaps regarding population sizes and status in several Mediterranean countries, and therefore the extent of overall Pinna decline during the MMEs.

Recently, a proposal to adopt *P. nobilis* as a bioindicator species to assess GES of benthic ecosystems in the context of the MSFD has been put forward, as stated in section 4.3.1. (Vázquez-Luis et al. 2017). The proposal's action plan provides guidelines on how to define GES for *P. nobilis* and lays bare the substantial knowledge gaps that need to be filled in order to adequately determine reference values and the thresholds between "good", "medium" and "bad" status of the species both at basin and Mediterranean level. According to this proposal, several years of monitoring and review of thresholds on a large scale would be required to "provide reliable data for GES establishment at basin level" (Vázquez-Luis et al. 2017: 35).

The IUCN's call for action as a response to the MMEs proposes measures to improve the resilience of *P. nobilis* populations, such as protecting individuals *in situ* from predation by placing exclusion cages around individual pen shells. In addition, establishing microreserves around *P. nobilis* populations is suggested to enable survival of the species in case *Haplosporidium* continues to spread. Altogether, these views resonate with the "Putting Nature First" discourse, and show how actors are dealing with uncertainties about the parasite. To complement passive restoration measures, efforts to achieve Pinna reproduction in vitro and subsequent restocking of depleted populations is advocated, in line with the "Bringing Nature Back" discourse.

In sum, the arguments put forth to protect and restore Pinna are mainly related to its value as an endemic Mediterranean mollusk species– highlighting its uniqueness and historical link to the region- coupled to its threatened status. Whereas the dominant discourse in "normal" conditions is to focus on strict enforcement of the existing protection measures, a sense of urgency to deal with the crisis sparked by the MMEs is tilting the balance towards higher levels of human intervention in nature to save this species. As such, a bio-centric concern distinguishes the dominant discourses currently framing the problems affecting *P. nobilis* in the Mediterranean as a species in crisis, and possible solutions to address and redress the situation.

In Croatia, *P. nobilis* populations are perceived as safe so far, however, respondents implied that the species is kept under their watchful eye, to intervene on its behalf if necessary

[33] https://www.iucn.org/news/mediterranean/201807/emergency-situation-pen-shells-mediterranean

(e.g., by cultivating Pinna in aquaria). The novelty of the mitigation-driven translocation project in their country sets a precedent for similar measures under EIAs. As such, it represents an interesting case of implementation of biodiversity off-setting within the mitigation hierarchy (EC 2011). Translocation initiatives involving Pinna may be compromised, however, by the spread of *Haplosporidium,* or other pathogens. Mitigation-driven translocation has been criticized for the potential to spread disease among healthy populations in recipient habitats, hence caution must be exercised whenever "Bringing Nature Elsewhere" is advocated (Germano, J. M. *et al.*, 2015).

The analysis presented is based on the views of actors who are predominantly classified as conservationists (scientists, former MPA manager, NGO representatives), hence the eco-centric motivation evident in this case comes as no surprise. Somehow surprising was the lack of claims grounded on the instrumental value (e.g. anthropocentric) of Pinna populations– no arguments alluding to the ecosystem services provided by this species could be identified throughout the analysis. Lately, ecosystem services have become a central concept in conservation and restoration rhetoric (MAES 2018; EC 2011), also used by conservationists to invigorate their cause, but were absent from the discourses constructed around *P. nobilis*, which focused on the species' intrinsic value.

The human-nature divide is palpable in the dominant discourses distinguished in our analysis, with humans perceived as the cause of an imbalanced or damaged nature (Callicott et al. 1999). Pinna's conceivable demise stands as symbol of human's harmful effects on nature, as the scientist below writes when referring to recent Pinna's mass mortality events in the Mediterranean:

> "This new threat, which may eradicate yet another protected marine species, is indicative of the intense stressors we put on the seas and oceans. For decades as we are unable to solve any of the problems we have caused to our marine ecosystems we are creating more and more. Our seas and oceans are currently at breaking point, stretched to their limits. The combination of multiple pressures caused by the constant influx of waste and sewage, extensive habitat destruction, overfishing and so many more cannot continue if we wish to preserve our seas for generations to come. It is now time to stop ignoring the fact that our seas are the ultimate recipient of all the problematic human activities that we all cause on land and sea."[34]

4.3.4 Imagining a restoration future for P. nobilis under the EU Biodiversity Strategy 2020

A 2009 assessment under the Habitat's Directive Article 17, returned an unfavourable conservation status for Pinna as a whole in the Mediterranean; this was based on a limited number of country responses, declines in the species range, incomplete data, low data quality and unknown trends.[35] Given the dire straits in which *P. nobilis* populations find themselves in large stretches of the Mediterranean Sea, effective conservation of remaining populations and active restoration of degraded and depleted populations are seen as imperative.

[34] https://forum.eionet.europa.eu/habitat-art17report/library/2001-2006-reporting/datasheets/species/invertebrates/invertebrates/pinnanobilispdf/download/en/1/Pinna%20nobilis.pdf?action=view

[35] http://archipelago.gr/en/noble-pen-shell-pinna-nobilis-another-marine-species-close-extinction/

Implementation of Target 2 of the EU Biodiversity Strategy (EU BDS 2020) requires common understanding of various key concepts in order to enable operationalization of restoration and assessment of progress. The core restoration concepts analyzed in this report are the notion of a baseline or reference point, and the conceptualization of ecosystem *degradation* and *recovery*. Within the latter, defining the thresholds of change and territorial scope of restoration are important considerations (Lammerant et al. 2013).

This section examines how a number of *P. nobilis* experts envisage restoration of this species, considering the questions of "restoring to what baseline?", "how to assess population recovery (or degradation)?" and "are local or regional restoration efforts preferred, and why?" Our respondents were asked to think of a hypothetical situation in which *P. nobilis* would be selected as a priority habitat-forming species for restoration under EU BDS 20202's Target 2, which calls for restoration of at least 15% of degraded habitats by 2020. Their views provide useful insights for deliberations among policymakers and other stakeholders in the context of the post-2020 restoration agenda of the EU BDS 2020.

Bringing *P. nobilis* back to what baseline?

Whereas the EU BDS 2020 in itself lacks a well-defined baseline scenario against which progress is to be measured, it is generally accepted that the progress of the restoration actions should be measured against the status of ecosystems (or habitats, or *P. nobilis* populations in this case) as they were in 2010 (Schoukens 2018). The experts interviewed were asked whether they thought that restoring *P. nobilis* to this baseline would be feasible.
An expert from Croatia expressed the following observations:

> "If we ignore the fact that real progress would be impossible to estimate for many Mediterranean areas...where there is no previous data on *Pinna* populations and their status, hypothetical answer would be yes. This feasibility would be based on the fact that rearing is possible..., transplantation as a method is proven to be successful, time to sexual maturity of Pinnas is relatively fast and gene flow is high, implying considerable recolonization capacity under normal conditions (i.e. no mass mortalities due to disease, …)."

The Greek experts provided similar answers regarding the paucity of data to set the baseline for the reference year of 2010. One of them observes: "Unfortunately, it is impossible to define a baseline in the absence of historical data. The first habitat mapping of seagrasses in Greece was completed two years ago... For habitats deeper than 30 m, we have no idea on their extent even now..." Another Greek scientist echoes this statement: "there is no true Mediterranean-wide or country-wide *baseline* for the population of *Pinna nobilis* that could be used for setting a target for restoration. Only local estimates from various sites along the Mediterranean coast exist in the literature."

One of the scientists added that, if data were available, his preferred baseline would correspond to the early Anthropocene, or 1950, which has been suggested as the period marked by the emerging large-scale and widespread human impacts on the planet (Waters et al. 2016; Zalasiewicz et al. 2017).

However, the MMEs have resulted in mortalities between 80-90% in Greece, therefore, even without knowing the exact numbers corresponding to 2010, "it would be impossible to restore Pinna populations to [that] baseline in the near future," according to one Greek scientist. A second scientist thinks that it would take several decades to approach 2010 population levels.

On thresholds of change: degradation and recovery

The experts interviewed concur with the literature regarding the uncertainties of the type "not knowing enough" in relation to Pinna population estimations and assessments of their status. The recent proposal to adopt *P. nobilis* as a bioindicator species to assess GES of benthic ecosystems under the MSFD lays down guidelines to define GES for *P. nobilis*:

> "It is advisable to revise the thresholds annually until a steady trend. After several years of monitoring, the available information and data on *P. nobilis* population will be increased. Therefore, it will be necessary to analyze wider data in order to review thresholds of GES for *P. nobilis* on a larger scale namely across the Mediterranean basin, by taking into account biogeography differences and anthropogenic and environmental variables. (Vázquez-Luis et al. 2017: 35)."

Additionally, another Greek scientist pointed out the wide margin of uncertainty in the country-wide estimates of Pinna populations conducted in Greece in 2014 under article 17 of the Habitats Directive. This large variance is related to the patchy distribution of this species, found at several depths. This expert wonders whether changes of 25%, or even larger, from this estimate could be detected in a subsequent survey. This would result in ambiguity in interpreting monitoring results attempting to measure degradation or recovery of Pinna populations at country level.

In summary, it would take several years of monitoring efforts at Mediterranean scale to be able to obtain reliable data on the status of *P. nobilis*, and to measure progress towards GES under the MSFD. Large confidence intervals infuse datasets on Pinna populations with potential ambiguity in interpreting changes in populations.

Are local or regional restoration efforts preferred, and why?

One Croatian scientist pointed out that, based on available data on genetic differentiation of *P. nobilis* populations, three areas can be distinguished in the Mediterranean, which may be considered as three different management units from a conservation and restoration perspective: (1) western Mediterranean and Ionian Sea; (2) Adriatic Sea; and (3) Aegean Sea and Tunisian coastal areas (Sanna et al., 2013). This would call for a regional approach, in order to maintain connectivity, according to the scientist. However, she thinks that local approaches would also be beneficial from a social perspective:

> "Higher resolution genetic studies employing recently developed markers would be desirable to further refine connectivity within mentioned areas and to identify source populations that should receive priority in potential restoration actions. In addition,

> locally oriented actions including diver volunteers appear more “tangible” to the general public and provide an excellent opportunity for raising environmental awareness.”

One of the Greek scientists reasons that, due to the nature of the threat of the *Haplosporidian* parasite, a Mediterranean-wide approach to conserve and restore *P. nobilis* would be necessary. This regional approach would consist of research on in vitro reproduction of Pinna and restocking extinct populations, as well as research aimed at understanding the parasite’s life cycle and virulence. He adds that local or national approaches would need to focus on coordinating large scale surveys to identify refugia, and on protecting the species from illegal fishing and consumption in restaurants, which is still practiced in Greece.

4.4. Red Coral restoration in the Mediterranean

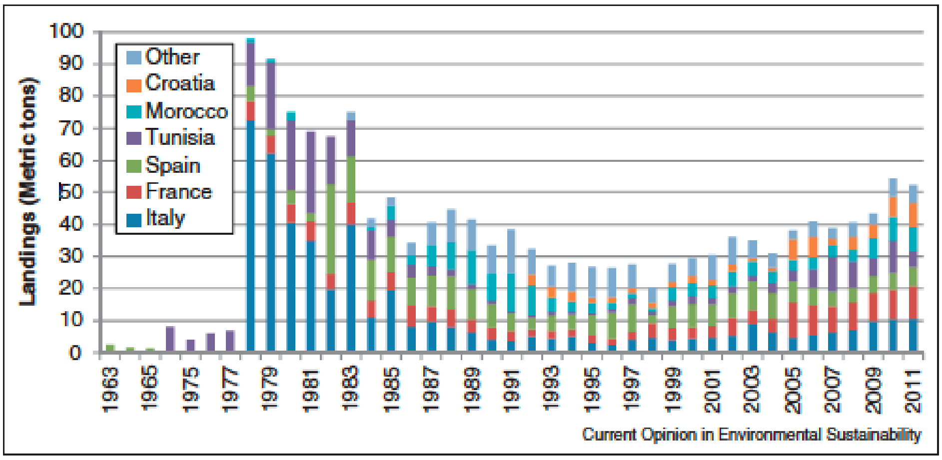
4.4.1 Introduction: general background and relevant policies

A) General background and relevant policies

Red coral is a general term used for marine corals, which have a red hue—varying in colour amongst and even within species, ranging from pale peach to oxblood red. They are among the most valuable living resources harvested in the sea (Bruckner 2014). Red corals, particularly the Mediterranean Red Coral (*Corallium rubrum*), have been highly sought after and prized as raw material for ornaments, amulets, jewellery, and other art work. In Roman times, the coral was believed to protect from danger, bring financial prosperity, and cure infertility (Tescione 1973, Cicogna and Cattaneo-Vietti 1993). In more recent years, demand has increased further due to the rising economic strength of the Chinese middle class; in Chinese culture, the colour red is a symbol of good luck and fortune. With the current demand, prices have skyrocketed and fishing increased, often to unsustainable levels and with illicit activities. The difficulty for the species arises due to the fact that red coral assemblages are made up of slow-growing animals which are geographically localized, due to their limited capacity for larval dispersal. It takes up to ten years for red coral to reach reproductive size. Critically, the released larvae do not travel far, which means colonisation from outside is extremely unlikely. For example, demographic projections predict that thirty to forty years may be needed for fully functional *C. rubrum* populations to develop (Montero-Serra et al., 2017).

The red coral fishery has been characterized by boom and bust cycles over the years. In the western Mediterranean in the 19th Century, fishers used small rowboats and wooden dredges to pull up the coral by hand. At its peak, thousands of boats, tens of thousands of fishers, and over 80 processing centres were involved in the fishery. Hard helmet diving increased direct access to the seabed in the late 19th century up to the advent of SCUBA diving, first used in the 1950s in harvesting. In the 1970s motorized vessels became more common, capable of dredging more and at greater depths (Bruckner 2014). SCUBA also meant that coral could be harvested in hard-to-reach areas (e.g., crevices and caves) where dredges could not reach previously (Bruckner 2014). Through the 1980s, both methods were used and divers also continued to go deeper using new technologies including diving with mixed gas (Tsounis et al. 2010) and rebreathers (Bruckner 2016). Over-fishing became a problem, as evidenced by deep declines in numbers, with landings finally levelling around 25% of previous harvest levels (Bruckner 2014, and figure below).

Bruckner (2014) has reported on recent catch trends in the Mediterranean with data shown in Figure 4.5. The six primary catching nations include Italy, France, Spain, and Croatia in the EU, and Morocco, and Tunisia outside of the EU (with an additional six others harvesting small amounts). In recent decades, there has been an expansion of harvest areas to those outside of the European Union Mediterranean as well as within the Eastern Adriatic Sea. Throughout these more traditional areas, shallow beds (30–50 m) have been overfished; divers now exploit unfished areas in deeper water (80–130 m).



Global catch data for the Mediterranean between 1963 and 2011. Data are shown for the six primary source countries; six other reporting countries are listed as 'other'.

Figure 4.5 Red Coral catch trends in the Mediterranean (from Bruckner 2014).

B) Species conservation status (which are the relevant policies?)

Precious corals form part of a group of 31 species in the Corallium and Paracorallium genera found around the world in tropical, subtropical and temperate waters and at the depths of 10 to 5000 m (OCEANA n.d.). Most are long-lived and slow growing, leaving them fragile and vulnerable. All species have been impacted by overexploitation, with many also impacted by fishing activities, ocean acidification, and higher ocean temperatures. *Corallium rubrum*, or Mediterranean Red Coral, in particular, is highly sought after for jewelry as mentioned above, and has seen a decline of 60% (FAO 2007 *in* OCEANA n.d.) For this reason, the United States and the European Union proposed the inclusion of more corals into the CITES Appendix II. Appendix II is for species that may become threatened with extinction if trade of the species is not strictly regulated. In addition, species that look similar in appearance to other species included in Appendix II may also be included, as seen with many of the red corals. Corallium rubrum is listed as endangered (IUCN 2016).

A few coral species are protected under the Barcelona Convention Annex II (i.e. strictly protected species), but C. rubrum is the only coral in the Annex III of the Barcelona Convention i.e. as a regulated species; it is also included in multi-governmental legislation, namely Annex V of the EU Habitats Directive (IUCN 2016). However, these measures are not enough to conserve these species and control their international trade. Some local and regional governments have also taken action in recent years.

The government of Catalonia, for example, established a moratorium on the collection of Red Coral in 2017 (Phillips, B. 2018) The ban was to last for 10 years, and to use an adaptive approach. For this, real-time monitoring is conducted in conjunction with experts. The plan is to review the status after 10 years, and then decide whether to continue again for 10 more years (Phillips 2018).

In addition to local initiatives (e.g. the 10 year ban by the Catalonian government), the Regional Fisheries Management Organization (RFMO) for the Mediterranean, the GFCM (General Fisheries Commission for the Mediterranean), following concerns over the species overexploited state, adopted a management plan for Red Coral. This management plan applies to the entire Mediterranean and consists of several measures (GFCM 2017) including a closure/move-on-rule in case undersized catch exceeds a limit.

	IUCN Category	International Legal Instrument	Regional Legal Intrument			European Legal Instrument	
Species		CITES (a)	Protocol SPA/BD (b)	Bern Convention (c)	GFCM Recommendtions(d)	EU Habitats Directive (e)	EU Regulation Trade wild fauna and flora species (f)
Isidella elongata	CR						
Desmophyllum dianthus	EN	II					B
Lophelia pertusa	EN	II	II				B
Corallium rubrum	EN		III	III	REC.CM-GFCM/36/2012/1 On further measures for the exploitation of red coral in the GFCM area	V	
Dendrophyllia cornigera	EN	II					B
Cladocora caespitosa	EN	II	II				B
Leiopathes glaberrima	EN	II	II	III			B
Madrepora oculata	EN	II	II				B
Paranemonia vouliagmeniensis	EN						
Crassophyllum thessalonicae	EN						
Dendrophyllia ramea	VU	II					B
Ellisella paraplexauroides	VU		II				
Funiculina quadrangularis	VU						
Pennatula rubra	VU						
Pennatula phosphorea	VU						
Pteroeides spinosum	VU						
Paramuricea clavata	VU						

(a) Ratified by all Mediterranean States. Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled.
(b) Ratified by all Mediterranean States (except Greece, Israel, Bosnia and Libya). Annex II lists species that are endangered or threatened and Annex II lists species whose exploitation is regulated.
(c) Ratified by all Mediterranean States of the study, except Algeria, Egypt, Israel, Lebanon. Appendix II – Strictly protected fauna species. Appendix III – Protected fauna species.
(d) Must be implemented in all Contracting Parties of the GFCM in the Mediterranean.
(e) Council Directive 92/43/EEC. Must be implemented in all European States of the Mediterranean. Annex I lists different marine European habitats, including one Habitat type (1170 Reefs) which might concern several species of anthozoans.
Annex V species whose taking from the wild can be restricted by European law.
(f) Must be implemented in all European States of the Mediterranean according to Regulation (EC) No 338/97, Annex B.

The IUCN Red List of Threatened Species ™

Table 4.4 IUCN status and relevant legal instruments/policies (from IUCN 2016

C) Historical overview of the management/conservation measures

In response to declines in catch numbers in the 1980s, the FAO's General Fisheries Commission for the Mediterranean (FAO GFCM) held a round of technical consultations to develop a new management framework. Some of the first new management measures included the establishment of quotas (FAO 1983), a minimum harvest size (first adopted in some countries in 1983) and a ban on the use of dredges (Bruckner 2014).

As Bruckner (2014) points out, advances have been made in the management of precious coral fisheries in the Mediterranean Sea. Yet, current harvest limits based on quotas or licensing are inadequate when not based upon precise information on the population dynamics of the coral and size of coral stocks. Also, some recent studies have also highlighted the vulnerability of these corals: recovery of exploited populations takes decades longer than previously believed. Poaching continues to be a significant problem despite many shallow areas now being protected from fishing. Furthermore, though the fishery has managed to continue with high yields thanks to new areas, the new areas are being exploited without adequate information on the population structure (Bruckner 2014). The depth at which the corals are found also impacts their vulnerability. Bruckner (2014) suggests that C. rubrum populations at 80–130m depth may be as – or even more-- vulnerable to overexploitation than shallow populations, and thus argues that "harvest at these depths (and deeper) should be cautiously managed until new population dynamics models are developed that incorporate realistic growth rates, and information on density, size structure and reproductive characteristics" (2014:6). The argument for this is that SCUBA divers can reach and harvest Red Corals down to 130m. And so, though they are new harvest areas, they will probably face the same fate as current shallow-water populations. Innovations with new technology (e.g. ROVs), as seen with motorized boats and scuba gear in the past, will enable harvesting at greater depths. Thus, Red Coral, target of an increasing technological intensification, may not be able to withstand future fishing pressure (Bruckner 2014).

4.4.2 Description of MERCES restoration project

The relevant restoration case here is the restoration of the Red Coral in the Mediterranean; we discuss three experimental cases located in Italy and Spain.

A) Restoration of Red Coral in Portofino MPA

This Italian MERCES case takes place in the Ligurian Sea in a shallow (25 m depth) and a deeper (+70 m depth) area inside the Portofino MPA[36], which is part of a Natura 2000 site and a SPAMI (Specially Protected Area of Mediterranean Interest). The MPA was designated in 1989, when a mass mortality event affected the Red Coral in the western Mediterranean, but is actively enforced since 2000 although some pressures are still present including artisanal fishing and diving.

The restoration case focuses on the transplantation of Red Coral from the shallow site, which hosts a rich coralligenous community, to the deeper site where a number of large red coral colonies remained unexploited by chance and have thus survived so far. This deeper population is known to be reproducing but there is no subsequent recruitment (no small or young colonies present). The problem is limited connectivity with the shallow site (e.g. the strong thermocline in the summer can limit the connectivity between gametes and sperms) while factors within the site may include suitability of site (e.g. on a cliff) and ground (e.g. sediment and rugosity). Two methods are being used to remedy the situation: use of transplanted corals (by transplantation of fragments) and use of recruited corals (grown on suitable recruitment plates attached to the roof of caves supporting dense Red Coral colonies, for larvae to settle and grow). Positive results have been already recorded on transplantation success with further monitoring work being carried out under the MERCES project to test and document differences in growth patterns and genetic diversity (between donor and restored populations).

[36] http://www.mmmpa.eu/POR-MPA.asp

The main stakeholders involved in this case study are scientists from the Università Politecnica delle Marche (UNIVPM), the Italian Ministry of the Environment and the Region of Liguria, that are responsible for granting permits to work with protected species (e.g. under HD, see also section 1.3.4.A) such as the Red Coral, the MPA authority for granting permits to work in the area and volunteers from local dive centers. Ministry authorities related to HD and MSFD implementation, are not involved, "but are mildly interested and expecting to hear about the success of the restoration projects" as one responder notes.

B) Restoration of Red Coral in Gallinara island

In addition to the above Italian case study, Red Coral from the shallow site in Portofino MPA is also used in the restoration of an extinct population of Red Coral in Gallinara island (100-150 km away from Portofino MPA, in Italian waters close to the border with France[37],. Although there is evidence that Red Coral existed in Gallinara before, currently 3-dimensonal structures such as gorgonians or other species living in the coralligenous habitat are absent, and restoration efforts are aimed at restoring the third dimension of the coralligenous, transplanting both Red Coral and other gorgonians.

The main stakeholders involved in this case study are scientists from the UVIVPM, and central and regional authorities (e.g. Ministry of the Environment and Ligurian Region departments dealing with HD and Natura 2000 issues) that are responsible for granting permits to work with Red Coral and volunteers from local dive centers.

The lead scientist involved in the translocation activities in the Ligurian Sea "hopes that this will be a 'success story' which then could be applied to Sardinia, where red coral is still harvested commercially" (coral quotas are available to divers/fishers for Red Coral management based on regional laws (Follesa et al. 2013, Bruckner 2016), "to restore the exploited populations there and improve the red coral population condition'. As the respondent put it 'Sardinia is still very active in commercial fishing for Red Coral in Italy, so my suggestion is to restore this population. In the past the red coral was everywhere but now we have just few scattered populations that are commercially exploited".

C) Restoration of Red Coral in the Natural Park of Montgrí

In a case in Spain, MERCES project scientists from the University of Barcelona and the Institute of Marine Science are restoring shallow Red Coral populations by transplanting Red Coral fragments intercepted/confiscated by local authorities from by illegal fishers/poachers along the Montgrí Coast (Catalonia, Spain). The project is carried out at the Medes Islands inside the Natural Park of Montgrí, Illes Medes i Baix Ter on the Costa Brava in Catalonia in a site where some sparse colonies of red coral still exist. The main stakeholders involved are MERCES project scientists, local government authorities, MPA authorities and volunteers from local dive centers. According to one of the respondents a difference with Italy is that "poachers in Spain (as opposed to Italy) also collect small colonies to sell for small amounts/profit; small fragments are made into red coral powder and combined with resin and using other techniques they make jewels out of that". This is in agreement with Tsounis et al. (2010) stating that "reconstituted coral and small coral

[37] http://www.parks.it/riserva.isola.gallinara/Eindex.php, https://en.wikipedia.org/wiki/Gallinara

fragments are more likely to be sold in the tourist and ethnic marketplaces". Nowadays, reconstituted along with authentic and vintage coral accessories are visible and available on online shops.

4.4.3 Dominant discourses and dealing with uncertainties

Respondents distinguish between three situations. First, in cases where the coral has almost disappeared, "Bringing Nature Back" is the main discourse acknowledging that high degree of intervention is needed to restore the populations and this is predominantly underpinned by eco-centric motivations. Secondly, cases where the coral, despite being endangered and protected, continues to be harvested unsustainably and illegally, "Putting Nature First" is the main discourse where management measures are implemented safeguarding the species' well-being (including temporary bans and various technical measures as part of a recovery plan).

There is however also room for the anthropocentric view of "Building with Nature". A difference between the two cases in Italy is seen in the motivations behind the diving communities in Portofino and Gallinara. In Portofino, divers are just happy to be part of the good effort of "Bringing Nature Back" and to demonstrate the community's technical ability, environmental awareness and social responsibility (scientist, personal communication). In Gallinara they are also happy to collaborate and to help bring and show Red Coral is coming back in the area. The motivation however in this case is mostly anthropocentric as the hope here is that rebuilding Red Coral populations in the area will support humans by bringing more unique diving opportunities to the island, and this will increase the value of the local seascape and the potential for exploitation of the Red Coral.

There are associated uncertainties to these discourses. For example, success stories depend on a number of biological, environmental, geomorphological and policy implementation related parameters and meaningful results cannot be guaranteed if local attempts are not well thought out and well spread/applied to multiple suitable areas. There are also uncertainties related to national efforts (e.g. on sustainable management and enforcement) feeding to the regional scale to improve the population condition in the region and reverse its endangered status. In general, respondents agree that recovery can be achieved by various 'passive' and 'active restoration' actions depending on the level of degradation and for some this can include bringing the red coral back to areas where it is currently absent.

In agreement with published work (e.g. Rossi et al. 2008, Bruckner 2016, Knittweis et al. 2016), for one respondent, "stopping illegal fishing and poaching, imposing fishing bans and establishing and maintaining well enforced Red Coral no-take zones in MPAs is of paramount importance for the existence and conservation of the species". These recommendations were made by a number of respondents. Overall, it is believed that increased legal protection and conservation measures are urgently needed in many Mediterranean countries to tackle fishing and bycatch impacts (the main threat to the corals) and the vulnerability of corals to climate change and marine warming events (Cerrano et al. 2000 and 2013, IUCN 2016, Garrabou et al. 2017, Cau et al. 2018). As one of the respondent noted "restoring Mediterranean Red Coral will probably also require a CITES listing affording protection through trade restrictions" as advocated by Tsounis et al. (2013), Bruckner (2016) and OCEANA[38]. Most of the respondents

[38] https://oceana.org/sites/default/files/CITES_English_Coral_Fact_Sheet.pdf

consider public awareness campaigns publicising the species' IUCN Red List Endangered status an essential part of mobilising civil society and helping towards "Bringing Nature Back".

The next section provides an overview of how various Red Coral experts interpret Target 2 of the EU Biodiversity Strategy (EU BDS 2020), which calls for restoration of at least 15% of degraded habitats by 2020 (EC 2011).

4.4.4 Operationalization of Target 2 for red coral: on baselines and territorial scope

While Member States agree with the 15% target, its implementation and operationalization are facing challenges linked to a number of critical issues. These include establishing a prioritization framework guiding decisions about which habitat or species to restore (e.g. the Red Coral or Pinna), and about restoring to what state or reference condition (in time) and where (in space).

The EU BDS 20202 does not provide a well-defined baseline scenario against which restoration development is to be measured, but it is generally accepted that progress of the restoration actions should be gauged against the state of the focal ecosystem or population at year 2010, or previous assessments around that time (Schoukens 2018; Lammerant et al. 2013). Moreover, operationalization of Target 2 has been proposed to be carried out at Member State level (Lammerant et al. 2013). In this final section we explore the interpretations of five Red Coral restoration experts we interviewed (from Italy, France, Greece and Spain), complemented with views expressed in published studies, of the notions of baseline and territorial scope of restoration.

A) The Baseline issue

Respondents involved in restoration projects and experiments (three countries, three MPAs), who are aware of the benefits and the high potential for various restoration methods being successful, are cautious. They well understand the long time scales to recovery (e.g. 80-100 years), the lack of knowledge or fragmented information based on a few localities, and the uncertainties surrounding the current and recent historic distribution of red coral (with new discoveries made from France and Malta the latter, extending its depth distribution to over 1000m, Garrabou et al. 2017, Knittweis et al. 2016).

A Greek respondent stresses "there is no 2010 (or any other whatsoever) baseline for the Red Coral in Greece, only some very fragmented, non-comparable and highly unreliable data of landings from licensed coral harvesting. There are however few specific areas in the Mediterranean for which such data exist (e.g. Sardinia, Cap de Creus)". Another respondent says, 'finding the baseline is not straightforward; Red Coral harvesting dates back hundreds of years which makes determining baseline targets for restoration and transplantation difficult'. A Greek respondent adds "the Red Coral distribution and status in Greece is practically unknown. There is no way to apply specific measures and actions before implementing a large-scale baseline project, which by the way would mean serious investment as its remaining populations mostly lie below 60m depth". An Italian respondent agrees by adding "lack of knowledge is the main uncertainty, we don't know how much Red Coral there was and at what depth- this would give unpredictability to the restoration action''.

On restoring to the 2010 baseline a French respondent notes “I think that in 2010 Red Coral populations were already in a bad shape all over the Mediterranean, especially in Greece’ but ‘we could take as a target the areas where the populations are in good condition, for example, in MPAs such as Scandola (Corsica, France), Portofino (Italy) or Banyuls sur mer (France), which are MPAs where protection has been working for more than 30 years and enforcement has been efficient for a large part of that period”. The respondent adds “with such extremely slow growth it would take at least 80 or 100 years to see the restoration of the Red Coral populations”. The recovery time of Red Coral populations appears to be very long indeed: 30 years after the last exploitation and 15 years after integral protection, the Portofino MPA shallow-water population seems to be on track to achieve the structure it had in the 1950s, when the heavy harvesting started (Bavestrello et al. 2009, 2014 in Cattaneo-Vietti et al. 2016). Montero-Serra et al. (2017), based on demographic projections, predict that three to four decades may be needed for fully functional Red Coral populations to develop.

A Spanish respondent argues that “we should aim to restore 50% of the degraded Red Coral since we lost so much to overfishing; but we need more ambitious management and control actions”. Finally, Garrabou et al. (2017) following their discovery of a deep coral population in France “call for the re-evaluation of the baseline for Red Coral and question the sustainability of the exploitation of a species that is still common but ecologically (functionally) extinct and in a trajectory of further decline”.

B) The territorial aspects

The territorial scope of restoration is also relevant and most respondents see value in using a combination of scales in the restoration approaches employing passive and/or active restoration.

A respondent says “considering the limited dispersal of this species (this is why a natural recovery of exploited populations is improbable) the restoration could be initiated using a local approach but in as many areas as possible”. A Greek respondent favors “a combination of levels: national to assess distribution and macro-status, local to address conservation issues, as the species is subject to different threats and pressures across the Greek seas”. Another respondent says “given the low connectivity of Red Coral populations, local actions are appropriate to maintain and restore local populations but I think that this species, given the overfishing suffered in the past, deserves a regional approach in order to avoid a situation where fishermen from one region move to other regions”.

This fear is not unreasonable and is in line with the ‘boom and bust’ cycles seen so far and a practice followed by the industry similar to strip mining, where one coral area was depleted before fishermen began exploring new areas’ (Tsounis et al. 2010, Jaziri et al. 2017, Buckner 2016, on rotation schemes used in the past by some countries). A respondent takes the territorial issue a step further by saying “what is needed is a total ban on Red Coral harvesting in all Mediterranean countries, as proposed by the Catalan government last year”.

Another respondent stresses other merits of a local approach “with Red Coral there is a need to act locally, to be sure that the local human population will not feel a top down management … as we have seen with FAO recommendations on stopping harvesting in the first 50 meters depth, the most successful stories come from local critical situations where the local administration took decisions e.g. extra measures in Catalonia, Tuscany and Sardinia”.

Sardinia for example, implements various additional measures including a 80 m depth limit, a 10 mm basal limit, the presence of observers when prospecting for Red Coral with ROVs and the limitation of licences (DECRETO N. 761, Cannas et al. 2014, Cattaneo-Vietti et al. 2016), measures, which according to Follesa et al. (2013) and Cattaneo-Vietti et al. (2016), reduce the harvest and aid the sustainable exploitation of the Red Coral. Similarly in Spain, the Catalan government in 2017, issued a 10-year moratorium on Red Coral collecting along much of the Costa Brava (NE Spain), in an urgent effort to safeguard the vulnerable species' recovery after hundreds of years of exploitation and in the hope that the Central government would expand the Catalan moratorium to the rest of Spain (Philips, 2018).

Philips (2018) reports that the Catalan's Director General for the Maritime Affairs and Fisheries was prompted to issue the ban based on a report by scientists stating that 90% of the Red Coral reefs along the Catalan coast at depths shallower than 50 meters are in 'poor condition' and that the regional government is the first government to put the new GFCM's 'move-on-rule' regulation into practice' opting for a science-based management of the coral fishery.

A note on 'passive' restoration

It is obvious from the above quotes that although the respondents were asked about operationalization of restoration, the majority of them are indeed strong supporters of local (e.g. well placed enforced MPAs, local closures) and large scale passive restoration approaches (large scale fishing and collecting bans). One respondent takes this a step further by making a strong case for a CITES listing which would impose trade restrictions and prevent further fishing and harvesting. The respondent observes that "transplantation can provide larvae sources to remote sites, but most Red Coral habitats have small Red Coral left, so that does not seem as high as a priority as enforcement of poaching and fishery laws. I have done some pilot projects involving Red Coral transplantation, and there might be a place [for restoration], but it is going to be ineffective without a CITES listing".

The CITES debate for the Red Coral is a long debate that started in 1986 when Spain first proposed its inclusion to Appendix II of CITES. Despite later proposals by USA and Sweden, including updated information (Bruckner 2016) based on FAO and GFCM concerns over data/data uncertainties not supporting the decline criteria, the listing was not adopted as of 2015 (Bruckner, 2016). In the meantime (2008) China listed four species of Coralliidae on Appendix-III of CITES (*P. japonicum*, *C. elatius*, *C. konojoi*, *C. secundum*) due to concerns of illegal harvest and trade. Continuous increases in coral demand, driven by affluence among the Chinese who value Red Coral accessories for their beautiful appearance and for show-off, decoration, collection and religious reasons (coral being one of the seven treasures or gems in Buddhism, red items signifying good fortune in the Chinese culture and coral being more rare than diamonds), and increased coral prices have, despite comprehensive local management plans, stimulated overexploitation and poaching of the resource in the Northwestern Pacific, even in territorially disputed areas (Chang 2015, Zhang 2016, Buckner 2016, https://wwd.com/accessories-news/jewelry/red-coral-jewelry-prices-china-demand-10274710/).

A scientist from the living coral foundation39 notes “the Pacific and Mediterranean fisheries are conducted differently, but now we know how misleading the data from the Pacific were, can we really take the Mediterranean coral landing data at face value when such a valuable commodity is at stake?’ She continues by saying “it might be that this ‘seemingly working’ sustainable management of the fisheries in the Mediterranean …gets in the way of the real protection of the species and the fear is that without significant changes to existing regulations the coral will not be able to sustain current fishing pressure for much longer”. Bruckner (2016) echoes this sentiment by saying “precious coral fisheries are at a crossroad” and “action must be taken now if these fisheries are to survive into the future... It is possible to sustainably harvest the precious coral resources [but] areas that are off limits to fishing must be established, and these must be of adequate size and be connected to fished populations so they can serve as a refugia and seed stock to replenish fished areas” (Buckner 2016:782).

[39] https://www.livingoceansfoundation.org/red-coral-whats-future/

5. Conclusions and Future Outlook of Restoration Policies

5.1. Introduction

Through our analysis of the EU policies, Regional Sea Conventions and the case studies, we identified several shortcomings and constraining conditions for implementation of marine ecosystem restoration, and more specifically, for the assessment of progress towards Target 2 of the European Biodiversity Strategy. We identified such constraining conditions at different levels studied: the policy-level, Regional Seas Convention-level and project-level. After laying out the constraining conditions in general terms, we draw conclusions at each level of analysis. Section 5.2 gives the conclusions of the *ex post* evaluation of specific actions under Target 2. Section 5.3 presents the conclusions related to our case studies. We finalize this chapter with a future outlook sketching how some of the constraints identified could be overcome in order to enable the EU realize its post 2020 restoration agenda.

5.1.1 General overview

The EU policy landscape shows multiple interpretations of restoration and a fragmented implementation. Firstly, there is unclearness about the understanding and implementation of Target 2 of the EU biodiversity Strategy to 2020 to restore "at least 15% of degraded ecosystems", and the interpretation of which baseline should be leading for restoration activities or how to assess restoration progress. Additionally, the EU directives (WFD, MSFD, BHD, CFP) present only implicit definitions of restoration. In the CFP, restoration is obliquely defined as "achieving levels above MSY for harvested species"; in the WFD and the MSFD, restoration is not defined, while the different operationalizations of Good Ecological Status (WFD) and Good Environmental Status (MSFD) by member states complicate (coordinated) restoration activities both in the Exclusive Economic Zones (EEZs) and on the level of regional seas. Also in the BHD an explicit definition of restoration is lacking: here, "favourable conservation status" reflects a restoration ambition.

Our analysis showed a comparable situation for the Regional Sea Conventions. The Conventions do not provide common and comprehensive definitions of restoration, but present related concepts, e.g. ecological quality (OSPAR), environmental quality (Bucharest) reintroduction of species (HELCOM), sustainable exploitation of non-renewable resources (Barcelona), which could be a starting point for restoration. Multiple uncertainties of the types 'not knowing enough' (data gaps) and 'knowing differently' (ambiguity in interpretation of concepts, of causal links, thresholds of ecosystem change) complicate a uniform operationalization of marine ecosystem restoration across European Seas.

At the project level, we found comparable conceptual shortcomings and operational constraints for marine ecosystem restoration. In the Dutch Wadden Sea ambiguity exists in determining the baseline and the validity of quantitative restoration targets. The case that examined the rigs-to-reefs debate showed that there are multiple and conflicting narratives about OSPAR's decision 98/3 (which requires the removal of structures), which may affect the operationalization and implementation of restoration activities related to RTR if this decommissioning option becomes a reality in the North Sea. In the *Pinna nobilis* and the Red Coral cases, decisions regarding restoration are faced with unknown baselines and cascades of uncertainties throughout the whole natural-technical-social system to be managed (Van den Hoek et al. 2014).

5.2. Towards common definitions and operationalization of marine ecosystem restoration in EU policies and regional seas?

Based on our analysis of Action 5 under Target 2 of the EU Biodiversity Strategy, we concluded that the goal of establishing a shared understanding among Member States of marine ecosystem types and joint approaches for mapping and assessment of ecosystem condition by the year 2014, was not met. Despite multiple habitat mapping initiatives from Member States and EU programs in previous decades, and recent efforts to reach common methodologies and definitions of marine ecosystem types as well as indicators of ecosystem condition by MAES (based on existing EU typologies and descriptors and trying to ensure coherence with, predominantly, the WFD and MSFD), much fragmentation still exists (Bekkby et al. 2017).

Similarly, our analysis of Action 6a shows that the goal to articulate common and comprehensive definitions of restoration in order to enable Member States to develop national prioritization strategies by 2014 to meet Target 2, was not realized. Notwithstanding a number of important outputs emerging from the working group set up by the European Commission to assist Member States with Target 2 implementation, namely the 4-level conceptual model of ecosystem restoration and related definitions (Lammerant et al. 2013), multiple conceptual and political hurdles complicate the path towards common definitions and operationalization of marine ecosystem restoration at EU level. Conceptually, our respondent affiliated to SER observed that "[one of the challenges] is to define descriptors and thresholds for each of the 4 ambition levels" (personal communication, SER). Moreover, debates about what the best restoration options are to meet EU targets, in terms of cost-effectiveness, have not been resolved (Kotiaho et al. 2015; Egoh et al. 2014). These debates include not only conceptual and operational challenges, but also involve political considerations. Although we have not investigated the political processes shaping decisions – or non-decisions for that matter-, it is clear that Member States have not set (marine) ecosystem restoration on their political agendas, or not high enough on their priority list yet. This is underscored by the fact that as of November 2018, only a handful Member States have made any progress towards developing their national prioritization frameworks for restoration (SER, personal communication).

What is more, while the MSFD has been hailed as the main instrument for implementation of marine restoration in European seas by key actors (Lammerant et al. 2013), one of our respondents, who is associated with the marine unit at DG Environment stressed the following:

> "My team deals with the MSFD where restoration is not a target by itself. It could be a measure to get good environmental status, but we rarely see it reported at national scale... As to select habitats to restore, again, we don't have such kind of discussions in our implementation groups. However, the assessments done under the MSFD (currently being updated) could be useful in the future, when more data will become available... Please, take into account that the scale of reporting is very broad (we use broad habitat

types) so probably only MSs will have detailed information to design restoration actions" (personal communication, DG ENV).

It seems obvious, then, that the crucial role that the MSFD can play in bringing marine restoration home to the Member States has to be clarified and set on the agenda of the implementation groups. The data collected for assessment and reporting obligations under the MSFD[40] provide valuable knowledge to guide restoration decisions. Substantial technical and coordination efforts have recently been undertaken, such as by DG ENV requests to ICES for advice, or by new technical task groups aiding member states to harmonize assessments (e.g. revised broad habitat types) and reporting under the MSFD. These new developments facilitate more coherence in outputs by member states and regions, while also strengthening links with HD, WFD and CFP (in areas of biodiversity conservation and reversing/halting degradation).

MSFD implementation, which requires cooperation at regional sea level, calls for a strengthened role of the RSCs as coordination units in their respective jurisdictions. Resolving the "paradox of coherence" (Cavallo et al. 2017) will require strong political will from member states to overcome national, short-term interests vis-à-vis a regional, long-term vision grounded on the realization that, RSCs and member states together, have been given the responsibility to act as marine environmental stewards of the regional seas under their wing, while being supported by the EU and the work of the MSFD's Common Implementation Strategy and the Marine Strategy Coordination Groups.

5.3. Project level

This section presents the conclusions for each of the projects analysed in chapter 4. The dominant discourses, which reveal how actors define ecosystem restoration in each case, are highlighted. Also, the most salient issues identified through the analysis of how restoration is being operationalized – or envisioned- are briefly discussed, including those related to European or international policy instruments relevant to the case studies. Finally, an outlook is provided for each case, recognizing that many questions remain open, multiple uncertainties persist, and that trade-offs are inevitable in any debate concerning the conservation and restoration of nature in an inherently uncertain, complex and constantly changing world.

5.3.1 Seagrass restoration in the Dutch Wadden Sea

The dominant discourse "Bringing Nature Back" clearly shows that the actors driving eelgrass restoration efforts in the Dutch Wadden Sea are predominantly concerned by eco-centric motivations and believe that human intervention in nature is indispensable to achieve the comeback of this species to the region.

Thus far, restoration efforts have failed to establish new persisting eelgrass fields in the Dutch Wadden Sea (Floor et al., 2018; Folmer et al., 2016). Despite doubts expressed by various actors engaged in eelgrass restoration regarding the feasibility of restoration in this area, they do

[40] All information is being collected into WISE marine (https://water.europa.eu/marine) and will be updated in a few months.

cooperate. Floor et al. (2018) put forward two factors to explain continuing cooperation among governmental actors, eNGO actors and scientists.

First, the advocacy of eNGOs has been successful, also in securing funding for restoration activities, by framing seagrass as 'the missing pillar' of the Wadden Sea ecosystem, coupled to the key role of seagrass as an ecosystem engineer, and most recently to seagrass as a possible source of a new restoration business. New plans have been devised to ensure the continuity of financing mechanisms, and additional socio-economic benefits, through an envisioned restoration industry based on Dutch expertise on eelgrass seed and plant cultivation techniques (Wadden Funds 2017).

Second, there are legal obligations under the WFD for eelgrass restoration. "Combined, these two factors kept seagrass on the agenda, even though there remained much scepticism among science-based experts regarding the potential of restoration" (Floor et al. 2018: 230). Furthermore, because the restoration projects have been regarded as relatively small, and given the focus on littoral *Z. marina*, as having no impact on economic activities, 'hot conflicts' have not occurred (ibid).

A nascent interest in restoration of sublittoral *Z. marina*, however, where interaction with shrimp fisheries could become problematic, may possibly add complexity to the governance landscape of eelgrass restoration in the region. If eelgrass restoration begins to show signs of success, the path towards payment for ecosystem services may be one worth exploring (Farley and Costanza 2010). Not only in relation to shrimp fishers, but also to other potential beneficiaries of ecosystem services associated with seagrass meadows (Waycott et al. 2009; Orth et al. 2006).

The "impossible" restoration targets under the WFD will most likely become a subject of debate at some point in time. The ambiguity surrounding the process of determining the baseline and setting such quantitative targets for eelgrass has not been problematized by actors in the Dutch Wadden Sea setting yet. What's more, there is ambiguity about *which* quantitative targets are valid (Korporaal et al. 2016; Foden 2007). Questions remain regarding how reporting of eelgrass restoration progress to the WFD will be given shape, and whether more realistic targets will be set, by whom, and based on which interpretation of what data.

5.3.2 The rigs-to- reefs debate

Various actors are currently considering options for the imminent decommissioning of a large number of offshore O&G installations in the North Sea. One option is the re-purposing O&G platforms into artificial reefs. Proponents and opponents of the conversion of obsolete installations into artificial reefs in the North Sea interpret the "rigs-to-reefs" meta-frame in different ways. The rhetorical arguments for and against RTR can be classified according to the conceptual framework built by Ounanian et al. (2018), that identifies marine ecosystem restoration discourses based on the (acceptable) level of human intervention in nature and the underlying motivations for restoration, which range from eco-centric to anthropocentric motivations.

The notion of costs and benefits play an important role in argumentation for or against RTR. Some actors with eco-centric motivations use "cost saving" arguments to highlight that rig removal expenditures would be 'dead money,' and this money could be better used in conservation projects, hence their preference for rig conversion to reefs. Anthropocentric motivations also permeate through the "cost saving" argument, highlighting RTR as a way to relieve society from high removal costs, given that a proportion of the decommissioning costs are tax deductible and ultimately born by the tax-payer. On the other hand, some eco-centric motivated actors see RTR as a breach of the polluter pays principle and a "conspiracy among oil companies to use rigs-to-reefs as a cover for evading the deep-water disposal rules" and associated removal costs (Jørgensen, 2012: 60). Opponents of RTR based on these grounds therefore advocate for rig removal, pointing out that "cost saving" would benefit the polluter.

Two contrasting framings were identified, based on eco-centric motivations but with a divergent rationale linked to how actors interpret RTR on the continuum from low to high human intervention in nature, which is a manifestation of the 'natural' versus 'unnatural' debate. Arguments, which posit "RTR as unnatural habitat" fit on the low (acceptable) intervention level side of the continuum and reject RTR as restoration. On the high intervention level side of the continuum, we find arguments which celebrate "rigs as habitats for (threatened) species" and "Rigs as de facto MPAs." Anthropocentric motivations are present in the arguments of those which accept a high level of intervention and portray "RTR as oasis in the desert," with fisheries enhancement as potential benefits.

Taking RTR as a serious decommissioning option impinges on OSPAR's decision 98/3, which governs the disposal of disused offshore installations and requires the removal of structures. The narratives identified in our analysis provide evidence that some actors that support RTR options are trying to re-frame the debate to get the issue back on OSPAR's agenda. These actor coalitions have not been successful thus far. However, frames that highlight the restorative function of RTR could gain traction in coming years if different policy streams come together to open a window of opportunity for policy change within OSPAR. Such streams include plans for an energy transition in the North Sea that involve deployment of large windmill parks – which requires policy development for turbine decommissioning (van Beuge 2016) – as well as the EU's international commitments to meet (marine) biodiversity targets (EC 2011). The compelling problem of biodiversity loss is recognized by The EU Biodiversity Strategy to 2020, which includes provisions for the establishment of 'blue infrastructure' at sea and a 'mitigation hierarchy' that prescribes actions based on an impact assessment of infrastructure project development (ibid). Such provisions - and framings of rigs-to-reefs as tools for marine conservation, restoration and mitigation - may cast the OSPAR 98/3 decision into new light.

5.3.3 Fan shell restoration in the Mediterranean

P. nobilis has suffered significant declines in previous decades, leading to its inclusion in the Habitats Directive and the Barcelona Convention. "Putting Nature First," by enacting and enforcing protective measures, e.g. through MPA establishment, and reducing stressors (for example poaching within the MPAs) is the dominant discourse under these now "normalized" conditions for this protected species. As Ounanian et al. (2018) point out, incomplete knowledge and unpredictability in species adaptations and survival could challenge these type of (passive) restoration initiatives due to the cumulative effects of stressors such as water pollution and climate change, which do not respect MPA boundaries.

The emergent discourse of "Bringing Nature Elsewhere" introduces its own set of uncertainties and governance challenges. According to the so-called mitigation hierarchy - a tool providing guidelines to limit negative effects of project development on biodiversity as far as feasible-, avoidance is the first option. Unavoidable impacts should then be addressed through minimization and rehabilitation/restoration measures, and as a last resort, biodiversity-offsetting measures (such as mitigation-driven translocation) should be applied for the residual negative impacts.[41] Arguments provided against a widespread use of mitigation-driven translocation are based on deep uncertainties that include the high risk associated with the enterprise of relocating nature, including risks of spreading diseases, exceeding the carrying capacity at the recipient location and unpredictability of the long-term persistence of the translocated population, as well as ambiguity of definitions and measures of translocation success (Menkhorst et al. 2016; Germano et al. 2015). For opponents, this type of biodiversity offset is a simplistic response to habitat destruction that shies away from placing strict restrictions on development, and sends the wrong signal as a sort of "license to trash nature."[42]

Moreover, mitigation-driven translocation practice is criticized for the lack of detailed documentation of the intervention and subsequent monitoring to enable evaluation of its effectiveness (Germano et al. 2015). In the case examined in this report, participating scientists applied a method described in the scientific literature (Bottari et al. 2017; Katsanevakis 2016) and despite the lack of a legal obligation to conduct monitoring under the EIA, monitoring is being conducted by their institution, addressing some of the criticisms cited above.

"Bringing Nature Back" is the response to the recent mass mortality of numerous Pinna populations throughout the Mediterranean due to a large-scale and rapidly spreading disease, which is driving the species close to extinction. Calls for action by eNGOs and scientists in the region include a package of various measures, including restoration. Following the MMEs, restoring this species to an unknown baseline and confronting multiple uncertainties related to the new parasite causing the MMEs will be a serious long-term challenge. Nonetheless, the perception of *P. nobilis* as a unique regional endemic asset and an endangered protected species will likely persist in evoking eco-centric feelings and motivations supporting its restoration.

5.3.4 Red Coral restoration in the Mediterranean

Red coral has been exploited for centuries in the Mediterranean (Bruckner 2016, Tsounis et al. 2013). Declines in yields and increases in calls for stricter protection and sustainable exploitation of the species have dominated the debates and policy landscape since the 1980s. Despite proposals to include Red Coral in CITES being unsuccessful, measures have been taken, for example minimum depth for harvesting, minimum basal diameter of harvested colonies, gear restrictions (i.e. hammer used by scuba divers is the only permitted gear for harvesting) and limiting further exploitation of deep populations to scuba divable depths and not by ROVs (in contrast to the industry's hopes) (Tsounis et al. 2013, GFCM 2011, GFCM 2012, EU 2015, GFCM 2017 for national laws and differences/comparison in measures implementation between Mediterranean countries). Some of these provisions have been also transcribed into national or

[41] http://ec.europa.eu/environment/nature/biodiversity/nnl/pdf/NNLGlossary.pdf
[42] https://www.theguardian.com/environment/2013/nov/12/biodiversity-offsetting-license-trash-natur

sub-regional laws including stricter measures such as deeper (80 vs 50 m) depth limits or local fishing bans in Sardinia[43] and in Catalonia[44] respectively.

"Putting Nature First" is the discourse behind enacting and enforcing protection with MPAs, by implementing no-take and off-limit areas to fishing, by harvest reductions and illegal poaching. This is the dominant discourse for a protected species which has suffered significant declines to warrant its inclusion in the 'threatened' list of IUCN and protected list of Annex V of HD and Bern and Barcelona Conventions.

"Bringing Nature Back" is the step that requires that additional human intervention be initiated (e.g. various active restoration methods). This would supplement the conservation efforts anchored in the "Putting Nature First" motivations of saving the precious and emblematic coral, a species vulnerable to extirpation and functionally extinct in many areas in the region. As one of the respondents stated "we have done so much damage so far, now we need to have multiple-year closures and to restore 50% of the degraded habitats".

"Helping Nature Support Humans" is also a major discourse. Red Coral is a commercial species, for which not only is there an increasing demand (locally but mostly internationally), but local communities depend on the resource across the region. This is seen in the statements supporting science-based sustainable management of the resource. Either way the debate is heated, the knowledge gaps point to large uncertainties relevant to baselines, existing data indicate very long time scales to recovery. Nevertheless, there is a sense of urgency to act now - even without having a clear baseline to measure progress towards 15%- to save the coral by any or all measures, for its intrinsic and instrumental values to humans.

5.4. Future outlook of restoration policies

In this final section we present our *ex ante* inspired evaluation - a type of evaluation which is forward looking- of restoration policies. More specifically, this section sketches an outlook of restoration policies based on the analysis presented in the previous chapters. The analysis of the EU policies, Regional Sea Conventions and the case studies identified several shortcomings and constraining conditions for restoration policies. Given these constraints for restoration, what are the possibilities to strengthen restoration in policies and restoration practices, in order to formulate and enable the realization of EU restoration goals post 2020? The following suggestions are based on our research, including empirical findings and an extensive literature review.

5.4.1 Implementation and enforcement of existing EU Directives and policies with a restoration component

According to the mid-term review of the EU Biodiversity Strategy to 2020 (COM(2015) 478 final) "the 2020 biodiversity targets can only be reached if implementation and enforcement efforts become considerably bolder and more ambitious". According to this review, this "will

[43] https://gfcmsitestorage.blob.core.windows.net/documents/SAC/SCMEE/2014/MgmtPlanRedCoral/PPT/Cannas_etal.pdf

[44] http://agricultura.gencat.cat/ca/ambits/pesca/dar_especies_calador_mediterrani/dar_altres_productes_mar/corall-vermell/

require strong partnerships and the full engagement and efforts from key actors at all levels, in particular with respect to completing the Nature 2000 network for the marine environment (…)".

As oulined in this report, specific actions have been agreed under Target 2 (e.g. Action 5, Action 6a) in addition to the fulfilment of the explicit and implicit provisions on restoration found in the Directives (WFD, MSFD, HBD). Nevertheless, the EU may fall short on reaching its policy targets on time (Telesetsky et al., 2017). Overall, the degradation of ecosystem services and biodiversity loss in the EU have continued since the 2010 baseline (EC and EEA, 20015; EEA, 2010). Supportive of Target 2 of the EU Biodiversity Strategy on restoration of degraded marine ecosystems are Target 1 –associated to improving the conservation of species and habitats protected under (marine) Natura 2000 network, and Target 4 –fishing having no significant adverse impacts on ecosystems (EC, 2016). The mid-term review shows that, overall, the degradation of ecosystem services and biodiversity loss in the EU have continued since the 2010 baseline (EC and EEA, 20015). Progress, but at insufficient rate has been reported for Targets 1 and 4:

> Target 1: A slight increase has been observed since the 2010 baseline on the number of species and habitats in secure/favorable or improved conservation status. However, there is no much progress in terms of habitats and species that had been characterized as in an unfavorable status. Among other challenges is the completion of the Natura 2000 marine network.
>
> Target 4: There is progress in terms of setting the policy framework for sustainable fisheries under the CFP and of good environmental status under the MSFD. Nevertheless, policy implementation remains a challenge (e.g. it us uneven across the EU). As a result of multiple pressures - not only from fisheries- marine ecosystems continue to decline across Europe's seas.

Progress has been reported in terms of designation of marine Natura 2000 sites and marine protected areas (MPAs). By the end of 2017 more than 3000 marine Natura 2000 sites had been designated, covering around 7% of the total EU marine area (EC, 2018). By the end of 2018, 10% of all EU waters had been set as MPAs (EU MARE, 2018). Local successes demonstrate that action at ground levels delivers positive outcomes (EC and EEA, 2015). Nevertheless, these positive examples need to be scaled up to have a measurable impact on the overall negative trends (EC and EEA, 2015). More concrete and clear restoration obligations and guidance might be needed to persuade member states to undertake restoration efforts. On the contrary, the EU may fall short on reaching its policy targets on time (Telesetsky et al., 2017).

5.4.2 Adoption of common and comprehensive definitions of restoration across EU Directives and policies

As demonstrated in this report, adopting common and comprehensive definitions of restoration requires that a shared understanding of the process of restoration is integrated into all pertinent EU directives, policies and RSCs, and is followed up by member states during implementation. If a numerical target is expressed in percentage, such as Target 2's "15%", common methodologies for measuring progress towards this target are imperative. The question is whether this is possible, realistic and practical (Kotiaho 2015). According to Deborah Stone (2012: 197), in politics, "numbers are measures of human activities, made by human beings, and intended to influence human behaviour". Setting a target of 15% does not speak for itself, but will be interpreted and manipulated by different actors to influence or manipulate what should be evaluated.

One of our respondents associated with the marine unit in DG Environment stated that, indeed, trying to measure restoration progress based on such a numerical target –which necessitates the establishment of a baseline or reference condition, decisions on the thresholds of ecosystem change and interpretation of what the percentage refers to - was too complicated and the procedure would be "radically simplified" in the future. Our respondent acknowledged that there were no clear answers yet regarding what this simplification entails, but suggested that perhaps targets could be expressed in spatial terms only (e.g. in hectares of seagrass restored by year x), without setting baselines or thresholds. Our respondent invited the MERCES consortium to provide input on how to set restoration targets and measure progress pragmatically and meaningfully, for the deliberations leading up to setting the EU Biodiversity Strategy's post 2020 restoration agenda.

5.4.3 A role for the Maritime Spatial Planning Directive?

In 2014, the EU published the Maritime Spatial Planning Directive (2014/89/EU). According to the directive, Maritime Spatial Planning means a process by which the relevant Member States' authorities analyse and organise human activities in marine areas to achieve ecological, economic and social objectives (art. 3(2). The ultimate aim of maritime spatial planning is "to draw up plans to identify the utilisation of maritime space for different areas" (EU, COM(2013) 133 final). The Directive does not mention restoration explicitly, but refers to an ecosystem-based approach to achieve Good Environmental Status according to the MSFD.

Member States are responsible to promote sustainable development and to identify the utilisation of maritime space for different sea uses as well as to manage spatial uses and conflicts in marine areas. In other words, Member States have to develop maritime spatial plans for their own EEZs. The consequences will be that Member States individually will decide whether restoration is a topic to be addressed in the development of national plans and the implementation of these plans. This limited role of the EU makes it difficult to influence the realization and implementation of restoration objectives in the individual maritime spatial plans of the Member States. The same holds for integrated planning at the level of the regional seas. According to article 11 of the Directive, Member States bordering a coastal zone or maritime area of another Member State "shall cooperate with the aim of ensuring that maritime spatial plans are coherent and coordinated across the marine region concerned. Such cooperation shall take into account, in particular, issues of a transnational nature" (art. 11(1)). This cooperation shall be pursued through: "(a) existing regional institutional cooperation structures such as Regional Sea Conventions; and/or (b) networks or structures of Member States' competent authorities and/or (c) any other method that meets the requirements of paragraph 1, for example in the context of sea-basin strategies" (Art. 11(2)). Once more we see the key role that RSCs, and implemetation institutions, occupy in coordinating Member State plans and strategies, including for marine ecosystem restoration.

As Smith et al. (2017) point out, the MSP is an instrument that enables setting boudaries for spatially managed areas which requires knowledge of both human pressures and potentially restorable ecosystems.

> "[The MSP] can also facilitate restoration initiatives by providing an appropriate zoning mechanism that will support continued economic activity while ensuring Good Environmental Status and thus sustainable 'Blue Growth'. Indeed, restoration areas may well be one of the tools in the 'toolkit' of managers tasked with maritime spatial planning. The identification of activities and pressure hot spots is crucial for planning future restoration actions. Mitigation of pressures and removal of their impacts at sites where restoration activities take place would also enable the quicker recovery of the given habitat" (Smith et al. 2017:4).

5.4.4 Development of an EU (Marine) Restoration Directive

Recently a wide ranging analysis has been undertaken of the EU policy instruments with a novel solution proposed to strengthen and allow for better implementation for the restoration agenda. Schoukens (2017) has assessed and analysed the current EU policies (Directives and Frameworks). EU environmental law contains some potentially far-reaching instruments in terms of restoration duties, but the legal framework aimed at implementing, for example, the EU Biodiversity Strategy objective of 15% restoration of degraded ecosystems is currently lacking. As also shown in this report, there are issues at basic levels, including the lack of specific definitions for key concepts such as degradation and ecological restoration. Different directives use "restoration" in many different ways, with very little commonality in terms of definition, relevant baselines, targets and the scope of restorative duties. In some directives a distinct restoration imperative is present (WFD and MSFD), but their detail and scope are too narrow to effectively compel Member States to implement comprehensive restoration strategies.

Schoukens noted that not a single EU environmental directive puts forward a specific prioritization framework to be observed when implementing conservation actions. Within the Habitat Directive, non-regression clauses, although focussing on avoiding loss, can function as an enforceable driver for more progressive restoration strategies, but this mainly applies within the Natura 2000 network, and a restoration duty regarding 'ordinary' biodiversity (non-Natura 2000) is lacking. The reliance on prevention and precautionary principle should always apply whilst restoration should remain a last resort option. Whilst ecological restoration has become a major environmental policy objective, to what extent restoration can be effectively enforced nationally has received little attention. Schoukens has suggested that environmental NGOs may provide a key impetus in this direction through environmental litigation. Novel tools are becoming popular, such as 'temporary nature', no-net-loss and biodiversity offsetting (currently mostly for terrestrial ecosystems), but they might yield additional benefits only if implemented within a restrictive framework.

Whist recognizing the needs for better enforcement for the existing measures to reach their targets, Schoukens makes a strong case for the drafting of a more comprehensive EU Directive on Ecosystem Restoration. This Directive would complement the existing EU nature and environmental directives, with precise definitions and concepts, filling in existing gaps and going on to ensure the EU Member States present robust restoration targets and strategies for their entire territory (not just 'target fixation' on Natura 2000 sites, which represent only 20% of EU territory) within a fixed timeframe. In other words, an EU Restoration Directive would make it possible to develop an implementation strategy for all Member States. It would end the fragmentation and implicit restoration objectives and targets in EU policies. However, the relation with existing policies (MSFD; WFD; BHD;CFP; MSP for marine ecosystems, and many more if terrestrial ecosystems are included in such Restoration Directive) would require very clear stipulations, and new arrangements would need to be developed about enforcement, monitoring, reporting, and other duties currently organized by each Directive, requiring major coordination capacity and non-trivial transaction costs. Yet, the idea of a EU Directive on Ecosystem Restoration, perhaps even straddling the land-sea continuum, should be taken seriously and comprehensive *ex ante* assessments should be carried out in order to test its feasibility and compare the costs and benefits that such a new Directive would signify for safeguarding biodiversity and ecosystem services in the EU.

5.5. Aichi biodiversity Targets: assessment and acceleration of progress?

At the 14th meeting of the Conference of the Parties (COP) of the Convention on Biological Diversity (CBD) in Sharm El-Sheikh, Egypt (17 - 29 November 2018), Working group 1 produced a document entitled "Updated assessment of progress towards selected Aichi Biodiversity targets and options to accelerate progress" (CBD 2018). The document opens as follows:

> "Deeply concerned that, despite many positive actions by Parties and others, most of the Aichi Biodiversity Targets are not on track to be achieved by 2020, which, in the absence of further significant progress, will jeopardize the achievement of the mission and vision of the Strategic Plan for Biodiversity 2011-2020, and the Sustainable Development Goals, and ultimately the planet's life support systems".

Regarding Targets 14 and 15, which focus on the restoration of ecosystem services and biodiversity, state and non-state actors are urged to "step up the implementation of the short-term action plan on ecosystem restoration, drawing on the findings of the Thematic Assessment of Land Degradation and Restoration of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services and noting the Pan-African Action Agenda on Ecosystem Restoration for Increased Resilience, endorsed at the African Ministerial Summit on Biodiversity 2018."

As we can see, the focus of the Aichi Targets on restoration lies on terrestrial ecosystems - no explicit mention of marine ecosystem restoration is made under Targets 14 and 15. Marine ecosystems are addressed through other Targets, namely Target 6 on fisheries sustainability, Target 10 on coral reef decline, Targets 11-12 on protected areas, Target 8 on nutrient pollution and Target 9 on invasive species.

A similar observation can be made at EU level, when it comes to the national restoration prioritization frameworks for instance. RPFs focus on terrestrial ecosystems because, arguably, marine restoration is already addressed by other EU Directives (MSFD, WFD, BHD, CFP). We argue here that marine ecosystem restoration should be brought to the fore and made more explicit, both at CBD and EU level deliberations.

The Working Group closes the documents with a list of “Possible options to accelerate progress towards the achievement of the Aichi Biodiversity Targets”, which includes approximately 20 items, ranging from improvement of information and tools, availability of technical and financial resources, awareness rasing and development of suitable governance arrangements. The first and last ítems listed are interesting to note here:

> “Making greater use of the social sciences, taking into account different visions and knowledge systems, promoting research on cultural issues and on issues associated with people’s quality of life, non-material values of biodiversity, the needs of indigenous peoples and local communities, women, youth, and the poor and vulnerable”.
> And “Increasing efforts to achieve a transformational change in society’s relationship with biodiversity.”

These items highlight that achieving any kind of sustainability goal, or a transition towards a desired future, requires deep understanding of the human and social dimensions that would enable and constrain such transformation. In Europe, current geopolitics – notably Brexit and the rise of populist governments – complicate negotiations on “soft” issues such as biodiversity conservation and ecosystem services. Yet, increased attention to climate change and climate action throughout the globe has raised awareness among large segments of the population of the fragility of our planet’s future. Such momentum should be seized as an opportunity to merge loss of biodiversity and ecosystem services into this wave of environmental concern.

As pointed out by the Working Group, CBD Parties should continue working on their national biodiversity strategies and action plans to adopt these “as whole-of-government policy instruments”, include resource mobilization strategies, communication and public awareness strategies, or capacity development strategies and endeavor for the mainstreaming of biodiversity into cross-sectoral plans and policies and/or sustainable development plans. With respect to marine ecosystem restoration in European seas, the Maritime Spatial Planning Directive and the Regional Sea Conventions – and potentially an EU Restoration Directive- would occupy key coordinating roles in the implementation of such comprehensive strategies.

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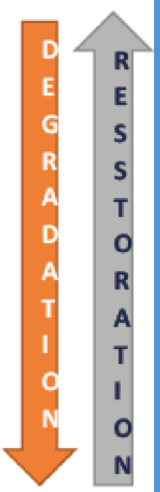
7. ANNEXES

Annex 1 **– List of interviews conducted**

Deliverable section	**Interviewee** (stakeholder type; affiliation)	**Interview mode** (skype; face-to-face; telephone; email)
Part A	Biodiversity policy officer DG ENV 1; Biodiversity policy officer DG ENV 2; Biodiversity policy officer DG ENV 3; Biodiversity policy officer DG JRC; SER member 1; SER member 2	e-mail; e-mail; e-mail & telephone; e-mail; e-mail; e-mail and Skype
Part B: "Seagrass restoration in the Dutch Wadden Sea"	Social scientist; Dutch university; Ecologist; Dutch university; Ecologist; Dutch university; Ecologist; Dutch university; Restoration project leader; Dutch NGO; Civil servant; Rijkswaterstaat; Project coordinator; Dutch NGO; Ecologist; former civil servant at Rijkswaterstaat; Ecologist; Dutch university; Former civil servant at Rijkswaterstaat	face-to-face Skype face-to-face Skype Skype; face-to-face Skype Skype e-mail Skype e-mail & telephone
Colonization experiment of an oil & gas installation in the North Sea	Professor in marine ecology; Dutch university; Restoration expert; MERCES; BP rep NGO rep MERCES scientist MERCES scientist	Face-to-face Comments made at conference Skype Skype Skype Skype
Red coral	Scientist; Spanish University Scientist; Italian University Scientist; French University Scientist; USA/Spanish University Scientist; Spanish University	e-mail Skype and e-mail e-mail e-mail e-mail
Pinna nobilis	Scientist; Croatian University Scientist; Croatian University Former MPA manager, Croatia Scientist, Greek University Scientist, Greek University	Skype and e-mail Skype and e-mail Skype and e-mail e-mail e-mail

Annex 2 – **"Four-level model for ecosystem restoration" (Lammerant et al 2013)**



ILLUSTRATIVE EXAMPLE FOR A MEMBER STATE WITH HIGH COVERAGE OF NATURAL AREAS					
		Types of areas	**Base-line**	**By 2020 (and net gain)**	**By 2050**
LEVEL 1	Satisfactory abiotic conditions. Key species, properties and processes of ecosystem patches and their functions, at site level and at landscape level, are in good to excellent condition.	a.o. 'wilderness' areas and N2000 habitats and species in FCS, rivers and lakes in good ecological status (GES), marine ecosystems in GES, ...	30%	32% (+ 2% from L2)	40% (+ 8% from L2)
LEVEL 2	Satisfactory abiotic conditions, some disrupted ecological processes and functions, either at site level or at landscape level or at both levels. Reduced or declining diversity and key species, compared to L1 but retains stable populations of some native species.	a.o. N2000 habitats and species not in FCS, ...	15%	28% (+ 15% from L3; - 2% to L1)	35% (+15% from L3; - 8% to L1)
LEVEL 3	Highly modified abiotic conditions, many disrupted ecological processes and functions, either at site level or at landscape level or at both levels. Dominated by artificial habitats but retains some native species and stable populations.	a.o. non-protected rural areas, not including intensive agriculture	30%	16% (+ 1% from L4; - 15% to L2)	10% (+ 9% from L4; - 15% to L3)
LEVEL 4	Highly modified abiotic conditions, severely reduced ecological processes and functions, both at site level and at landscape level. Dominated by artificial habitats with few and/or declining populations of native species; traces of original ecosystem hardly visible.	'heavily modified ecosystems' (e.g. Intensive agriculture, build urban areas, roads, airports, brownfield areas, heavily modified water bodies); heavily degraded 'natural' and 'semi-natural' ecosystems	25%	24%	15%
TOTAL SURFACE			100%		
TOTAL 'RESTORABLE' SURFACE			70%		
TOTAL 'RESTORED' SURFACE (cumulative starting from baseline, and calculated on the basis of 'restorable surface')				25.7%	71.4%