Mainstreaming Marine Biodiversity into the SDGs: The Role of Other Effective Area-Based Conservation Measures (SDG 14.5)

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Mainstreaming marine biodiversity into the SDGs: The role of other effective area-based conservation measures (SDG 14.5)

Daniela Diz[a,*], David Johnson[b], Michael Riddell[c], Sian Rees[d], Jessica Battle[e], Kristina Gjerde[f], Sebastian Hennige[g], J. Murray Roberts[g]

[a] University of Strathclyde, United Kingdom
[b] Global Ocean Biodiversity Initiative; Seascape Consultants Ltd., United Kingdom
[c] Bioclimate, Research and Development, United Kingdom
[d] Plymouth University, United Kingdom
[e] WWF International, Switzerland
[f] International Union for the Conservation of Nature, Switzerland
[g] University of Edinburgh, United Kingdom

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ABSTRACT

This article explores the concept of "other effective area-based conservation measures" (OECMs) in the context of the UN Convention on Biological Diversity (CBD) Aichi Biodiversity Target 11 on marine protected areas and OECMs and its linkages to the Sustainable Development Goals (SDGs). It argues that mainstreaming biodiversity through CBD Aichi Biodiversity Targets' implementation into the SDGs can contribute to a more systemic and comprehensive implementation of SDG 14.5 on conservation of at least 10% of marine and coastal areas. It argues that OECMs can complement MPAs and contribute to ecologically representative and effectively managed marine protected areas systems integrated into broader governance systems such as marine spatial planning. Selected global and local sectoral conservation measures are therefore highlighted in this analysis as potential forms of OECMs. At the local level, a case study of ecologically or biologically significant marine areas managed as locally managed marine areas (LMMAs) in Mozambique is discussed. This case study explores how multiple-use LMMAs, which respond to short-term fisher's needs and targeted biodiversity conservation, could contribute to the achievement of specific SDGs on food security, poverty elimination and resilient ecosystems if properly supported by long-term investments, strong institutions and integrated oceans management.

1. Introduction

The adoption of a stand-alone Sustainable Development Goal (SDG) 14 on oceans and seas (to "conserve and sustainably use the oceans, seas and marine resources for sustainable development") represents a unique opportunity to enhance marine governance and management globally. However, to successfully achieve the ambition enshrined in SDG 14, requires that each one of its targets are properly implemented and integrated into other related SDGs and that relevant instruments, such as the Convention on Biological Diversity's (CBD) Aichi Biodiversity Targets are also integrated into the implementation of the SDGs. To this effect, the thirteenth meeting of the CBD Conference of the Parties (COP 13) in 2016 urged parties to mainstream biodiversity and the Aichi Biodiversity Targets when implementing the SDGs.[1]

To mainstream biodiversity, the implementation of SDG 14.5 (on conserving at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information by 2020) will also require integration with Aichi Biodiversity Target 11.[2] Such integration would add value to the SDGs since the comprehensive approach adopted under the CBD Aichi Target 11 for biodiversity protection is not fully reflected in SDG 14.5 (see Rees et al. [80]). SDG 14.5 provides no detail as to how this target may be achieved beyond the 10% protected areas indicator (see Rees et al. [80]).

* Corresponding author.
E-mail address: dizdani@gmail.com (D. Diz).

[1] See CBD (2016) Decision XIII/3, paras. 9, 10, 11 and 14.

[2] "By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes"(CBD (2010) Decision X/2, target 11).

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The IUCN definition and categories of protected areas have been recognised by the CBD[3] as the basis for defining what an MPA is and the type of management objectives and roles MPAs may entail (CBD 2004). Extensive literature exists on the role of MPAs for biodiversity conservation [18], with recent work highlighting the need to take the implications of climate change into account when designing MPA networks [23]. Safeguarding ecological processes that underpin provisioning services often requires conservation measures that reduce multiple anthropogenic impacts, such as ecologically representative MPA networks (see Rees et al. [80]). These need to be supported by complementary conservation measures, as part of an integrated coastal and oceans management framework to enable the operationalization of the ecosystem approach[4] [14].

In this regard, the potential for OECMs, aside from statutory MPAs, to contribute to ecologically representative and well connected MPA networks is increasingly receiving attention in the literature. Areas that may be included as an OECM include private, local, community managed or non-statutory protected areas; areas where protection levels are increased for biodiversity conservation or resource management, such as Locally Managed Marine Areas (LMMAs); and areas of 'incidental' or 'de facto' conservation benefits, such as military areas and renewable energy sites [59].

As yet, no definition of OECMs has been acknowledged by CBD Parties, and the term is still unclear, especially when associated with areas important for ecosystem services. Much debate continues to interpret this undefined term amidst current work being undertaken by IUCN in this regard ([40]; see also [43]). In particular, opposing views pertaining to the scope and objective of a particular OECM continue to dominate the debate without definitive conclusions to date.

This article argues that mainstreaming biodiversity through the integration of Aichi Target 11 qualifiers[5] into SDG 14.5 can strengthen its implementation in a systemic manner (see also Rees et al. [80]). More specifically, this paper looks into the role that OECMs can play in complementing MPAs, and the need for proper integration of these area-based management tools within broader governance mechanisms. In doing so, this article explores how the mainstreaming of biodiversity through the integration of Aichi Target 11 qualifiers[6] into SDG 14.5 can strengthen its implementation in a systemic manner by: i) contextualising OECMs in relation to Aichi Target 11's purpose to conserve areas of particular importance for biodiversity and ecosystem services; (ii) discussing conservation objectives; (iii) considering ecological timeframes for effectiveness; and iv) identifying the potential role of global to local sectoral area-based conservation measures such as, Particularly Sensitive Sea Areas (PSSAs), Areas of Particular Environmental Interest (APEIs), Vulnerable Marine Ecosystems (VME) closures, as well as LMMAs as OECMs in complementing MPA networks and contributing to the improvement or maintenance of ecosystem services, functions (SDG 14.2 and SDG 14. C) and livelihoods (SDGs 1 and 2).

In addressing these synergies for biodiversity mainstreaming, this article does not intend to propose an OECM definition or criteria, but rather, to explore whether and how certain area-based management tools related to navigation, mining and fishing such as PSSAs, APEIs, VMEs and LMMAs can complement and contribute to ecologically representative MPA networks[7] as potential OECMs. In addition, the case study on LMMAs describes how these have been designed under a specific project in Mozambique to reduce social injustices and secure essential ecosystem services for local communities while protecting the intrinsic values of marine biodiversity. This article concludes with some reflections and lessons learnt for the meaningful implementation of these area-based conservation measures towards a healthy, resilient and productive marine environment from the global to the local level - and particularly notes the utility of OECMs for the most vulnerable communities who are dependent on these attributes and ecosystem services for their livelihoods and food security, while highlighting the need for complementary social safetynet measures envisioned under other SDGs.

2. The complexities of OECM conceptualisation

In situ conservation of biodiversity and protection of marine habitats constitute international obligations under article 8 of the CBD and article 194 (5) of the UN Convention of the Law of the Sea (UNCLOS).

Further to these legal obligations, several political commitments with normative impact have been made in the three Earth Summits, UN General Assembly resolutions and CBD Decisions on marine protection through area-based conservation tools, including MPAs and MPA networks [14].

Among these commitments, CBD Aichi Biodiversity Target 11 states that:

> "By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes." (CBD Decision X/2, target 11)

While the IUCN definition of MPAs has been recognised by the CBD, and the different IUCN MPA categories are widely accepted [16], much debate continues to take place on the meaning of OECMs. Concerns that "a loose interpretation [of the term] could result in inclusion of areas under so many management approaches that the target becomes meaningless" ([46], pp. 6) still dominate the debate.

In this connection, the CBD COP 13 invited parties to "endeavour to undertake more systematic assessments of management effectiveness and biodiversity outcomes of protected areas, and where possible, [OECMs] to improve the management effectiveness (…)"[8] (CBD COP 13 2016). In the same decision,[9] the CBD Secretariat was also requested to organise technical expert workshops on the definition, management approaches and identification of OECMs and their role in achieving Aichi Target 11 (CBD 2016). With these questions in mind, this section explores the debate regarding OECM's definition and purpose (subsection 2.1) and conservation objectives (Subsection 2.2), while noting the importance of ecological timeframes (Subsection 2.3).

Before engaging in this discussion, however, it is important to note that OECMs should not be perceived as a replacement for target 11 qualifiers "ecologically representative", "well connected", and "effectively and equitably managed" MPA networks that are "integrated into broader seascapes". Rather, OECMs should be scientifically robust and complement or contribute to the MPA networks. With respect to the numerical target, the achievement of the 10% coverage does not suffice if these other qualifiers are not present (see [16]; Rees et al. [80]; see also [58]). Equally important is the notion that these measures (MPAs and OECMs) should be "integrated into a broader seascape"context by applying the ecosystem approach.[10] Given the recognition by the CBD

[3] CBD (2004) Decision VII/5, para 10.

[4] This interpretation is in line with CBD (2004) Decision VII/11, para 8 and Annex I, para 4; Decision VII/5, Annex I, Programme Element 1.

[5] 'Namely, 'marine areas important for biodiversity and ecosystem services', 'ecological representativity' and 'connectivity', 'equitable management' and 'integration into wider seascapes'.

[6] 'marine areas important for biodiversity and ecosystem services', 'ecological representativity' and 'connectivity', 'equitable management' and 'integration into wider seascapes'.

[7] While also potentially contributing to other Aichi Targets such as Target 10 on minimizing multiple anthropogenic pressures on ecosystems that are vulnerable to climate change and ocean acidification (CBD Decision X/2, Target 10).

[8] CBD (2016) Decision XIII/2, Para. 5 (b).

[9] See CBD (2016) Decision XIII/2, para 10 (b)).

[10] Integration through the application of the ecosystem approach is included in the

parties that "marine spatial planning is a participatory tool to facilitate the application of the ecosystem approach, expedite progress towards achieving the Aichi Biodiversity Targets in marine and coastal areas and support mainstreaming of biodiversity into public policies related to human and economic development (…)"[11] (CBD 2016; Ntona and Morgera [55], in the current issue), it is reasonable to assume that the integration of MPAs and OECMs into the broader seascape context through an ecosystem-based marine spatial planning is one logical approach to integrated ocean management. Target 11, thus comprises a package of elements that should be implemented in a comprehensive manner.

2.1. Definition & purpose

Any proposed definition of OECM needs to be intrinsically linked with the issue of purpose or the role that these measures can play towards the achievement of Aichi Target 11. This target is linked to the achievement of the Strategic Goal concerning the improvement of the status of biodiversity by safeguarding ecosystems, species and genetic diversity (CBD 2010),[12] with target 11 focusing more on ecosystems, while target 12 and 13 are directed towards species and genetic diversity. More specifically, Aichi Biodiversity Target 11 aims to conserve, most particularly, areas important for biodiversity and ecosystem services. Therefore, questions associated to how to identify these areas serve as the starting point for this discussion.

2.1.1. Areas particularly important for biodiversity and ecosystem services

Within the context of the CBD, the ecologically or biologically significant marine areas (EBSAs) criteria for identification of marine areas in need of protection, which were adopted in 2008[13] should play a significant role in answering this question. Further to the adoption of the EBSA criteria, CBD parties agreed in 2010 to initiate a scientific and technical process to describe areas meeting one or more of the criteria through a series of regional workshops organized by the CBD Secretariat.[14] Bax et al. [10] evaluated use of different criteria for the first nine regional workshops. To date, 279 areas have been described globally as meeting the EBSA criteria in areas within and beyond national jurisdiction. These areas comprise pelagic and benthic features, as well as dynamic and fixed features [15,60]. As seen in Rees et al. [80], the EBSA criteria in the context of MPA network planning design were complemented with criteria for ecological representativity in 2008 (CBD Decision IX/20, Annex II), which includes, in addition to EBSAs, connectivity, representativity, replication, and adequacy criteria [16]. While by no means all areas that meet the EBSA criteria will necessarily be designated as MPAs,[15] the development and adoption of these two set of criteria provide sound guidance for ecologically representative MPA network planning through the identification of areas important for biodiversity conservation. In addition to MPA designation, EBSA features can be managed through a variety of conservation measures tailored to their specific characteristics and can inform marine spatial planning[16] (CBD 2016). Furthermore, the EBSA description process has already proved to be beneficial for enhancing conservation capacity, for example in developing states in West Africa, with a view to also improving food security (and associated ecosystem services) and enhancing livelihoods [37].

The identification of areas important for ecosystem services[17] can be relatively easy for well-known features such as mangroves and coral reefs (see [71]), but it can be a complex endeavour in areas where ecosystem functions are still not fully understood. In this regard, the CBD Marine and Coastal Environmental Impact Assessment and Strategic Environmental Assessment (EIA/SEA) Guidelines can shed some light on how to begin to identify these areas, since they call for efforts to be made in the incorporation of latest work on ecosystem services and values in EIAs and SEAs. In this context, they also recommend that in the screening phase of the proposed project or activity questions concerning the risks to ecosystem services of scientific/ecological value, or of cultural value be investigated [12]. However, given the limited knowledge regarding ecosystem functions and scientific constraints with respect to marine ecosystem services scalability, the Guidelines recommend making use of the information contained in the description of areas that meet the EBSA criteria for the purpose of assessing those impacts on ecosystem services (UNEP/CBD/COP/11/23, Annex, para 15; CBD Decision XI/18). Furthermore, the EIA/SEA Guidelines connect EBSAs and VMEs to ecosystem services, especially regulating and supporting services[18] in a number of instances. The guidelines contain an indicative list of screening criteria to be further elaborated at the national level, recommending that EIAs be mandatory for activities in MPAs, EBSAs, VMEs, ecological corridors, and other areas known to provide important ecosystem services, as well as in areas covered by sectoral conservation measures such as PSSAs and APEIs. An indicative list of ecosystem services is provided in Annex III of the Guidelines. Furthermore, making use of the CBD EIA/SEA Guidelines, particularly when conducting SEAs can help also on the identification of the appropriate area-based conservation measure that could be put in place in a given area – including for EBSAs and VMEs - to prevent or minimise impacts on biodiversity and ecosystem services from particular activities.

Such an approach is also consistent with the 2016 CBD COP decision regarding mainstreaming biodiversity into fisheries, whereby Parties called for further collaboration and information sharing between the CBD Secretariat, the Food and Agriculture Organization of the UN (FAO) and regional fisheries bodies on the use of scientific information on areas meeting the EBSA criteria and VMEs in support of various Aichi Biodiversity Targets (CBD 2016).[19] The use of EBSA and VME information is not restricted to Aichi Target 11. It can also contribute to a more integrated approach in achieving other Aichi targets, including target 6 on sustainable fisheries[20] and 10 on avoiding and minimizing anthropogenic impacts on ecosystems which are vulnerable to climate change[21] and a range of key enabling targets (2,3,4,8,9,14,17,20). In this connection, attention should also be paid to the implementation of the 2016 Voluntary Specific Workplan on Biodiversity in Cold-Water Areas within the Jurisdictional Scope of the Convention (CBD Decision XIII/17) and of the 2014 Priority Actions to Achieve Aichi Biodiversity Target 10 for Coral Reefs and Closely Associated Ecosystems (CBD Decision XII/23) should also be highlighted.

Such a comprehensive approach promoted by the CBD, which reflects the ecosystem approach (as per the guidance provided under CBD Decision VII/11), should be duly noted when discussing the role of OECMs in achieving target 11, not only to maximise synergies across the Aichi Targets per se, but to maximise its contribution to the SDGs and the implementation of international obligations under UNCLOS and

(*footnote continued*)
rationale of Aichi Biodiversity Target 11 as per CBD (2010) Doc. UNEP/CBD/COP/10/INF/12/Rev.1.

[11] CBD (2016) Decision XIII/9, para. 2.

[12] CBD (2010) Decision X/2, Strategic Goal C.

[13] CBD (2008) Decision IX/20, Annex I.

[14] CBD (2010) Decision X/29, para. 36.

[15] In line with previous COP Decisions, CBD COP 13 has encouraged Parties to take measures to ensure the conservation and sustainable use by implementing relevant tools, including area-based management tools such as MPAs, EIAs, SEAs, and fisheries management measures. (Decision XIII/12, para. 14).

[16] See CBD (2016) Doc. UNEP/CBD/SBSTTA/20/INF/6 [74].

[17] See ecosystem services classification by the Millennium Ecosystem Assessment [50]; UN [72] First Global Integrated Marine Assessment (First World Ocean Assessment); and IPBES proposed ecosystem services re-classification [35].

[18] See proposed re-classification of such ecosystem services as regulating contributions (IPBES/5/INF/24).

[19] CBD (2016) Decision XIII/3, para 68.

[20] See CBD (2016) Decision XIII/9, para 11.

[21] See CBD Decision XI/18, para 27.

CBD.

2.2. Conservation objectives

The draft IUCN guidance on OECMs suggests that to count against Aichi Target 11, the conservation measure in question should have as its primary objective the conservation of biodiversity [40]. However, it also recognizes that some measures may not have a biodiversity conservation objective per se, but can lead to a biodiversity conservation outcome [40,47].

Some area-based measures like fisheries closures can also (directly or indirectly) contribute to biodiversity conservation. For instance, bottom fisheries closures to protect vulnerable marine ecosystems (see Section 3 infra) can contribute to both biodiversity conservation (as per UN General Assembly Resolution 61/105, para. 80) and respective ecosystem services. In this connection, it is important to note that evidence for important functional roles between fish and VMEs is growing across several VME taxa. For example, cold-water coral reefs may support a characteristic fish fauna [67] and provide habitat for deep-water sharks to lay eggs [28]. In the North west Atlantic, deep-water sea pens have been found to contain redfish (*Sebastes* spp.) larvae, indicating that these coral species provide nursery grounds for redfish ([7]; see also CBD Decision XIII/17, Annex I, para 3). Therefore, in ensuring the long-term sustainability of redfish fishery, managers should also consider protecting these important habitats and the biodiversity they contain, in accordance with the ecosystem approach (CBD Decision VII/11; Aichi Target 6; SDG 14.2 and 14.c).

Fisheries closures to protect deep-sea sponge grounds can also contribute to both objectives, as these organisms tend to form structurally complex habitats and contribute to enhanced local biodiversity [44]. Furthermore, they also provide important ecosystem services from water filtration [44] to pharmaceutical products [49]. The drawback of sectoral measures, however, when they are not integrated into an ecosystem-based marine spatial plan, is that other potentially impactful activities may not necessarily be legally restricted in the same area (see Section 4 infra).

It is also important to note that other types of fisheries closures (e.g. single species focused; short-time frame) can contribute to fisheries management and the achievement of Aichi target 6 on sustainable fisheries (and to provisioning ecosystem services[22]) thus contributing to SDG target 14.4, without directly contributing to biodiversity conservation per se (see [47]). Hence, the IUCN emphasised biodiversity conservation being explicitly stated as the primary objective of the measure in question, and in case of conflict between multiple objectives, IUCN's recommendation has been that conservation should prevail [47]. However, some exceptions may apply, and thus, it is suggested here that in order to determine whether or not a specific area-based conservation management measure fulfill the Aichi Target 11 requirements, assessments should be conducted on a case-by-case basis ([59] provides an example of such an assessment; see also [22]).

For instance, in Rees et al. [59] assessment, a number of spatial management measures[23] other than MPAs (e.g. military ports and offshore renewable energy installations, among others) in the Celtic Sea were analysed to determine whether these were functioning as OECMs (termed as de facto MPAs in the analysis) by contributing to the ecological coherence of the current MPA network configuration. In order to do this, Rees et al. [59] defined a set of criteria[24] against which each spatial management measure was assessed. The study concluded that only a fraction of the spatial management measures in place could be assumed (with confidence) to be benefiting biodiversity, and therefore may be considered as an OECM. This was due to, inter alia, the lack of statutory/voluntary means to restrict activities for the purpose of conservation within these sites, compounded by a lack of empirical evidence of the 'effectiveness' of the OECM for benthic and low mobility biodiversity under such management regimes. In terms of the contribution of the other spatial management measures to the ecological coherence of the MPA network in the Celtic Seas, it was found that the majority of the area covered by other spatial management measures were small, inshore and already within or overlapping with current MPAs. None of the offshore spatial management measures qualified as an OECM according to the criteria used in the assessment, despite the purpose of some offshore fisheries closures to protect commercial fish species during essential life history stages. As the UK MPA network is predominantly designed on benthic habitats and low-mobility species, without permanent closures, prohibiting all mobile demersal gear in these sites could not contribute to ecological coherence (connectivity, viability etc,) of a network. To incorporate such sites into a network there would be a need to integrate fisheries and conservation management objectives into the ecological coherence framework.

While the focus of Rees et al. [59] study was on benefits for benthic habitats and low-mobility species, it is important to note that for pelagic species it has been found that "[i]n general the success of any MPA will be strongly influenced by management of pelagic fishing effort surrounding MPAs. While MPAs can provide added protection, in many cases they are not substitutes for well-managed fisheries." [48], pp. 17). In fact, Rees et al. [59] identified the need to undertake further research on the role of temporal closures in supporting mobile species in their crucial life history stages. Others suggested the need for protective measures, based on precaution [63].

Vertical integration in the form of vertical zoning within MPAs has been proposed by Grober-Dunsmore et al. [27], as a means to address benthic-pelagic linkages. Grober-Dunsmore et al. developed a conceptual framework to identify the need for such zonation as part of MPA management planning processes based on the consideration of four elements, namely, water depth, habitat type, predator type, and taxonomic, mobility and life history characteristics of pelagic species. With regards to habitat type, for instance, it is known that complex benthic habitats such as reefs and kelp forests have strong linkages with pelagic species, as well as seamounts and canyons [27].

These linkages - to the extent that they are known - should also be observed when assessing specific OECMs in the context of Aichi Target 11. Marine food web models can provide better understanding of these linkages, and have been applied in the operationalisation of the ecosystem approach to fisheries management (Kenny et al. [41]).

2.3. Ecological Timeframes Considerations For Effective Management

Auster [6] highlights the relationship between compliance and timing required for ecosystem recovery and associated ecological timeframes in assessing OECM status. Ecological timeframes relate to ecosystem integrity and function and associated ecosystem services (Hiscock, 2014).

It is important to note, however, that despite the fact that ecological timeframes and compliance mechanisms are conceptually distinct, their interface has been evidenced in practice. For instance, the apparent lack of compliance with some fisheries closures in the Northeast coast of the US has arguably hindered scientific analysis of ecological and seafloor ecosystem recovery timeframes; and as indicated by Auster, "… the role

[22] Or material contributions (as per the proposed IPBES re-classification of ecosystem services (IPBES/5/INF/24).

[23] These measures comprised: 1) Fisheries closures; 2) Maritime safety zones; 3) Non-statutory nature conservation areas; and 4) Cultural heritage sites.

[24] The criteria included: 1. The area must have defined boundaries; 2. There must be measures in place to restrict certain activities (either statutory or voluntary; 3. Must comprise sea or coastal waters within the EU Marine Strategy Framework directive region 4. Must be permanent (year round) restrictions (for benthic habitats and low mobility species); and 5. Must likely benefit biodiversity conservation (e.g. highly polluted or modified sites are not considered). (Rees et al., [59] pp 121).

that such closures currently play as OECMs remains questionable and should be assessed for compliance (…), limited access, and longevity with both management and ecological time frames." ([6], pp. 3)

Furthermore, the issue of ecological timeframes is directly related to the debate on whether an OECM should be permanent or temporal. Long-term conservation is often an objective of protected areas, as defined by IUCN [33] and in evaluations of MPA effectiveness [18]. Ensuring long-term conservation is consistent with sustainable development (and inter-generational equity) and has been embedded not only in protected areas requirements, but also in fisheries management as a key objective of the UN Fish Stocks Agreement (UN Fish Stocks Agreement, Article 2). While long-term conservation may not always mean perpetuity, especially in light of climate change and other environmental variables, the respective management measure should be compatible with the ecological time-frame of the ecosystem in question and substantiated by scientific information for effectiveness.

3. Sectoral vs cross-sectoral measures

International biodiversity conservation obligations and the realization of the risks posed by maritime activities have persuaded sectoral organizations to develop their own protective designations. Three sectoral designations are described below together with efforts to evaluate their effectiveness as potential OECMs, namely, PSSAs, APEIs and VMEs. A fourth type of sectoral measure – LMMA - implemented and co-managed by local communities in Northern Mozambique is also presented as a case study.

3.1. Particularly Sensitive Sea Areas (PSSAs)

PSSAs are area-based management tools designations by the International Maritime Organization (IMO) for areas that are ecologically, scientifically or socio-economic significant and vulnerable to shipping activities. Guidelines on designating a PSSA are contained in IMO Resolution A.982(24) *Revised Guidelines for the identification and designation of Particularly Sensitive Sea Areas (PSSAs)* adopted in 2005, replacing previous Guidance. Provisions of the United Nations Convention on the Law of the Sea are also relevant [31].

Each PSSA is proposed on the basis of meeting site-based criteria (ecological, socio-economic, scientific) substantiating a need for protection but also including an analysis of that location's vulnerability to the potential adverse impacts of international shipping. Vulnerability is considered both in terms of vessel traffic characteristics and natural factors, including hydrographic, meteorological and oceanographic conditions. One or more Associated Protective Measures (APMs) to protect the area from the identified vulnerability, consistent with the legal instrument under which the APMs is being proposed, are also required. Proposals to designate PSSAs are subject to technical review within IMO Marine Environmental Protection Committee (MEPC). PSSAs can be discrete areas, such as vulnerable seamounts (e.g. Saba Reef PSSA), or more extensive pelagic areas vulnerable to oil spills (e.g. Western European PSSA).

As of 2016, sixteen of these designations have been adopted by the IMO, all proposed by a State or States in national waters, the most recent being Jomard Entrance in Papua New Guinea. Roberts et al. [62] discuss possible application in the high seas but as yet no proposal for Areas Beyond National Jurisdiction (ABNJ) has been forthcoming. Four further areas are currently under consideration within IMO as proposed respectively by the Philippines (Tubbataha Reefs), Malaysia (Pulau Kukup and Tanjung Piai), Indonesia (Lombok Strait including Gili Islands and Nusa Penida Islands) and Mauritania (Banc D'Arguin and adjacent sea area). The Banc d'Arguin proposal is of note in the context of this paper having drawn data from the CBD EBSA described for the area (CBD COP 12, 2014). Banc d'Arguin National Park and an adjacent zone of the Atlantic (Gulf d'Arguin) can be described as an ecologically inter-connected region of global significance situated at the junction of two biogeographic realms, hosting the largest concentration of wintering wading birds in the world (the area is a core component of the East Atlantic Flyway) and one of the most diversified communities of piscivorous birds. The National Park has been listed as a World Heritage Site since 1989 (UNESCO 13COM XV.A) and UNESCO's World Heritage Committee has taken a keen interest in 2014, requesting the State Party (Mauritania) to submit the request to designate Banc d'Arguin region as a PSSA (UNESCO 38COM 7B.62).

No formal exercise to evaluate PSSAs has yet been attempted by IMO, however a consultancy conducted on behalf of the Common Wadden Sea Secretariat [70] suggested a need for awareness raising amongst mariners. A consortia of NGOs (WWF, IUCN, ACOPS) has urged IMO MEPC to undertake such an evaluation. At the 70th session of MEPC (October 2016), the Russian Federation supported formal evaluation, tabling a proposal to introduce requirements to regularly evaluate status effectiveness of Special Areas and PSSAs (MEPC 70/8/1).

3.2. Areas of Particular Environmental Interest (APEIs)

In 2012 the International Seabed Authority (ISA) approved an Environmental Management Plan for the Clarion-Clipperton Zone (CCZ) in the Eastern Central Pacific (ISBA/18/C/22, 26 July 2012), an established area where a number of UNCLOS State Party contractors to the ISA and latterly private sector mining corporations sponsored by State Parties have been granted 15-year exploration contracts. Integral to this Plan in addition to the mosaic of contract blocks (which may also contain Preservation Reference Areas) are nine extensive APEIs. ISA's mandate is to encourage prospecting for minerals in the Area, while ensuring the effective protection of the marine environment and the promotion of scientific research. The APEIs were proposed at a workshop in Hawaii in 2007, where experts recognised the existence of latitudinal and longitudinal productivity gradients in the CCZ, which appear to drive major changes in the seabed community composition across the region [69]. They are large precautionary areas, each 400 km^2 with an inner core zone and surrounding buffer intended to protect the core, and minimum viable population sizes, from any sediment plume caused by mining. The nine APEIs allow for biogeographic representation based on three north-south and three east-west strata, reflecting strong productivity-driven gradients, in the absence of detailed data on the composition and distribution of benthic communities [78]. The APEIs also recognize high diversity of fragile fauna that will be very slow to recover from any mining impacts [3].

[39] highlight the fact that 'whilst contractors gather environmental and technical information on an annual basis, and report to ISA for the purposes of constructing a common baseline within their license areas, an 'Achilles heel' of the CCZ-EMP is that there is no requirement or incentive for contractors to carry out similar surveys in APEI's. Further to an interim preliminary evaluation report [68], in 2016 the ISA Legal and Technical Commission (LTC) also undertook an initial review of the current status of management implementation of the CCZ-EMP (ISBA/22/LTC/12). Other than workshops convened to consider specific taxa, implementation measures (such as data standardization and taxonomic inter-calibration and contractor plans and measures to ensure habitat and faunal recovery) have not been undertaken. LTC recommended the creation of two additional APEIs, workshops on APEI effectiveness and Impact Reference Zones[25]/Preservation Reference Zones[26] and the

[25] Impact Reference Zones are "Areas which are representative of the environmental characteristics of a particular region to be used for assessing the effect of activities in that region on the marine environment." (ISA, < https://www.isa.org.jm/impact-reference-zone >).

[26] Preservation Reference Zones are "Areas representative of the mine site in which no mining shall occur to ensure representative and stable biota of the seabed in order to assess any changes in the flora and fauna of the marine environment caused by mining activities." (ISA, < https://www.isa.org.jm/preservation-reference-zone >).

creation of a working group of expert consultants to assist with the assessment of cumulative impacts and production of environmental quality status reports for the region.

At its 22nd session in 2016, the ISA also recalled UNGA Resolution 70/235 encouraging EMPs for other regions having the potential to support deep-sea mining (ISBA/22/C/28).

3.3. Vulnerable Marine Ecosystems (VMEs)

According to the Food and Agriculture Organization [20] 'the vulnerable marine ecosystem (VME) concept emerged from discussions at the UNGA in 2002 (Resolution 57/171) and gained momentum after UNGA Resolution 61/105 of 2006. No globally agreed definition of a VME is available but VMEs constitute areas with characteristics that may be vulnerable to impacts from fishing activities.[27] Specifically this relates to high seas fisheries likely to contact the seabed and the prevention of 'significant adverse impacts' (SAIs). Recommendations and Guidance for the identification of VMEs, based upon potentially vulnerable species groups, communities and habitats (see [66]), were formally negotiated under the auspices of the FAO. In 2009, UNGA Resolution 64/72 called upon States, individually or through Regional Fisheries Management Organizations, to implement the International Guidelines for the Management of Deep Sea Fisheries in the High Seas [19]. The Guidelines are supported by identification tools and taxonomic guides to help practitioners identify VME indicators, in order to assess, avoid and mitigate potential SAIs. These fisheries measures adopted in ABNJ are made explicit in a global inventory, which includes coordinates of measures – the VME database (http://www.fao.org/in-action/vulnerable-marine-ecosystems/vme-database/en/) and a detailed technical paper [21].

Rice et al. [61] analysed the FAO criteria for VMEs recognizing that VMEs can meet one or multiple criteria for areas where fishing gear may come into contact with the seafloor. Not dissimilar to PSSAs, the VMEs are linked directly to management action. As a result, significant areas have been closed to bottom trawling. Whilst recognizing important achievements, Gianni et al. [25] highlight specific shortcomings, including VME areas that remain open to bottom fishing and insufficient 'move-on' rules (the rules that require fishers to cease fishing when they encounter a VME). A more scientific approach would involve predicting the occurrence of VMEs, as demonstrated by habitat suitability modelling creating potential distribution maps for VME indicator taxa in New Zealand waters and adjacent seas [5] as well as in Eastern Canada [42]. Vulnerability of seamount faunas, many of which are VME 'indicator species', has prompted calls to protect all seamounts from impacts of deep-sea fishing, recognizing them as 'islands of rich megafaunal biodiversity in the deep ocean' ([77] p. 3).

A review and evaluation of the implementation of the respective UNGA resolutions on VMEs was coordinated by UN Division for Oceans and the Law of the Sea (DOALOS) in 2011, concluding, inter alia, on the need for further impact assessments and cumulative impact assessments to be undertaken to identify and prevent SAIs on VMEs. A UNGA multi-stakeholder workshop (1–2 August 2016) to consider how the impacts of bottom fishing on VMEs are being addressed preceded another review by the UNGA in November 2016. On 7 December 2016, the UNGA adopted Resolution 71/123 with both renewed and new calls for actions to manage bottom fisheries on the high seas to protect deep-sea ecosystems and species. Another UNGA review will be held in 2020, a timescale which resonates with the timeframe established for SDG 14.5, as well as with most Aichi Biodiversity Targets.

3.4. Locally Managed Marine Areas (LMMAs): A case study from Northern Mozambique

Johnson et al. [38] considered how formal intergovernmental approaches are increasingly complemented by a range of regional projects committed to ambitious targets to establish MPAs and Locally Managed Marine Areas. These regional efforts have been inspired by political leaders, non-governmental organizations, coastal communities and committed individuals.

This section looks into LMMAs, as illustrated by a northern Mozambique case study, as potential OECMs in the context of target 11 that contribute to the conservation of important areas for biodiversity and ecosystem services towards food security and poverty alleviation. The case study draws from a project in northern Mozambique, the Our Sea Our Life Project,[28] which was initiated in 2013 with funding provided by the European Union, UK Government's Darwin Initiative and Global Poverty Action Fund, the Waterloo Foundation and Foundation Ensemble. The project is a collaboration between various international and national institutions working closely with district and provincial government institutions on projects that support the establishment of a network of sustainably-financed LMMAs.[29] The project has adopted the LMMA definition provided by Govan and Tawake [26]:

> "an area of nearshore waters and coastal resources that is largely or wholly managed at a local level by the coastal communities, landowning groups, partner organizations, and/or collaborative government representatives who reside or are based in the immediate area." (pp. 28)

Furthermore, the objective of this network of LMMAs is sustainable and equitable marine biodiversity conservation that benefits local communities, reduces local dependence on the fishery, and increase levels of well-being and food security.

3.4.1. Ecological and socio-economic considerations

The coastline of northern Mozambique forms part of the Northern Mozambican Channel (NMC) and the East African Coral Coast eco-region. The area has been described as an EBSA (CBD Decision XII/22) due to its biological and ecological importance. Cabo Delgado Province has exceptionally high coral reef biodiversity as well as other key habitats of conservation importance such as mangroves, sea grass beds and intertidal reef flats [24,30,56]. In addition to meeting the EBSA criteria, the area has been identified as being worthy of World Heritage status [57].

Cabo Delgado represents an intersection between high marine biodiversity and high levels of poverty and livelihood dependence on marine biodiversity of coastal communities. Marine resources are threatened by increasing fishing effort from local and itinerant fishers, and the introduction of damaging fishing gears and practices, including the use of mosquito nets both sewn into the cod end of beach seine nets and also as standalone fishing nets. Additionally, the region is about to undergo rapid socioeconomic and environmental change due to the discovery of Africa's largest natural gas reserves [4]. Despite these changes, the only marine conservation area in the Quirimbas archipelago along the Cabo Delgado coastline is the Quirimbas National Park (QNP) in the southern archipelago, and one Locally Managed Marine Area[30] on the east side of Vamizi Island, which was thought to be the

[27] Although, regionally, the Northwest Atlantic Fisheries Organization (NAFO) Scientific Council, has adopted [53]) the following VME definition for those that follow under the structure-forming criterion of the FAO Deep-Sea Fisheries Guidelines: "Under the structure-forming criterion, a VME is a regional habitat that contains VME indicator species at or above significant concentration levels. These habitats are structurally complex, characterized by higher diversities and/or different benthic communities, and provide a platform for ecosystem functions/processes closely linked to these characteristics." [52]p. 52).

[28] See ZSL, Our Sea Our Life project, online: < https://www.zsl.org/conservation/regions/africa/our-sea-our-life > ; Bioclimate, Our Sea Our Life project, online: < https://www.brdt.org/our-sea-our-life > .

[29] The project has applied the principles of Free Prior and Informed Consent, and has worked through a national NGO (AMA – Associação do Meio Ambiente).

[30] The reserve area of Vamizi operates using Mozambican Fisheries Law (Law No. 22/

only LMMA in Mozambique in 2014 [65].

The Our Sea Our Life project was therefore designed to respond for the need for conservation measures in the northern part of the archipelago, and support the government of Mozambique to meet their commitments under the CBD.

3.4.2. Approach to establishing LMMAs

The project has adopted a participatory approach, with an emphasis on building the capacity of local community-based institutions and the establishment of marine management measures that respond to coastal communities' needs. At the time of writing, two coastal communities have established spatial management measures, and a further two have plans to do so.

The legal and institutional grounding for communities' involvement in marine management in Mozambique is based on legislation promoting fisheries co-management. Specifically, Mozambique's Regulations on Marine Fisheries (2003)[31] promotes a participatory management forum, the Co-Management Committee (CCG), made up of local fisheries administration, district-government represented by the district economic services, other interested parties such as fish traders, research institutions and non-governmental organisations, and community fishing councils (CCPs – Conselhos Comunitários de Pesca). CCPs, composed of community members, are legally registered as associations with a model Statute, and include fishers themselves, community leaders, fish traders and other interested local parties, and have to have a composition of 25% female members [1]. While Mozambique's Fisheries Law[32] rules that fish resources within territorial waters[33] are the property of the state, CCPs have the right to enforce Mozambican fisheries legislation. However, there is little experience or legislation specifically supporting LMMAs as defined here, and CCPs implementing community spatial management measures are doing so as part of their management of the broader fishery. Despite this, there is provision in Mozambican Fisheries Law for Conservation Zones for Fisheries Resources,[34] and in the new 2014 Conservation Law[35] there is also an opportunity for communities to register a conservation area including marine areas, which can be for sustainable use.

One of the project's approaches to introducing CCPs to different potential marine management measures was to start with species that respond quickly to management in order to illustrate the potential benefits of spatial and temporal management measures to communities with little experience of these measures. Octopus (*Octopus cyanea*) was an ideal candidate for those communities with an octopus fishery, particularly due to the base of evidence for this approach in similar ecological conditions in Madagascar [11] and given their life-history characteristics (i.e., short-lived and fast-growing) ([29]; see also [13]). Management measures, in this case, included temporary closed areas (also referred to as periodically closed areas) where an area of the fishery is closed for a short period of 2–3 months, and then open to fishing [11]. Criteria for the selection of these areas were generated through an exchange visit of fishers from Mozambique to periodic closed areas in Madagascar in 2014, and further refined with communities themselves. These include areas that are 1) visible from the village (to facilitate monitoring and enforcement), 2) contain appropriate habitat, 3) still have octopus present, 4) are chosen by the CCP, and 5) have support from fishers still using the area. Although no gear modification has been introduced yet, one community has prohibited all collection of coral rock, and rock from this area, prevented open-air defecation on this section of beach, and mangrove cutting seemed to have stopped.[36] These measures were adopted through additional regulations developed at the time of the design of the periodic closure.[37]

In reality however, other community interests such as protecting the area from people from the district capital coming to fish and collect coral rock and stone, also factored, meaning the first zone selected (in Quiwia village) contained quite degraded octopus habitat and a large area without octopus habitat. Communities have also applied the closure to all species within the area under management to facilitate the monitoring and enforcement of these areas. While there are no definitive results due to the limited (two) openings to date, there have been visible short-term increases in octopus catch per unit effort (CPUE) for the days of opening (five days on first opening and six on second), including over 50 kilos of octopus from an area with previously no octopus caught, and a catch of over 900 kilos of fish and octopus in total over a five day period, with an average catch per trip over 12 kilos per fisher.[38] As the habitat in the area was previously highly degraded and overfished, fishers perceived these catches to be a positive change, and at the time of writing, they are now on their third closure.[39]

In addition, fishers noted subjective improvements such as return of species that were not previously present in these quite degraded areas now under management (e.g. lobster), increased presence of small fish in the intertidal zone, increased quantity of bivalves, and improved coral quality.[40] Once this approach was adopted in two communities, the second phase of marine management facilitated a broader discussion around the threats to marine resources and the broader fishery, to establish broader community objectives for marine management, and resulting in the establishment of one replenishment reserve (no-take zone) and a proposal for a second area. [41]

3.4.3. Broader social considerations

The 'Our Sea Our Life' project also aims to improve community well-being and food security, and therefore also contributing to SDGs 1 (ending poverty), 2 (ending hunger, improving food security and nutrition) and 3 (improving health and well-being). While one pathway to improved food security is through establishing LMMAs with potential to either increase short-term cash income (through management of short-lived species such as octopus, or cockles and oysters), and medium-

(*footnote continued*)
2013 of November 1) and is managed in a collaboration between Vamizi Lodge and the community of Vamizi. See GoM (Government of Mozambique). 2013. *Lei das Pescas* – Lei no. 22/2013, de 1 de Novembro 2013.

[31] Decree No. 43/2003 of 10th December 2003 (GoM (Government of Mozambique). 2003. Regulamento Geral a Pesca Marítima - REPMAR, Decree no. 43, 2003 of 10 December).

[32] GoM (Government of Mozambique). 2013. Lei das Pescas – Lei no. 22/2013, de 1 de Novembro.

[33] The Law of the Sea (Law No. 4/96 of 4th January) defines Mozambique's Exclusive Economic Zone as being 200 miles from the territorial sea, which is defined as being 12 miles from the coastline (Article 4, paragraph 2).

[34] Article 16 of the Fisheries Law (Law No. 22/2013 of November 1): the regulation defining how these are defined and declared is not yet published.

[35] Articles 18 and 22 of the 2014 Conservation Law (No. 16/2014).

[36] Riddell, M., Wosu, A., Abdala, J., & Cachimo, R. (2016) Assessment of the closed period of the Quiwia Locally Managed Marine Area. Our Sea Our Life internal project report in file with author, pp. 24.

[37] Riddell, M., Wosu, A., Abdala, J., & Cachimo, R. (2016) Assessment of the closed period of the Quiwia Locally Managed Marine Area. Our Sea Our Life internal project report in file with author, pp. 24.

[38] Mussa, J. J. A. (2015) *Relatório avaliação do impacto da reserva temporária de Quiwia*. Our Sea Our Life internal project report in file with author, pp. 3; Mussa, J. J. A., & Abdala, J. (2016) *Relatório avaliação do impacto da reserva temporária de Quiwia*. Our Sea Our Life internal project report in file with author, pp. 5.

[39] Mussa, J. J. A. (2015) Relatório avaliação do impacto da reserva temporária de Quiwia. Our Sea Our Life internal project report in file with author, pp. 3; Mussa, J. J. A., & Abdala, J. (2016) Relatório avaliação do impacto da reserva temporária de Quiwia. Our Sea Our Life internal project report in file with author, pp. 5.

[40] Mussa, J. J. A. (2015) Relatório avaliação do impacto da reserva temporária de Quiwia. Our Sea Our Life internal project report in file with author, pp. 3; Mussa, J. J. A., & Abdala, J. (2016) Relatório avaliação do impacto da reserva temporária de Quiwia. Our Sea Our Life internal project report in file with author, pp. 5.

[41] Although these LMMAs were framed around short-term gain of related ecosystem services for communities, the establishment of replenishment zones (NTZs) protect longer-lived species, key brooding/ breeding sites, which are habitat essential for biodiversity. This means that there will be a longer-term benefit for biodiversity, even if it is framed around community objectives; the two are inseparable.

longer term fisheries improvements, there are also short-medium term costs of introducing marine management measures (e.g. fishers' and fishing council opportunity costs, operational costs for enforcement and monitoring, and opportunity costs associated with closed areas).[42] To help communities overcome the short-term opportunity costs, the project is supporting communities to establish savings groups and supporting small-medium enterprises. Village Savings and Loans Associations (VSLAs) have been established in all communities. These are savings groups that allow men and women not only to save cash collaboratively, take out loans for small enterprises, and access a social fund for members in times of need [2]. Local enterprise development being explored with communities includes horticulture, seafood processing and sale, and aquaculture. The project has also adopted a performance-based support mechanism that provides fishing councils the training and resources necessary (conditional upon conducting and completing management activities decided by the CCP) in order to remove some of the operational barriers and costs to implementing LMMAs. These approaches are still in the early stages of development, but there are indications that this type of comprehensive conservation and sustainable management practices – when well designed – have potential to contribute to the achievement of SDGs 1,2,3 and 5 (particularly SDG 5.5, on gender equality) in addition to SDG 14.2 (with respect to ecosystem restoration for increased productivity), 14.4 (with respect to restoring fish stocks), and 14.5.

Key challenges that the project and communities face in establishing LMMAs directly relate to other SDGs such as Goal 4 (on education) and target 14. B (on access for small-scale artisanal fishers to marine resources and markets) to markets. Specific challenges include the high levels of food insecurity, low levels of literacy, limited financial and organisational capacity in local fishing councils, and lack of financial resources within the district and provincial government departments responsible for supporting communities to implement fisheries co-management measures [32]. This makes enforcement of any spatial or other management measure particularly challenging throughout coastal Cabo Delgado. It has been observed that literacy and numeracy skills are needed for the involvement of community's members in formal marine management, but also for improving their access to markets for enterprise and fish processing, as a supporting activity to LMMA functioning.

4. Discussion: Equivalence of sectoral designations?

A key difference between these sectoral designations, such as the ones addressed in Section 3 above, and MPAs is that the latter have cross-sectoral area-based conservation objectives. Sectoral designations, instead, only apply to the specific sectoral impact concerned and do not offer protection from other human impacts.

A PSSA is not a marine protected area, although it may be coincident with an MPA. However, as explained in the Banc d'Arguin example, those areas designated or under consideration as PSSAs are sites of high conservation value. The ecological criteria adopted by IMO (uniqueness or rarity, critical habitat, dependency, representativeness, diversity, productivity, spawning or breeding grounds, naturalness, integrity, fragility/vulnerability, biogeographic importance) mirror and in some cases go beyond those used for MPA selection.

Furthermore, PSSA designation can strengthen MPA designations, as States usually cannot impose restrictions to navigation by international shipping without IMO's involvement. Therefore, PSSAs can complement and contribute to the conservation objectives of MPAs[43] and MPA networks and integrated oceans management.

APEIs were chosen as a terminology to 'avoid confusion with other initiatives to establish MPAs' ([45], p. 68). However, they are seen by some as analogous with MPAs, and in effect the CCZ-EMP design is based on principles for MPA networks [79]. Indeed, the CCZ-EMP includes a requirement to foster international collaboration to integrate APEIs in MPAs in ABNJ, and hence these measures are not MPAs themselves, although they could be considered OECMs. APEI design elements included representativity and GIS optimization as applied to MPA networks.

A process to design a series of so-called 'banded APEIs' for the Mid-Atlantic Ridge (SEMPIA) is underway, in this case to protect significant biodiversity of chemosynthetic ecosystems associated with hydrothermal vents rather than abyssal nodule provinces. This process is also taking a precautionary approach, but recognizes the linear and more heterogeneous nature of ridges, the distribution characteristics of metal-rich deposits of Seafloor Massive Sulphides and the importance of particulate organic carbon as an important driver of ecosystem structure and function. Critical design considerations include spatial scales of meta-population connectivity with respect to ecological and evolutionary timescales. Long-term protection is essential given that these ecosystems are considered to be fragile and are likely to recover very slowly [75,76].

For VMEs vulnerability is assessed based on threats but the VMEs themselves are identified based on ecological features. To date efforts have particularly involved closure of deep-sea fisheries based upon the presence of vulnerable deep-sea corals and sponges,[44] but the recent UNGA resolution called for the VME criteria to be applied to the full range of indicator species. VME criteria relate strongly to those adopted by the Convention on Biological Diversity to describe EBSAs [61].

In evaluating effectiveness of a given OECM, cross-sectoral considerations should be taken into account. For instance, VME closures only protect selected habitats and species from bottom fishing threats, but not necessarily threats from other activities. This has been the case, for instance, in the Grand Banks off the coast of Canada – where a Northwest Atlantic Fisheries Organization (NAFO) VME closure to protect sea pens has been subject to oil and gas drilling activities in the outer limits of the Canadian continental shelf (NAFO FC-SC Doc. 16/03 (Revised) [51]). Such an uncoordinated approach suggests that this particular closure is not effective for the purposes of Target 11, nor Target 10 on avoidance or minimization of anthropogenic impacts on ecosystems vulnerable to climate change and ocean acidification.[45] Arguably, EIAs[46] and SEAs, with effective consultation and participation processes, can play a key role in this regard and be an integral part of an ecosystem-based marine spatial plan – even in transboundary areas.

Protection of one or a very limited number of species or protection from only one specific human activity in the presence of other potentially impactful activities makes qualification as a marine protected area controversial. However, in ABNJ, where very few MPAs have yet been designated, promoting the adoption of such measures is important

[42] M Riddell, A Wosu, J Abdala, R Cachimo (2016) *Assessment of the closed period of the Quiwia Locally Managed Marine Area* (Bioclimate) draft report in file with author.

[43] For instance, this is the case of the Papahanaumokuakea Marine National Monument in Hawaii, which has been designated as a PSSA by IMO in 2008; the Florida Keys National Marine Sanctuary, in 2002; the Great Barrier Reef in 1990; among others. See Papahanaumokuakea, online: http://www.papahanaumokuakea.gov/news/pdfs/FINAL_PSSA040708.pdf accessed on 3 January 2017.

[44] Although it is important to note that gear modification regarding mid-water trawl on seamounts in the Northwest Atlantic has also been adopted to avoid SAI on VMEs [17].

[45] Relevant to the implementation of Aichi Biodiversity Target 10 in this context (of cold-water corals, among others) is the recently adopted CBD Voluntary Workplan on Biodiversity in Cold-Water Areas within the Jurisdictional Scope of the Convention (CBD Decision XIII/11). In this connection, implementation of Target 10 and the voluntary workplan would also contribute to the achievement of SDG 14.3 on ocean acidification.

[46] As a rule of customary international law to conduct EIAs for activities that have potential to cause significant adverse impacts on the marine environment, and as reflected in UNCLOS, Art. 206, CBD, Art. 14, and ICJ, *Pulp Mills on the River Uruguay case* (2006), para. 204; ITLOS Advisory Opinion on the Responsibilities and Obligations of States sponsoring persons and entities with respect to activities in the Area (2011), paras. 145 and 148.

to at least securing sectoral protection of areas important for biodiversity and ecosystem services. Furthermore, in ABNJ, experience with poor data coverage demonstrates the relevance of a biogeographic multi-criteria based approach for MPA network planning.

For these areas, [8] have advocated “an improved global legal regime that incorporates systematic planning as well as the expansion of existing and new regional agreements and mandates”. Such a systematic approach is difficult to achieve through an ad hoc approach to sectoral area-based conservation measures. Their analysis of the alignment of policy processes and associated spatial measures in the high seas with the eleven different stages of systematic conservation revealed shortcomings in terms of scoping, objectives and gap analysis. This cannot be divorced from a wider governance debate, beyond the equivalence of sectoral designations and demonstrates the need for a better integrated regional governance strategy [64]. An immediate benefit of considering these different sector-based designations therefore is the involvement of different stakeholders into MPA planning and design processes. In particular, conservation of high seas biodiversity is seen by many as dependent on regional and global cross-sectoral cooperation [9]. Whilst not specifically the subject of this paper these considerations are at the heart of the deliberations by the Preparatory Committee established by General Assembly Resolution 69/292 to develop an international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biological diversity of ABNJ.

In the North-East Atlantic, the development of a ‘Collective Arrangement’ between relevant intergovernmental organizations is a leading effort to maximise synergies and mutual understanding [36,54]. But the “Collective Arrangement” also has shortcomings in being able to attract only some of the relevant international organizations; it is directed at the Secretariat level and thus is not binding on members of the competent organizations, and lacks the ability to attract or apply to distant water players/States from outside the region.

At the project level, an initiative seeking to better integrate these different designations and provide essential new knowledge of North Atlantic ecosystems through data gathering and synthesis is the EU ATLAS Horizon 2020 project (www.eu-atlas.org). The project aims to propose a marine spatial planning framework for sustainable blue growth and conservation in the deep North Atlantic, scenario testing, using 12 trans-Atlantic case studies, five of which are in ABNJ. It will provide ‘scaled-up’ information including basin-scale oceanography (flux, trajectories and thresholds); models predicting changes to ecosystem functioning; biodiversity hotspots and marine genetics. Case studies will then ‘scale down’ this information for regional management. The intention is to integrate EBSAs, MPAs and VMEs. If appropriate, proposals for APEIs and PSSAs will be included.

With regards to the effective and equitable management requirement under Target 11, questions regarding who should define the objectives of individual OECMs also require attention in assessing equity and effectiveness. The LMMA case study from Mozambique illustrates an example where communities are being supported to lead on establishing marine conservation areas for biodiversity and ecosystem services that directly benefit livelihoods of these same communities. Preliminary results indicate that effectively enforced management measures have the potential to increase catch and raise local interest in marine management. This case study highlights an approach with potential to meet shorter-term community needs for provisioning services such as income and food, and the inclusion of biodiversity objectives through replenishment zones (supporting ecosystem services). However, additional supporting actions are required in the short term to improve food security, education and well-being, which are essential conditions for the longer-term sustainability of LMMAs. While this might be feasible at a project level through involvement of multiple organizations, government institutions also require resources (in line with SDG 16.6 and 16.7) to provide support to communities in co-management, which is currently lacking. In this context, interventions that fail to tackle the underlying issues of food insecurity, poverty, and gender inequality are unlikely to result in sustainable and effective LMMAs. This case study therefore illustrates the indivisible and integrated nature of the SDGs.[47]

5. Conclusions

There is much debate on which area-based conservation measures could qualify as OECMs in the context of Aichi Target 11, particularly with regards to their effectiveness. The risk of developing criteria that do not match MPA standards, is that States would be allowed to count any area-based management measure against the 10% marine conservation target. Furthermore, this numerical target has been perceived by some commentators as insufficient to protect areas important for biodiversity and ecosystem services and ensure socio-economic benefits [58]. Therefore, it is important to remember that Target 11 is also comprised of important qualifiers that go beyond the numerical target and that cannot be ignored in assessing progress. If the qualifiers are given proper consideration, OECMs can complement individual MPAs (depending on the biological characteristics and vulnerability of the area) and contribute to ecologically coherent MPA networks, while also being integrated into wider seascape through ecosystem-based management.

In their emerging 'field trial' stage guidelines for recognizing and reporting OECMs, IUCN [34] note potential for OECMs to engage new partners; incentivise and recognize application of robust conservation and management; and stimulate improved management and restoration to achieve long-term "in situ" conservation of biodiversity. IUCN propose a rapid assessment screening tool to ascertain whether an area may or may not qualify as an OECM, including ensuring that the conservation outcome is likely to be sustained when challenged (i.e. legally or through other means such as customary laws or sanctions). To contribute meaningfully to OECMs, the area-based measures discussed here must demonstrate that the conservation efforts they establish should not be easily reversed and is consistent with the ecological timeframes of the ecosystem in question.

The sectoral area-based management tools highlighted in this article (PSSAs, APEIs, VMEs) are all subject to periodic review and revision. It is incumbent on the organizations concerned to ensure that they are both effective and enduring. In particular VMEs should not be regarded as temporary set asides: unlike some other types of fisheries closures that may be subject to periodic exploitation, VMEs focus on sensitive habitats and species many of which are long-lived, slow-growing and have limited fecundity. LMMAs, as described here, should also be considered OECMs for the purposes of Aichi Target 11 under the same conditions, as they contribute to both biodiversity conservation and ecosystem services. To avoid conflict with other users (e.g. oil and gas, industrial fishing, among others), LMMAs, however, can further benefit from a more formalized statutory designation (e.g. as MPAs) and/or inclusion into broader ecosystem-based management or marine spatial plans. This case study also highlighted the need for integrated efforts towards different SDGs, especially those addressing social safetynets and capacity building, to ensure the long-term sustainability of the conservation measure in question and of the benefits it provides to livelihoods. Therefore, assessed on a case-by-case basis and under the conditions highlighted herein, PSSAs, APEIs, VME closures and LMMAs could be considered effective OECMs.

Moreover, the inter-relationship (and even inter-dependency) between SDG 14.5 and several other SDG 14 targets and other SDGs demonstrates that coordinated approaches are required for their meaningful implementation, including through mainstreaming of relevant Aichi Biodiversity Targets.

[47] This is consistent with the UN Ocean Conference outcome document “Our Ocean, Our Future: Call for Action” (A/Conf.230/11 [73]), paras. 6 and 13 (a).

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