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1. Introduction

1. Marine Protected Area (MPA) definitions have evolved over time to include a range of marine areas where human activities are subject to some level of restriction or management to protect living, non-living, cultural and/or historic values. Protection can include sites subject to restoration, rehabilitation and precautionary measures. The International Union for the Conservation of Nature (IUCN) protected area definition (below), whilst clearly recognising nature conservation as the primary objective, allows flexibility, identifying a protected area as:

   'A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values' (Dudley, 2008).

2. Key elements are therefore the area-based nature of any designation, consistency with international law, and long-term conservation objectives linked to timescales appropriate for specific species, representative habitats and/or ecological processes. IUCN defines a set of six MPA 'use' categories and four governance types, reflecting that some MPAs accommodate compatible activities (e.g. ecotourism) and even some extraction (e.g. strictly defined and limited fisheries). Day et al., 2012 have produced guidelines for applying IUCN protected area management categories.

3. However, the term MPA is not universally popular or acceptable. A root cause of this is a perception that, despite the broad IUCN Categories, MPA designation will promote conservation objectives on the basis of a moratorium on other and future uses. As a consequence sectoral agencies have developed their own (at times synonymous) terms: for example, the International Maritime Organization uses Particularly Sensitive Sea Areas (PSSAs) and Special Areas under MARPOL; the International Seabed Authority prefers Areas of Particular Environmental Interest (APEIs) and Preservation Reference Zones (PRZs); and FAO and Regional Fisheries Management Organisations have a system of closed areas and Vulnerable Marine Ecosystems (VMEs). Very often analyses of MPAs fail to take account of these other sectoral area-based designations, many of which apply to extensive marine transboundary areas.

4. Marine boundary limitations are based upon established zones of national maritime jurisdiction as well as the framework for governance and regulation of marine areas beyond national jurisdiction, balancing the rights and duties of States including a general obligation to protect and preserve the marine environment, as determined by the 1982 United Nations Convention on the Law of the Sea (UNCLOS, 1982). Within the Territorial Sea (0-12nm) right of innocent passage is granted to foreign ships but there are technically no High Seas freedoms. Within the Contiguous Zone (12-24nm) States have control for customs, fiscal, immigration and quarantine purposes. From 12nm seawards High Seas freedoms apply (freedom of navigation, overflight, laying of submarine cables and pipelines and other lawful uses by any State) and the Exclusive Economic Zone (EEZ) applies in the area 12-200nm from the baseline. Continental shelf extension (up to 350nm from the baseline if approved by the Commission on the Limits of the Continental

Shelf (CLCS)) applies to the sea floor and subsoil beneath the continental shelf. Beyond the continental shelf and any extended continental shelf the seafloor is The Area for the purposes of non-living resources and beyond 200nm is the High Seas for fisheries, living resources on the sea floor and for fisheries and purposes other than exploitation of non-living resources on or under the seabed. Extensive marine transboundary areas are therefore likely to be within adjoining EEZs, waters superjacent to Continental Shelf extensions, archipelagic waters of an archipelagic State, High Seas or any combinations of these different boundary limitations.

5. In 2010 GRID-Arendal made an analysis of CLCS submissions with comparative figures for other maritime zones. This information is summarised in Table 1.1. At that time, 53 CLCS submissions covered an accumulated area of 26.1 million km^2 to an average depth of 3,600m, with a further 43 Preliminary Information Documents covering a further estimated accumulated area of 4 million km^2.

Maritime zone	**Area**
Territorial Sea	22.4 million km^2
Contiguous Zone	6.6 million km^2
Exclusive Economic Zone	101.9 million km^2
Total area under national jurisdiction excluding outer continental shelf	131.0 million km^2
High Seas	200.4 million km^2
Area of the Earth covered by Oceans	Ca. 335 million km^2

Table 1.1: *Area coverage of different maritime zone (Source: GRID-Arendal, 2010)*

6. Delineating the exact extent of these maritime zones and defining the jurisdiction and sovereignty of coastal States is likely to take at least a further 10 years. For successful joint submissions to CLCS it is then incumbent on countries to determine their maritime boundaries bilaterally. Continental shelf extensions will bring associated obligations to establish extensive and/or transboundary MPAs. At the Convention of Biological Diversity COP10 in Nagoya Japan, the international community adopted the 2011-2020 Strategic Plan and associated Aichi Biodiversity Targets. Under Aichi Target 11 State Parties to CBD committed to:

> '*By 2020…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…seascape.'* (CBD COP/10/INF/12/Rev.1).

7. Notwithstanding this impetus, nearly two-thirds of the oceans are beyond any State's territorial sovereignty or jurisdiction. The UNGA has recognised the importance of marine

biodiversity for sustainable livelihoods - global food security, healthy functioning marine ecosystems, and economic prosperity - also acknowledging that no overall cross-sectoral mechanism for management currently exists in ABNJ. To address this UNGA decided to establish an Ad Hoc Open-ended Informal Working Group to study issues related to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction (A/RES/59/24, para 73). Biannual meetings of the Working Group from 2006 explored relevant issues and in 2011 delegations decided to establish a process within the Working Group and convened two workshops to focus on a package of issues (see Figure 1). The 'package' includes conservation and management tools, specifically area-based management and environmental impact assessment. In 2013 the Working Group reaffirmed a Rio+20 commitment (para 162) and in 2015 agreed to take forward a draft General Assembly resolution to develop draft text of a legally binding instrument (Druel and Gjerde, 2014). This lengthy process will work by consensus and is scheduled to make substantive recommendations to the 72nd session of UNGA by the end of 2017. Hence it is extremely unlikely that any Implementing Agreement will be agreed before 2020 and a parallel process to designate High Seas MPAs will need to be made by appropriate competent international organisations and Regional multilateral environmental agreements.

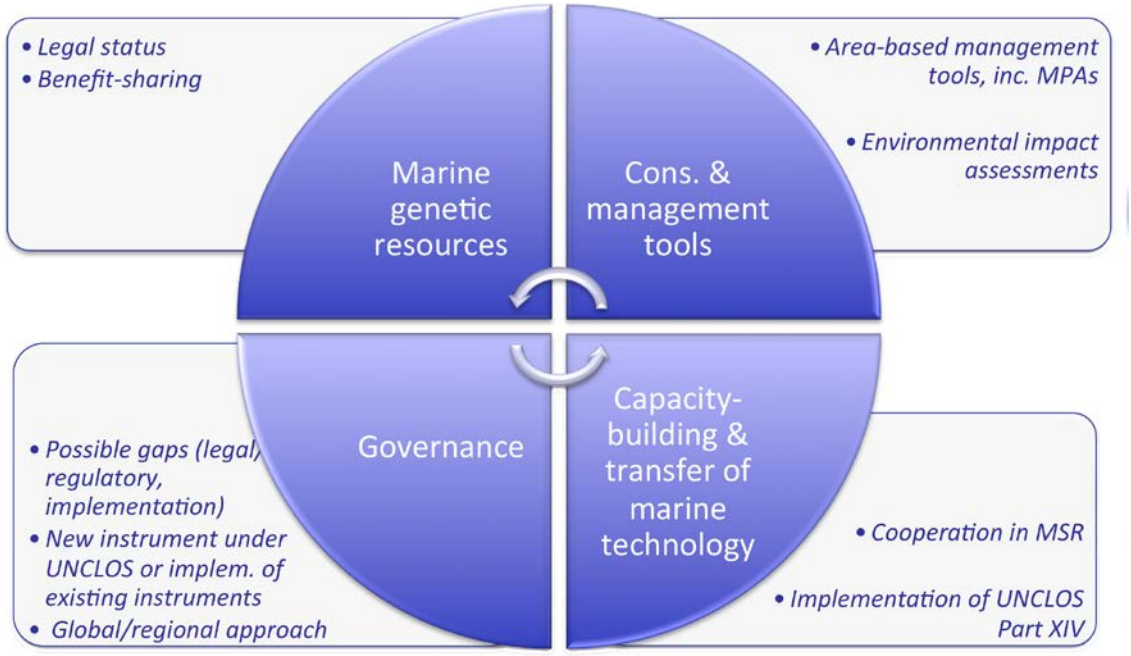

Figure 1.1: *The 'package' of issues to be considered for protecting biodiversity beyond national jurisdiction (Source: UNDOALOS, 2015)*

8. Advantages and benefits of MPAs extend beyond direct benefits to marine biodiversity (maintaining or restoring ecosystem structure, function and integrity). A significant body

of work has demonstrated benefits to fish stocks including greater size, abundance and fecundity of fish in fully protected no-take marine reserves. So-called 'spillover effect' can then benefit adjacent non-protected areas. For example, Roberts (2012) asserts that 'marine reserves do replenish populations in surrounding fishing grounds' and 'modern reserve networking theory is validated by exchange of offspring of animals among protected areas'. Social benefits of community-wide involvement in MPAs include empowerment and social cohesion as well as cultural reinforcement. MPAs are compatible with certain aspects of 'blue growth' including sustainable recreation and tourism, biotechnology, aquaculture and renewable energy. Recent studies of methods to assess socio-economic benefits of MPAs highlight the need to establish plausible links between ecosystem functions and benefits derived (i.e. ecosystem services) using both monetary and non-monetary approaches (Fletcher et al., 2014). Arguments have also been advanced that benefits conferred by MPAs and MPA networks that span large distances and geographic areas include buffering against large-scale changes and increasing variability as a result of climate change (Lubchenco et al., 2003). Overall, Ballantine (2014:1) concluded that 'The general benefits of marine reserves to society as a whole; directly to conservation, education, recreation and management, and indirectly to fisheries, tourism and coastal planning; are so important that a systematic approach to their creation is in the public interest'.

9. Within this International context, the Mediterranean is one of the priority ecoregions in the world. It represents only 0.82% of the ocean surface, but with nearly 17,000 known marine species it is home to 4-18% of global marine biodiversity, according to the taxonomic groups examined (Coll et al., 2010; Bianchi & Morri, 2000), and has an important endemism of 10 to 48% depending on the groups (in Coll et al., 2010). This remarkable diversity is the result of its geological history: the opening / closing of the Straits of Gibraltar with consecutive drying / reflooding in the basin, warming and ice age cycles, mixed flows from the Atlantic Ocean and the Red Sea via the Gulf of Suez.

10. In the Mediterranean, the intensive use of maritime space calls for more integrated management, to avoid cumulative impacts on marine ecosystems, users' conflict, and to create synergies between maritime activities and promote blue economy. As discussed before, MPAs are an efficient tool contributing to achieve these Mediterranean and worldwide goals. The Specially Protected Areas and Biological Diversity Protocol (SPA/BD Protocol) and the Strategic Action Programe for the Conservation of Biological Diversity in the Mediterranean (SAP BIO) are the main tools which the Contracting Parties to the Barcelona Convention can use to implement the Convention on Biological Diversity 2011-2020 Strategic Plan and associated Aichi Biodiversity Targets. The Protocol gives three key elements to ensure the preservation of the Mediterranean's biological diversity:

    - The creation, protection and management of Specially Protected Areas (SPA);

- Drawing up a list of Specially Protected Areas of Mediterranean Importance (SPAMI[1]) and
- The protection and conservation of species.

11. Additionally, under the SPA/BD Protocol, Mediterranean countries contribute to the objective of establishing a coherent Mediterranean network of marine and coastal protected areas by implementing the Regional Work Programme for marine and coastal protected areas in the Mediterranean, as well as in open sea, which was adopted by the Contracting Parties to the Barcelona Convention in 2009.

12. This report will firstly review progress in establishing MPA coverage in the context of a global goal to create ecologically coherent networks of MPAs. The report then examines possible MPA management measures, setting out different options and providing a commentary on MPA management plans. Large marine transboundary areas raise specific questions for surveillance and enforcement. The report considers how new technologies are helping to address this challenge by providing tools with the potential to help manage multiple activities. The report distills structures and governance arrangements considered essential to deliver effective results for large and distant transboundary areas, shared marine resources and extensive MPAs. Finally, conclusions and recommendations are suggested for effective management structures and governance arrangements to support collaborative MPA initiatives.

[1] Specially Protected Areas of Mediterranean Importance (SPAMI) are sites "of importance for conserving the components of biological diversity in the Mediterranean; contain ecosystems specific to the Mediterranean area or the habitats of endangered species; are of special interest at the scientific, aesthetic, cultural or educational levels".

2. Progress in Establishing MPA Cover

13. MPA establishment has lagged behind terrestrial protective designation. In 2010 only an estimated 1.31% of the ocean surface was included as MPA coverage.

14. The disparity is more dramatic when comparing nearshore and offshore waters. Spalding et al. (2013) provide the most recent headline figures summarised in Table 2.1.

Global coverage of MPAs (2012)	**Biogeographic coverage**	**Political coverage**
8.3m km^2 (2.3% global ocean area) 7.9% of waters <200m 1.7% of waters >200m	Representation in all coastal realms and provinces but particularly poor coverage of offshore pelagic provinces	5.69% of jurisdictional space (0-200nm) falls within MPAs 28 of 193 countries had met the 10% Aichi Target 111 of 193 countries and territories had less than 1% MPA coverage

***Table 2.1**: Analysis of MPA coverage in 2012 (Source: Spalding et al., 2013)*

15. The first MPAs were pioneered by New Zealand and, until very recently, richer and more developed countries have made the most rapid progress in designating MPAs in their national waters. For example, ten EU Member States had met the 10% Aichi Biodiversity target in 2012. As of March 2015 the UK is protecting 16% of UK waters (based on 108 Special Areas of Conservation with marine components; 108 Special Protection Areas with marine components; 28 Marine Conservation Zones; 30 Nature Conservation MPAs; and 1 Marine Nature Reserve) and 22% of waters under British jurisdiction (Fig. 2.1).

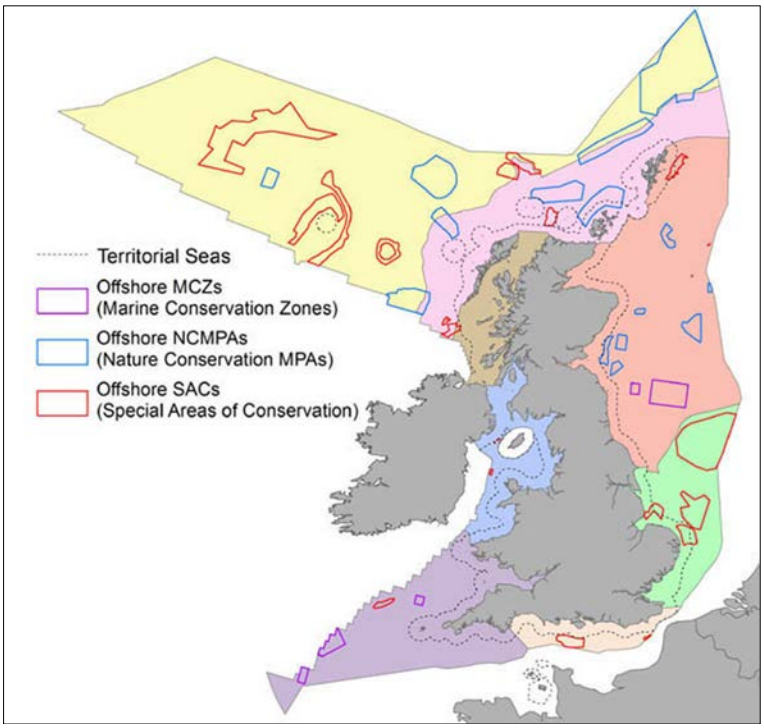

***Figure 2.1**: Offshore MPAs in UK waters. Image courtesy JNCC; www.jncc.defra.gov.uk/marine protected areas*

16. High Seas MPAs are proving the most difficult to establish for reasons explained in the previous section. Those established are the result of consensus-led negotiations over several years and have taken one of three approaches:

    - Coalition approach: e.g. PELAGOS sanctuary (see following section);
    - Sectoral approach: e.g. International Seabed Authority Areas of Potential Environmental Interest in the Pacific Clarion-Clipperton Zone (Lodge et al., 2012); **(Case Study 1: ISA)**
    - Regional organization approach: e.g. CCAMLR South Orkney Islands Southern Shelf MPA (Hislop and Jabour, 2015) and OSPAR MPAs in the Wider Atlantic Region of the North-East Atlantic (O'Leary et al., 2012). **(Case Study 2: CCAMLR)**

17. Lessons learned from the OSPAR experience are set out in detail in O'Leary et al. (2012) and Freestone et al. (2014). In summary these include the following steps:

    - Pressure and awareness raising by OSPAR Observer environmental NGOs and 'championing' by supportive Contracting Parties;
    - A scientific Background Document for each MPA collectively agreed by the Contracting Parties;

- Confirmation of the legal mandate of the Regional Seas Convention to protect biodiversity in the High Seas set out by the OSPAR Group of Jurists and Linguists;
- Conservation Objectives for each MPA agreed by the Parties;
- 'Socialising' of the concept both within national administrations and with other key stakeholders such as the Regional Fisheries Management Organisation;
- Combining hard law Decisions to establish the MPAs with soft law Recommendations setting out management obligations; and
- High-level decision-making. In OSPAR's case the High Seas MPAs were agreed at the 2010 Bergen Ministerial Meeting showing political will and leadership.

18. Consideration is currently being given by other Regional Seas Conventions and Action Plans (Abidjan Convention, Nairobi Convention and CPPS) to possible protection for High Seas areas adjacent to their current maritime areas. An initiative that may provide tools to help is Component 4 of the GEF ABNJ Common Oceans Project, which will consider dynamic ocean management and natural capital infrastructure planning approaches in pilot areas. The Sargasso Sea Commission is another model attempting to secure High Seas protection but finding this problematic in the absence of any formal Convention (Freestone et al., 2014).

19. Momentum and trajectory has been spurred in the last decade in response to political objectives to halt the loss of marine biodiversity. Toropova et al. (2010) state that the global MPA network grew by 150% in seven years. Targets set by WSSD and CBD failed to meet their 2012 deadline and have been extended to 2020[2].

20. Over the past decade a trend has emerged for the creation of extensive MPAs in remote areas. For 25 years the Great Barrier Reef Marine Park Authority established in 1975 was the outstanding protected area of this nature at 344,00km^2. Then in 2000 the Papahanaumokuakea Marine National Monument was established by the US covering 362,074 km^2. Subsequently increasingly extensive areas have been gazetted as shown in Table 2.2.

Name	**Country**	**Year establi-shed**	**Size (km^2)**	**Comment**
Phoenix Islands Protected Area	Republic of Kiribati	2008	408 250	UN World heritage since 2010 (largest and deepest WHS)

[2] Decision X/2 of CBD COP10

Mariana Trench Marine National Monument (NB. Pacific Remote Islands and Rose Atoll National Monuments est. as MPAs at same time)	Commonwealth of Northern Mariana Islands, USA	2009	246 609	Protected deep-sea trench with surface waters open to fishing
Chagos Archipelago, British Indian Ocean Territory MPA	UK Overseas Territory	2009/10	640 000	Subject to ongoing legal challenge
Motu Motiro Hiva Marine Park (Sala y Gomez)	Chile	2010	150 000 planned expansion to 411 000	Isolated reefs north-east of Rapa Nui (Easter Island)
Cook Islands Marine Park (Marae Moana)	Cook Islands	2012	1, 065, 000	Core area and surrounding areas zoned for multiple uses significant support from NGOs
South Georgia and South Sandwich Islands MPA	British Overseas Territory	2012	1,070,000	Exceptional biodiversity and endemic cold water species
Le Parc Naturel de la Mer Corail (Natural park of the Coral Sea)	New Caledonia, French Overseas Territory	2014	1, 300, 000	Unique geological diversity (deep sediment basins, seamounts and coral reefs)
Pacific Remote Islands Marine national Monument	USA islands lying between Hawaii and American Samoa	2014	2, 000, 000	Uninhabited and access only for scientific research
Pitcairn Islands Marine Reserve	UK Overseas Territory	2015	834 334	**(Case Study 3: Pitcairn)**

Table 2.2: *Extensive MPAs established over the past decade (Source: adapted and updated from Toonen et al., 2013 presented in Day et al., 2015)*

21. But concerns have been expressed about this 'bigger is better' approach (Pala (2013); De Santo (2013)) highlighting the risks of favouring a political rather than ecological

rationale as well as challenges associated with long-term monitoring, enforcement and social justice (see following sections).

22. To strengthen standalone MPAs, regional approaches provide various frameworks for multilateral cooperation. Johnson et al. (2014a) highlight both:

- Networks promoted by UNEP Regional Seas Programmes promoting intra and inter-regional cooperation (Rochette et al., 2014); and
- Community-based MPAs including locally managed marine areas (LMMAs) considered to be a critical initiative in the Pacific Oceanscape Framework and protecting more than 11,000 km2 of marine resource in the Western Indian Ocean (Rocliffe et al., 2014)

23. Ecologically coherent networks are seen as optimal for biodiversity (Olsen et al., 2013). In many regions this is politically problematic (e.g. Vu, 2014). Notable examples of collaborative efforts to create such networks include:

- The French GEF (FFEM) MPA network project (2006-2010) implemented by WWF Madagascar under the management of the Indian Ocean Commission. Based upon a regional ecological analysis, 45 potential priority sites for seascapes and sites of critical importance for marine conservation and fisheries have been identified using Marxan and expert knowledge; and
- Australia's marine reserves network (proposed in 2012) stipulating restrictions to fishing and oil and gas exploration with expected compensation to the fishing industry (100m Australian $), increasing Australian reserves from 27 to 60 a total of 3.1m km2. However, elements of this network are controversial. For example, the NW region is considered by some to be vulnerable to more foreign trawlers fishing illegally.

24. Arguments for more dramatic reverse burden of proof-type measures have been made by academics and NGOs. For example:

- MPA designers seeking to achieve management for sustainable fisheries have argued in favour of larger MPAs. For example, Walters (2000) described a modeling tool ECOSPACE advocating much larger MPA areas incorporating 'fishing exceptions' where stock size is uncertain, rather than MPAs as exceptional areas, in order to protect seed spawning stock and local biodiversity;
- High Seas closure: White and Costello (2014) make the case for a complete closure of the High Seas to fishing on the basis of their calculations showing large gains to fisheries profit, fisheries yields and fish stock conservation; and
- The Global Ocean Commission's recommendation in response to recognizing weak High Seas governance of an 'High Seas Regeneration Zone' (GOC, 2014).

25. In 2008 the CBD adopted seven criteria to describe Ecologically or Biologically Significant Areas (EBSAs). The EBSA expert process has broadened from its original intention to establish MPAs in open ocean waters and deep sea habitats to integration of physical, biological and biogeographic data that can more generally inform future protection of biodiversity by States and competent international organisations. To date:

    - 204 EBSAs have been accepted by CBD covering a total area of 63.8m km2. Many EBSAs span the boundary between EEZ and ABNJ, and some are exclusively High Seas, but the majority have been described by developing countries within national jurisdiction (Dunn et al., 2014);
    - A further 42 EBSAs have been described in the Northern Indian Ocean and additional regional workshops are planned;
    - The EBSA descriptions vary considerably in terms of how well the different criteria are met, their extent and whether or not they recognise fixed benthic features such as seamounts or dynamic pelagic features such as upwelling systems; and
    - In some regions EBSAs incorporate MPAs and fisheries closures. In others potential MPAs (and other measures) are under consideration using EBSA data **(Case Study 4: Prospective transboundary MPAs in the Western Indian Ocean).**

26. Active consideration is being given to how EBSAs can provide the basis for marine spatial planning to achieve long-term sustainable protection (Weaver and Johnson, 2012).

27. Broader definitions of MPAs would extend area coverage considerably. Aichi Target 11 includes ‘other effective area-based conservation measures’. Arguably these could include:

    - Vulnerable Marine Ecosystems (VMEs) are ‘groups of species, communities or habitats that may be vulnerable to impacts from fishing activities’. They can be identified by States or through RFMOs. VMEs are an integral part of the International Guidelines for the Management of Deep Sea Fisheries on the High Seas adopted by the Food and Agriculture Organisation in 2009. Rice et al. (2014) suggest that ‘The CBD workshop processes appear to view description of EBSAs as the building of relevant strategic information on biodiversity and a starting point for dialogue with States on what measures they might decide to implement, whereas the RFMO/A actions to identify VMEs quasi-automatically attaches a formal label to places where they are committed to take management actions’ (Rice et al., 2014: 206). The FAO launched the VME database website in 2014 (www.fao.org/in-action/vulnerable-marine-ecosystems/en/).
    - Particularly Sensitive Sea Areas (PSSAs) designated by the International Maritime Organisation apply to international shipping and must have at least one Associated Protective Measure to reduce risks to ecological, socio-economic or scientific criteria justifying designation (**Case Study 5: Coral Sea PSSA**)

- Large cetacean and fishery management areas such as Indian and Southern Ocean Whale Sanctuaries established by the IWC and the Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest; and potentially
- The entire CCAMLR Convention Area of 35m km^2, which is equivalent to an IUCN Category IV MPA according to advice of the CCAMLR Scientific Committee. Similarly the Pacific Oceanscape, a collaborative management agreement between 15 Pacific Island nations covers 38.5 km^2.

28. However, percentage coverage does not necessarily achieve conservation objectives and is not in itself sufficient to meet the CBD Decision's requirement of 'ecologically representative and well-connected systems'. The case for a global representative system of MPAs, based on marine regions defined by biogeographic criteria, was set out in 1995 by the Great Barrier Reef Marine Park Authority, The World Bank and The World Conservation Union (IUCN). More recently analyses of ecological coherence of MPA networks have been undertaken, based on scale, size and spacing of MPAs, taking into account representation of habitats and species, replication, adequacy (the proportion of habitats and species protected), viability and connectivity. A conclusion of an ecological coherence study for the North-East Atlantic (Johnson et al., 2014b), which found an overall lack of coherence, was to focus on smaller sea basin regions. A more detailed assessment for the Celtic Sea (OSPAR Region III) reached a more positive conclusion (Rees et al. 2015 in press).

2.1 Mediterranean situation

29. The Mediterranean Sea provides vital areas for the reproduction of transboundary species: the Atlantic bluefin tuna's main spawning areas (Medina et al., 2007; Fromentin and Powers, 2005), the great white shark's unique breeding areas (Tudela, 2004; Abdulla, 2004), sea turtles – Loggerhead, Leatherback (Broderick et al., 2002), a remarkable number of cetacean species such as fin whale, sperm whale, Cuvier's beaked whale, killer whale, long-finned pilot whale, Risso's dolphin, rough-toothed dolphin, common bottlenose dolphin, striped dolphin, short-beaked common dolphin, and harbour porpoise (Notarbartolo di Sciara et al., 2010) and 15 species of seabirds (Carbonera and Requena, 2011).

30. As shown for the worldwide trend, the type of protection applied in Mediterranean MPAs is variable and reflects the cultural and political differences between countries. A total of 677 MPAs were inventoried in the Mediterranean by Gabrié et al 2012. This total includes 161 nationally designated MPAs, 9 MPAs that just have an international designation and no national designation and 507 Natura 2000 sites with marine components. This analysis also shows that 8.22% of the 12 nautical mile zone[3] is protected in the Mediterranean Sea, with a strong contribution from the Pelagos Sanctuary (6.1%; **Case Study 6**), while the

[3] The 12 nautical mile zone in the Mediterranean includes more than 50,000 km^2.

area beyond 12 nautical miles- which represents 74% of the Mediterranean surface - is very poorly represented in the MPA network: only 2.7% of which 2.6% is Pelagos, and 0.1% the Gulf of Lions Marine Nature Park (Fig. 2.2).

31. This inventory also confirms that there is still a disproportionate geographical distribution in MPAs between the southern, eastern and northern shores of the Mediterranean: 75% of them are located along the basin's north-western shore (Gabrié et al 2012). Whilst this is a significant concern, the 2012 Status report recognises that several southern and eastern countries (Algeria, Morocco, Tunisia, Libya, Israel and Lebanon) have many on-going projects, which, if these result in MPAs, would help achieve more representative coverage.

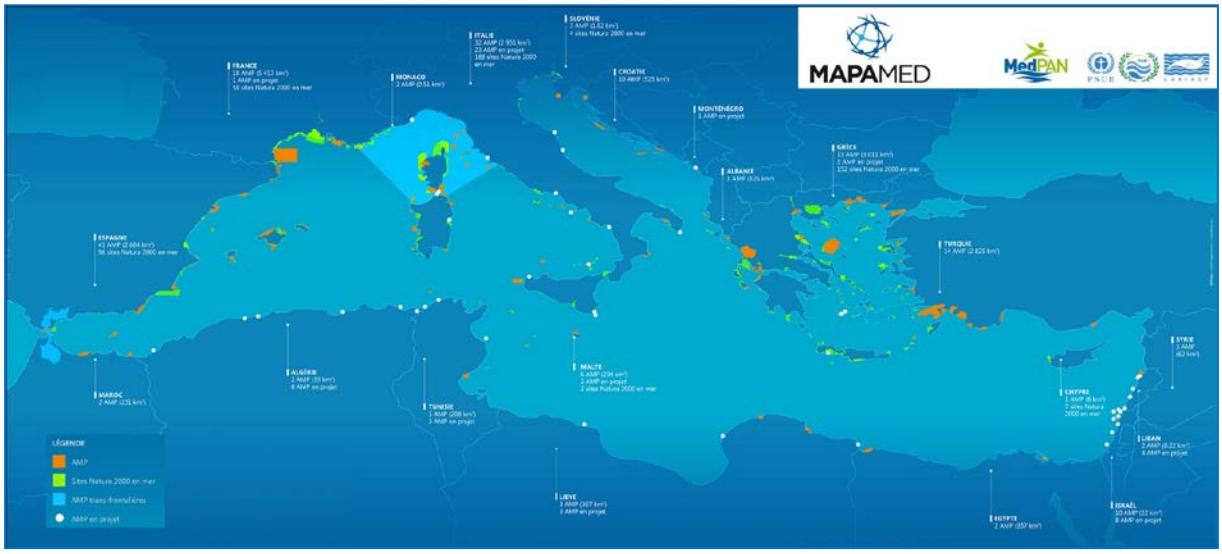

Figure 2.2: Mediterranean MPAs

32. However, this analysis did not take into account the existing sectoral area-based designations, which in the Mediterranean include:

- 4 Fisheries Restricted Areas in open seas designated by GFCM covering 17 677 km^2: the slope of the Gulf of Lion (2 017 km^2); Lophelia reef off Capo Santa Maria di Leuca (976 km^2); the Eratosthenes seamount (10 306 km^2) and the Nile Delta's cold seeps (4 377 km^2). See Figure 2.3.
- 1 Particularly Sensitive Sea Area designated by the IMO in the Strait of Bonifacio.

33. Moreover, the GFCM decided in 2005 to prohibit bottom trawling under 1000m depth in the Mediterranean, due to biological issues at such depths (sperm whale's prey species, deep benthic or pelagic fish) (see Fig. 2.3). This exclusion zone covers an area of 1 455 411 km^2, or about 58% of the Mediterranean Sea's surface area. ICCAT (another RFMO to manage tuna) has established, particularly for bluefin tuna, various restrictions

associated with stock recovery. In addition, the IMO decided in 1973 to establish a Special Area under MARPOL Annex V for the whole Mediterranean.

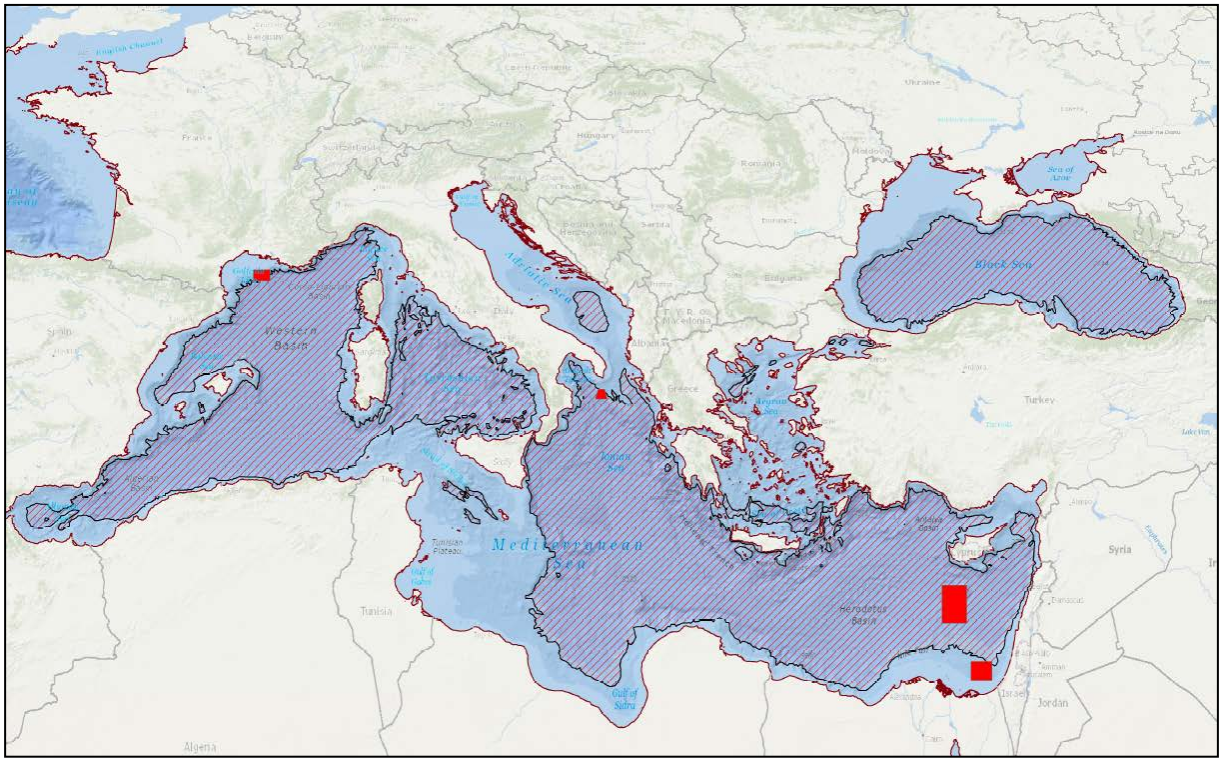

Figure 2.3: *Regulated fisheries declared by GFCM: bottom trawling exclusion zone and Fisheries Restricted Areas (in red).*

34. As can be inferred of these figures, the CBD target of 10% protection is far from being achieved in the Mediterranean Sea, especially for the High Seas realm. Existing MPAs cover a total surface area of almost 114 600 km^2, about 4.6% of the Mediterranean; and 1.1% if the Pelagos Sanctuary (87,500 km^2) which alone accounts for 3.5% is excluded. Less than 0.1% of the Mediterranean's total surface area is covered by a strict protection and/or no take zone. Since 2008, 23 MPAs have been established in 10 countries amounting to an additional area of 6 754 km^2 which represents close to a 7% increase of the protected surface area in 5 years in comparison to the 2008 protected surface area of 97 410 km^2, or 4% of the Mediterranean (Gabrié et al 2012). These figures do not take into account the 5 fisheries restriction areas created by the GFCM neither the PSSA established by the IMO.

35. Besides these analyses of trends in numbers and surface coverage of MPAs designation, it is important to consider that the existing studies show that the Mediterranean MPA network is currently not representative of all the Mediterranean ecoregions.

36. The analysis made by MedPAN and RAC/SPA in 2012 shows that the infralitoral zone (10% is covered by MPAs without Pelagos and 13% with), the circalitoral zone (3.9% is

covered by MPAs without Pelagos and 7% with Pelagos), are better represented than deep sea benthic habitats within the system of MPAs. In this sense the bathyal zone (resp. 0.6 and 4% without and with Pelagos) and the abyssal zone (resp. 0 and 2% without and with Pelagos) are good examples. Deep-sea biocenosis unique to the Mediterranean, such as cold seeps, brine pools and cold- water corals are not protected. Aside from deep-sea corals, deep-sea canyons and seamounts and other remarkable geomorphological features (such as submarine knolls and banks) are only weakly represented. Similar trends are seen for pelagic species. Among the iconic species considered in that analysis, only one of the seven species of cetaceans studied, namely the fin whale sees its range covered by over 10% by MPAs (Gabrié et al 2012).

37. The study presents also a bioregionalisation of the pelagic zone. The epipelagic bioregions identified, which indicate differences in oceanic water masses, are represented to various degrees within the network of MPAs. Offshore bioregions are by far the least protected, mostly when they are located in oligotrophic waters (nutrient poor) of Eastern Mediterranean. Only 2 pelagic bioregions reach the 10% protection target (the Gulf of Lion and the Aegean Sea).

38. Consequently, pelagic protected areas are a missing dimension in Mediterranean conservation. In order to overcome this High Seas MPAs challenge, the UNEP, together with the Barcelona Convention Parties' support, prepared a study to propose SPAMIs in open seas using its own preliminary EBSA identification work (UNEP(DEPI)/MED WG.348,. Inf. 3 to 5, 2010). The elements considered in this study were Vulnerable Marine Ecosystems, critical habitat for fish breeding, crucial habitats for cetaceans, monk seals, seabirds, turtles, sharks and the bluefin tuna. On this basis, 86 sites were identified and grouped in 12 priority conservation areas (UNEP(DEPI)/MED WG.348/5, 2010) (see Fig. 2.4).

39. Following this regional study, a Mediterranean regional workshop was jointly organized by the Secretariats of the CBD and UNEP/MAP from 7-12 April 2014 in Spain to facilitate the description of ecologically or biologically significant marine areas (EBSA) within the CBD context. On this basis, 17 EBSA were described (UNEP/CBD/EBSA/WS/2014/3/4).

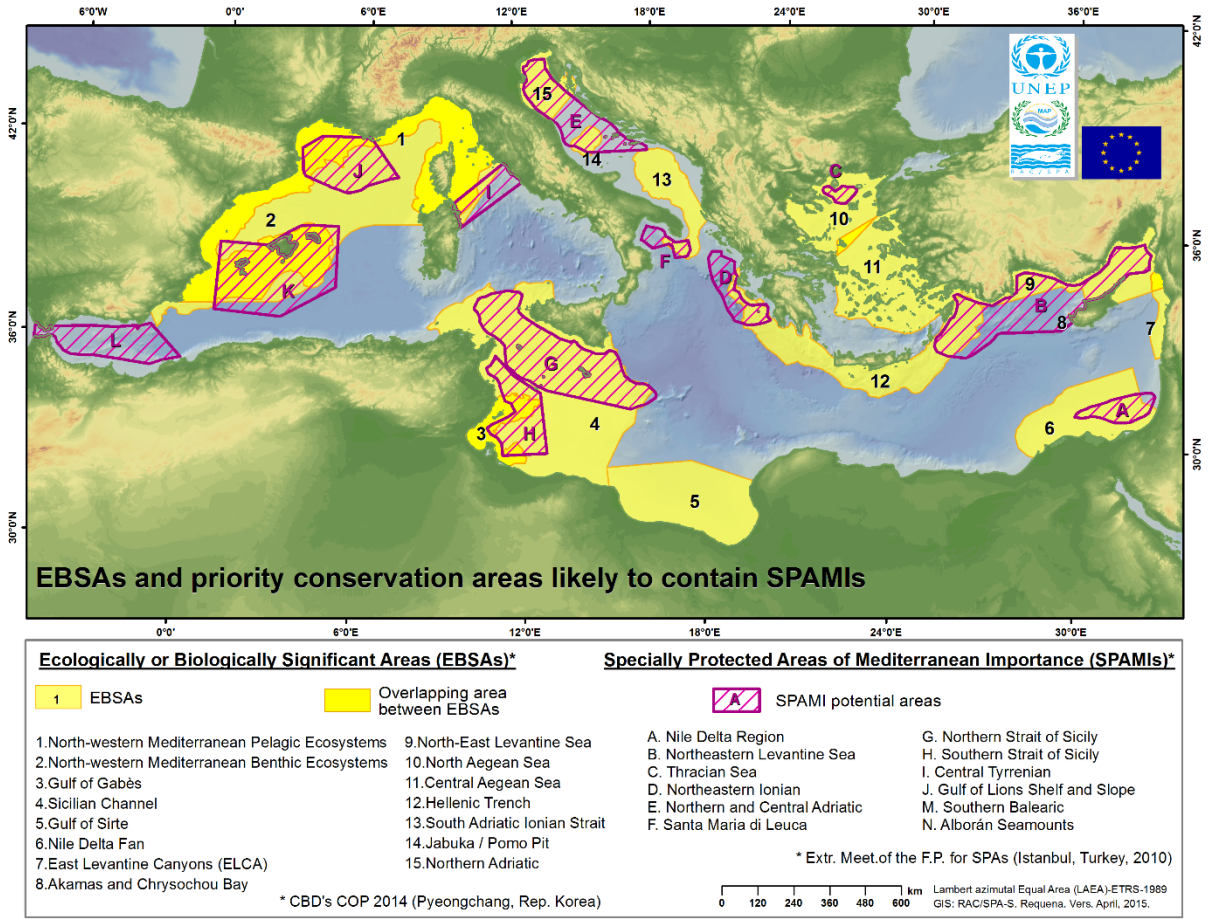

***Figure 2.4**: Map of the twelve priority sites identified during the first MedOpenSeas project phase (Extraordinary SPA FP, Istanbul, June 2010) overlapped on the EBSAs included in the CBD adoption (CBD COP12 Pyeongchang, October 2014).*

40. At the Conference of Parties in October 2014, 15 of the 17 Mediterranean Areas presented were deemed (COP 12 Decision XII/22) to meet the EBSA Criteria (see Fig. 2.4) . These 15 EBSA areas are now part of the CBD repository (see Fig. 2.5).

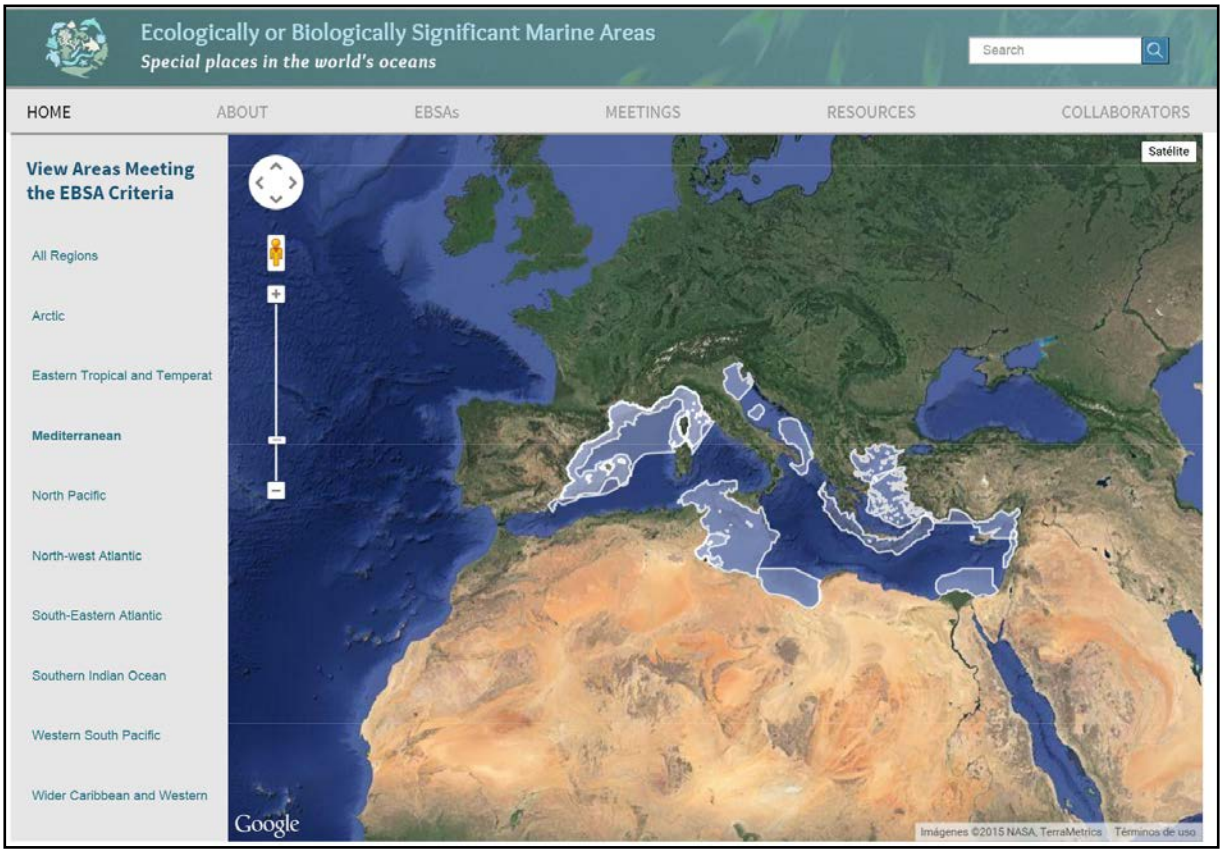

Figure 2.5: Mediterranean EBSAs part of the CBD repository.

41. In addition to these recent and forefront initiatives, other regional exercises have contributed to identifying some key areas to be protected: WWF identified 13 key areas to protect (2001), Greenpeace identified 33 potential marine reserves (2004), ACCOBAMS identified 15 areas to protect (2007). More recently, Oceana, in the MedNet report, proposed 100 sites for a network of MPA (2011, 2012), CIESM identified 8 transnational future zones proposed to be called Marine Peace Parks (2011).

42. Micheli et al. (2013a), provide a review of the multiple existing and proposed conservation achievements and plans within the Mediterranean. Importantly, the study highlights the consensus regarding top priority areas selected through these different planning processes.

3. MPA management measures

43. Without effective management provision there is a risk the MPAs will just be ‘paper parks’, where ‘legislation is not enforced, resources for protecting areas are lacking, and/or management plans are poorly conceived. In other MPAs management safeguards are in place, but pressures outside parks and reserves undermine the integrity of protected habitats’ (WRI, 2015). A commentary in 2001 estimated MPAs existing primarily on paper at that time to be as high as 80 – 90% (MPA News, 2001). In the same report practitioners highlighted shortages of funding, lack of community support, lack of economic alternatives and lack of management guidance as key reasons for ineffective management.

3.1 Data deficiencies, science needs and funding

44. Management should be informed by understanding of the system, its ecology and the pressures and threats of human uses on the flora and fauna present. Many transboundary marine areas are data deficient and MPAs have often been established as a precautionary measure. The onus is therefore to add information wherever possible and plan research accordingly. A concerted effort to bring together information for extensive transboundary areas has been made by the Global Environment Facility Large Marine Ecosystem (GEF-LME) Projects. **[Case study 7: CCLME]**

45. In the Mediterranean, Micheli et al. (2013b) analysed the intensity and distribution of cumulative impacts concluding that 20% of the entire basin and 60-99% of territorial waters of EU Member States are heavily impacted. Combining this spatial information on current impacts with scientific understanding provides an essential baseline.

46. Science needs and priorities for achieving coherent MPA networks in Europe were suggested by Olsen et al. 2013. These included:

- a more rigorous approach, including baselines and controls;
- understanding connectivity;
- ecological mapping and classification as a means of determining MPA representativeness;
- considering resilience to climate change;
- no-take zones and recovery;
- human responses and socio-economic effects;
- possible linkages between scientific monitoring and surveillance;
- clarifying legal issues for enforcement and surveillance of national/international networks of MPAs; and
- improving the social science surrounding stakeholder participation.

47. However, for extensive transboundary MPAs, gathering scientific evidence can be an expensive exercise. For example, the National Oceanography Centre UK are currently collaborating with Defra on use of new robotic technologies for mapping and monitoring MPAs (partly to try and reduce ship-time costs). In Aug-Sept 2015 they will be visiting a newly-designated Marine Conservation Zone off southwest UK called 'The Canyons' (http://jncc.defra.gov.uk/page-6556), and deploying a Remotely Operated Vehicle (ROV Isis) and and Autonomous Underwater Vehicle (Autosub6000) from RRS James Cook to assess the extent and conditions of cold-water coral habitats within and adjacent to the canyon system on the continental slope (>200 m water depth). Large research vessels like the James Cook, capable of accessing remote deep-water sites with hi-tech vehicles, can cost in excess of €35,000 per day. However, rapid uptake of robotic vehicles is increasing the rate at which high-quality data are collected, helping to reduce the amount of ship-time required.

48. Self-financing mechanisms using user-supported funding policies have been suggested to counter MPA funding shortfalls. Typically this has been the subject of 'willingness to pay (WTP)' and travel cost studies targeting user groups. For example, a study of Bonaire National Marine Park in the Netherlands Antilles suggested fees could be increased substantially based on scuba divers' WTP, raising sufficient funding needed for annual management costs (Thur, 2010). Johnson and Ferreira (2015) proposed an industry funded 'APEI Trust Fund' to support scientific research in areas protected from deep-sea mining activities.

3.2 Management options

49. A range of MPA management options to control adverse human impacts are available. These must relate to conservation objectives but can be compulsory or voluntary; time and space limited; directed at particular sectors; general or specific. Legislative tools include licenses and permits, but stakeholder engagement, education and awareness raising are equally valid and important. IUCN guidance is to combine top-down and bottom-up approaches to management (IUCN, 2008).

50. OSPAR has agreed international 'soft law' non-binding Recommendations for the management of each of its High Seas MPAs. Each Recommendation includes standard text on awareness raising, information building, marine science, provisions for new developments (e.g. ensuring Environmental Impact Assessments) and engagement with third parties. [**Case Study 8: Milne Seamount Cluster**]. Matz-Luck and Fuchs (2014) expressed concerns that these non-legally binding management measures are the responsibility of individual Contracting Parties.

51. However, although they are soft law these Recommendations place a moral obligation on OSPAR Contracting Parties to act collectively. Encouraging scientific research (e.g. through application of the OSPAR Code of Conduct for Responsible Marine Research in

the Deep Seas and High Seas of the OSPAR Maritime Area) is particularly relevant in offshore areas where data is poor.

52. For coastal MPAs, ranger services (often employing former fishers or hunters in developing countries) ensure practical steps such as deploying demarcation buoys, undertaking monitoring programmes and conducting surveillance and enforcement duties. Networks of MPA managers constitute professional communities of expertise who can share good practice and develop management tools. Johnson et al. (2014a) describe the success of such networks in the Mediterranean (MedPAN), West Africa (RAMPAO) and the Caribbean (CaMPAM).

53. For transboundary offshore MPAs monitoring, surveillance, enforcement and coordination with other entities is a different proposition (see following section). Management measures are most appropriately linked to sectoral threats and are likely to be the competence of respective international competent authorities. For example, the Western Central Pacific Fisheries Commission has moved to address the problem of Fish Aggregation Devices (FADs) as a conservation and management measure for Bigeye, Yellowfin and Skipjack tunas. Within so-called Common Measures for the period 2014-2017 the Commission has prohibited setting of FADs for 3 months (July, August, September) for all purse seine vessels fishing in EEZs and High Seas of the Western and Central Pacific. Additional measures and limits on total numbers of FAD sets also apply. Likewise the International Commission for the Conservation of Atlantic Tunas and Inter-American Tropical Tuna Commission have taken measures for certain capacity classes of purse seine and larger long-line vessels.

3.3 Management plans

54. Management plans capture the management regime for each MPA specifying protection objectives, regulations, permissible activities and monitoring regimes. Leay et al. (1986) describe the role of the management plan as a vehicle for recording systematically the characteristics of the site, acknowledging explicitly its most valuable aspect and specifying proposals and work programmes which are outlined in the plan. Management plans also formalise institutional arrangements for joint management planning. Thus, the management plan is an accepted means of rationalizing decision-making and ‘the value of a management plan is to provide a ‘memorandum’ for an agreed framework of positive rather than reactive action’ (Johnson, 1996 p275). Even for non-consumptive activities such as recreation and marine tourism – risk analysis is needed (Thurstan et al., 2012). An example of a management plan for deep-water feature is the OASIS Sedlo Seamount draft Management Plan [**Case Study 9: Sedlo Seamount**]

55. Regional and national guidelines for MPA management plans within national jurisdiction have been established (e.g. OSPAR, 2003) but for ABNJ this is a work in progress. In 2014 WWF produced a management plan proforma for Josephine Seamount MPA for consideration by the OSPAR Biodiversity Committee (OSPAR, 2014) to prompt discussion. This document considered potential threats and vulnerabilities in the context

of specific objectives for the water column, benthopelagic layer and habitats/species of concern in the context of a vision and overall objectives as stipulated in the management Recommendation. For transboundary areas key stakeholders are likely to include competent international organisations as represented by their respective Secretariats. To this end OSPAR and the North-East Atlantic Fisheries Commission (NEAFC) have pioneered a 'Collective Arrangement' applying to selected areas of ABNJ within the North-East Atlantic. The intention of the Collective Arrangement is to promote, within the framework of their respective mandates, regular inter-organisation consultations for the purposes of voluntary information exchange, cooperation where appropriate on environmental impact assessments, strategic environmental assessments and equivalent instruments (Johnson, 2013a; Hoydal et al., 2014). OSPAR and NEAFC formally ratified this Collective Arrangement in 2014 (OSPAR Agreement 2014-09) and OSPAR Parties have made a commitment to introduce the initiative in other forums. The first 'official' meeting between OSPAR and NEAFC under the auspices of the Collective Arrangement was held in April 2015.

3.4 Evaluations of 'well managed'

56. Day et al. (2015: 630) state that ' an adaptive management approach is essential for effective MPA management. Particularly in large MPAs, where levels of uncertainty may be highest, this is best achieved through regular interaction between agencies across all levels of government and with local communities and interest groups'. Fernandes et al. (2005) illustrated this process as applied to The Great Barrier Reef Marine Park, which revised its network of no-take areas from 4.5% to 33% coverage (115,000km^2). This revision termed the Representative Areas Programme was a rezoning of the entire area between 1999-2003. It was a technical exercise based on clear scientific parameters (at least 20% protection per bioregion, minimum levels of protection for all known habitats and special or unique features, and minimum sizes for no-take areas) but it also involved communicating with the public as to why better protection was needed and inviting community input. Stakeholder engagement of this nature must be handled carefully to avoid resentment of management policies and/or interest groups compromising conservation objectives.

57. Scorecards have become an accepted methodology for evaluating MPA effectiveness and demonstrating accountability. The World Bank (Staub and Hatziolos, 2004) scorecard is a short straightforward metric allowing managers to identify where management is succeeding or otherwise, enabling comparisons and communication. Pomeroy et al. (2005) developed an effectiveness methodology and indicators as an adaptive management tool, arguing that management effectiveness of MPAs must be based on continuous feedback of information to achieve objectives. OSPAR drew inspiration from both these initiatives when producing it own Guidance (OSPAR, 2007). Another recent standardized methodology for monitoring MPAs is the scorecard-based ecological

condition reporting applied in North America by the Commission on Environmental Cooperation (in collaboration with the North American Marine Protected Area Network – NAMPAN) adapted from the 'System-Wide Monitoring Approach' (SWiM) used by the US National Oceanic and Atmospheric Administration (CEC, 2011). This is a consensus-building approach based on 12 questions in three categories (water, habitat and living resources) that also serves as a communication tool.

3.5 Mediterranean situation and examples

58. For the Mediterranean, Gabrié et al (2014) provided a recent analysis using an online survey[4] to measure the «effectiveness» of the MPA management. Eighty MPAs were selected and form the MPA sample group on which the management effort assessment was made. The following parameters were used to measure the management's effectiveness:

- Existence or absence of a management plan
- Existence of baseline studies for the MPA
- Implementation of regular monitoring programmes or occasional studies within the MPA
- Type of governance (participation of stakeholders)
- Presence of no-take zones
- Perception of the global evolution of fishery resources
- Personnel assigned to the MPA (sworn staff, staff training)
- Importance of the surveillance effort
- Existing infrastructure and equipment
- Awareness raising tools developed by the MPA
- Financing of the MPA and the existence of a business plan

59. Main findings of the study were:

1) The conservation of biodiversity (91% of MPAs), of key habitats (49%) and key species (26%) remain the main objectives for all the MPAs in the study.
2) 42% of all the Mediterranean MPAs have a management structure (95% of MPAs with a national status and 25% of Natura 2000 sites). Most of the MPAs (76%) are governed by the government whether at a local, regional or national level, with only 11% having shared governance in co-management or joint collaboration.

[4] *Consisting of 70 questions which were sent to Mediterranean MPA managers*

3) 56% of the MPAs in the sample group have no management plan. However, a significant improvement in these figures was expected as 22% of MPAs, among those without a management plan, reported being in the process of developing their management plan (Slovenia, Monaco, Spain, Malta...). In addition 67% of MPAs who have a management plan have already evaluated it, which give an idea of the management effectiveness.
4) 60% of MPAs have a good participation from local stakeholders in the planning and management of MPAs. Only three MPAs reported being directly managed by local communities.
5) 80% of the MPAs surveyed do regular monitoring in their MPA and with a good participation from the management structure's teams (30%) alongside scientists
6) On human resources management, 84% of MPAs reported having permanent staff, the most often supplemented by seasonal and temporary staff.
7) Surveillance together with implementing infractions' penalties, are known to be low in the Mediterranean MPAs. Only a quarter of the MPAs reported having sworn-in personnel, and most of them rely on partners for surveillance such as coast guards, marine police, armed forces or the police. The presence of illegal activities in the MPAs ranks fourth in the list of pressures and was reported by 40% of MPAs, which would justify increased surveillance.
8) The results on equipment of the MPA sample group surveyed show that MPAs are fairly well equipped in boats (surveillance and research), with only 12% indicating none and 30% having more than 2 boats. They are quite well equipped in GIS equipment too (more than 3/4 of the MPAs). In contrast, signs of demarcation at sea showing the boundaries of the MPAs are rare (11% of MPAs), as well as diving equipment, thus MPAs are generally poorly equipped.
9) Financial resources differ vastly among MPAs. Among the operating budget the results shows 7 MPAs whose operating budget is between 20 000 and 100 000 €/km², 8 between 10 000 and 20 000 €/km², and 15 MPAs between 1 and 10 000 €/km². Funding is mainly from government6 (89% of MPAs); few MPAs get funding from NGOs and international donors, while 36% of MPAs are self-financed, which is still too little to ensure the sustainability of MPAs who have no other resources, including some countries in the South or the North-East. The commitment of the private sector is currently low (only 8 MPAs mentioned it).
10) Half of the MPAs have a good cooperation with other Mediterranean MPAs, indicating that the human network for exchanging experiences (particularly MedPAN) works quite well.

60. It is important to keep in mind that this study was made for coastal / near-shore MPAs. The pelagic ocean is a uniquely dynamic environment, such that the lessons learned and evidence provided through the implementation of MPAs in near-shore benthic systems cannot, necessarily, be transferred to extensive transboundary systems.

61. Some indications could also be highlighted from the development of the MedOpenSeas Project. This project has been promoted since 2008 by the Regional Activity Centre for Specially Protected Areas (RAC/SPA) in order to facilitate the establishment of SPAMIs in the open seas, including the deep seas and areas beyond national jurisdiction.

62. During the first phase of the project, the RAC/SPA defined the 12 priority conservation areas mentioned above and evaluated the international legal instruments relevant to the conservation of marine biodiversity and the practicalities of their implementation in the Mediterranean in order to guide the institutional development of SPAMIS in areas beyond national jurisdiction (UNEP-MAP-RAC/SPA 2010).

63. During the second phase of the project (completed in December 2011), RAC/SPA started supporting neighbouring Parties of the Alboran Sea and Gulf of Lions priority areas in evaluating and potentially presenting joint proposals for these sites as candidate for inclusion in the SPAMI List, in accordance with the provisions of Article 9 of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean. The programme of work of the second phase included the establishment of ad hoc working groups, composed of technical representatives from the countries bordering both areas, Algeria, Morocco and Spain for the Alboran Sea and, France and Spain for the Gulf of Lions.

64. The third phase of the project (2012-2015) focused on three priority areas: Adriatic Sea, Alboran Sea and the Sicily Channel/Tunisian Plateau areas.

65. The final general discussion (UNEP(DEPI)/MED WG.408/Inf.9, 2015) highlighted that key steps for establishing sites that deserve to be managed in terms of conservation and sustainable use of resources in the open seas include *inter alia*:.

    1) Preparation of the technical documents for the description of the sites.
    2) Revision by neighbour countries.
    3) Joint statement from neighbour countries willing to create SPAMIs embracing the open seas.
    4) Presentation and final approval by an Ordinary Meeting of the Contracting Parties to the Barcelona Convention.
    5) Declaration of SPAMIs through national procedures.
    6) Preparation of draft management plans.

66. In the final step (6), additional international consultations with organisations (GFCM, CBD, ACCOBAMS etc.) would be undertaken.

67. According to the project general conclusion (UNEP(DEPI)/MED WG.408/Inf.9), the main concerns remained to be:

    - The effectiveness of the SPAMI instrument for the declaration of area-based management for conservation and sustainable use of nature resources in areas embracing the high sea. The discussions considered the different existing instruments

for the implementation of effective measures in the high sea, the International Maritime Organisation (IMO) for the maritime traffic, GFCM for fisheries, etc.

- The lack of enough information on threats and impacts by human activities.

[Case Study 10: **Sur de Almería MPA.]**

4. Surveillance and enfoncement

4.1 Introduction

68. The practical challenges of managing large transboundary marine areas, especially remote and deep sites, encompass surveillance and enforcement of management measures, which are an essential management activity in MPAs seeking to apply regulations that prevent damaging activities. More specifically these include:

    - Budget strains of policing an area remote from major centres of population;
    - The logistics of dealing with a wide variety of situations – size of area, jurisdictions, distance from shore, quantity and types of vessel traffic;
    - Access to assets (often these assets have shared functions); and
    - Integrating data streams into a usable and visually intuitive format for use by law enforcement personnel.

69. An example where this has proved to be a challenge is the Chagos Marine Reserve (see details in section 2 of this report), where illegal fishing is an issue and reef shark populations declined by an estimated 90% as a result of illegal fishing in the 30 years before the marine reserve was established. Year-round patrols by the British Indian Ocean Territory's vessel *Pacific Marlin* since establishment of the MPA in 2010 have resulted in arrests and prosecutions of illegal Sri Lankan vessels, but *Pacific Marlin* is the only vessel available and has other duties so therefore cannot be allocated to enforcement all the time (Chagos Trust, 2015).

70. Davis and Moretti (2005) reviewed US MPA compliance and enforcement issues. Their conclusions from a literature review examining influences on compliance with marine resource management programmes were that 'compliance can be directly related to the balance between the anticipated payoff from a violation, likelihood of detection and severity of penalties. However, many 'normative' factors are also important determinants of compliance, including social pressures and the perceived legitimacy of management authorities and regulations' (Davis and Moretti, 2005: 3). Commonly enforcement of marine conservation legislation is also undertaken by separate bodies under varying sets of powers provided by a range of legislation, which in turn influences levels of compliance.

71. In this section we argue that in addition to traditional policing methods, advances in technology and opportunities for cooperation will increasingly present more cost-effective solutions.

4.2 Conventional surveillance approaches

72. Brooke et al. (2010) undertook a global background study into surveillance and enforcement of remote marine areas (SERMA). Their overview of existing technological options for surveillance of remote marine managed areas distinguishes between cooperative v non-cooperative vessels. For the latter, targets are observed without their consent. A summary is presented below.

73. Cooperative tools include:

- Vessel Monitoring Systems: devices on vessels that sends a signal to satellite showing the vessel heading and speed. On receipt of this information ground stations can alert enforcement about interesting tracks and enforcement authorities can take a closer look. This real time technology is in common use in many States;
- Electronic monitoring systems: video cameras positioned on board and monitor activities such as fisheries catch handling; sensors may also be placed on winches (to monitor bycatch, size of fish etc.). Video analysis is labour intensive and data is not real time but these systems are less expensive than observers;
- Automatic Identification Systems (AIS): compulsory for ships >300GT under IMO legislation (primarily for navigational safety and collision avoidance as originally intended under SOLAS) is a powerful monitoring tool but with limited range (20-100nm) using a shipboard VHF broadcasting system. In future AIS will appropriate for smaller vessels (e.g. all EU fishing vessels >15m were required to be equipped with AIS by 2014) and/or deployed from mooring buoys (sited around an MPA) or on oil platforms. Satellite AIS is now commercially available and has been used to justify PSSA designation;
- Long range identification and tracking (LRIT) systems: use satellites to relay data from vessel to data centre (similar to VMS but not interfaced and LRIT data is only available to 2 parties). Vessel identification and location data is transmitted automatically. It can be requested by flag State and coastal States may track vessels within 1000nm of the coast. LRIT is mandatory on certain vessels – passenger ships, cargo ships >300GT, and mobile offshore drilling units.

[Case Study 11: Straits of Bonifacio PSSA]

74. Non-cooperative platforms and sensors include:

- space-based satellites: provide platforms for an effective first alert for larger areas (large scale high resolution images) but surveillance is not continuous and images are expensive, with some systems being sensitive to weather and light. Refresh rates can also be slow depending on system;

- Long range aircraft: surveillance planes are very valuable for medium range surveillance but expensive to purchase, maintain and operate. They are too expensive for many natural resource agencies but counter pollution authorities are open to cost sharing between agencies. Aircraft can be equipped with a great variety of sensors including radar, Synthetic Aperture Radar (SAR), visual and/or IR cameras and more specialized sensors for pollutants;
- Unmanned aircraft/drones: payloads can include visual and/or infra-red cameras, biological or chemical sensors and radar. These drones can fly extended missions (8-48 hours) but most are currently operated by the military (e.g. US Navy MQ-8B fire scout rotorcraft, US Coast Guard Bell Eagle, MQ-9) and their operation raises airspace issues.
- Patrol vessels: are the most common approach to maritime surveillance, range of vessels limited to line of sight even with radar and other imaging systems, They are usually necessary for follow-up in response to intelligence from other sources)

[Case Study 12: Kerguelen Islands]

4.3 New technologies

75. Brooke et al. (2010) also consider the potential of new technology alternatives and possible data fusion combinations of science and surveillance. Options include unmanned vessels, autonomous underwater vehicles, land or buoy-based (airships, aerostats, helikites – deployed from land, ships or vehicles; tethered or untethered, used for visual sensors and transceivers) seabed underwater mooring systems, and buoys with acoustic packages. Challenges for such systems include launch and recovery, resilience to heavy weather, and endurance for long-term observations, as well as safety and insurance in congested sea-lanes.

76. To illustrate what is possible two examples are presented below:

- Wave adaptive module vehicles (WAM-V) provide an autonomous surface platform. They are different designs of catamaran powered by wave energy electricity, with a range of 5000 miles, trialled in the San Francisco Bay area (www.wam-v.com); and
- Wave Glider a robust wave powered hybrid unmanned maritime vehicle designed to be a ‘persistent’ ocean presence, for which trial deployments of up to a year, including periods of high waves and strong winds, have been achieved. Wiggins et al. (2010) explore its utility for monitoring marine mammal acoustics and Daniel et al. (2011) consider application for oceanography research. Towed hydrophones can triangulate sounds to identify the unanticipated presence of powered craft. Their evaluations suggest Wave Glider is versatile and easily deployed allowing near real-time communications via satellite telemetry.

4.4 Partnerships with RFMOs and NGOs

77. In additional to technological solutions additional costs for MPAs could be offset by planning and cooperation between agencies and the non-profit sector.

78. Regional Fisheries Management Organisations (RFMOs) have an established track record for surveillance and enforcement of TACs and quotas, closed and protected areas (e.g. deep water corals and other vulnerable habitats), gear use (e.g. temporary prohibition of gill nets), and specific fisheries measures (e.g. shark fining). Leading RFMOs have comprehensive schemes of control and enforcement for their entire areas. Schemes of control for fishing vessels include general provisions, control measures, monitoring of fisheries, inspections at sea, port State control of foreign fishing vessels, infringements and measures to promote compliance. This is achieved, for example, by:

- VMS-based management using transponders (data transfer language) to deliver administrative messages (notification, limitation, withdrawal, authorization, suspension) and vessel activated messages (entry, position, exit);
- Vessel activity reports enshrined in fishing vessels' reporting responsibilities - manual position, catch on entry, catch since previous report, transhipment (vessel donor and receiver), port of landing, catch on exit
- Surveillance activity reports – from inspection vessels correlated between platforms and transferred to inspectors;
- Projects to improve monitoring control and surveillance (MCS) including:
    - integration of passive and active satellite-based technology
    - secure and harmonized e-logbooks
    - catch, effort and discard estimates in real time; and
- Port State control as applied to frozen catches caught in Convention Areas

79. Johnson (2013b) exemplified the successful enforcement in the North-East Atlantic by the North East Atlantic Fisheries Commission of the Panamanian registered *MV Polestar* between 2006-7. This vessel was observed in the NEAFC Regulatory Area receiving fish from IUU vessels. Sanctions applied to IUU vessels by Contracting Parties are severe, prohibiting supply of provisions and fuel, entry to port, future chartering etc. Frozen Redfish bound for South Korea onboard *MV Polestar* could not be landed in Japan or mainland China and was eventually landed in Hong Kong. The same presentation also noted 'Project Scale' a response by Interpol to escalation of transnational and organized criminal networks engaged in fisheries crime (see www.interpol.int/crime-areas/Environmental-crime/Projects/Project-Scale).

80. Global marine NGOs have similarly taken a strong interest in enforcement, particularly as related to Illegal Unregulated and Unreported (IUU) fishing.

81. Regional partnerships have formed to strengthen enforcement. For example, the MarViva partnership to combat illegal fishing in the Marine Corridor of the Eastern Tropical Pacific (which includes Coco Island National Park in Costa Rica, Coiba National Park in Panama, Malpelo Flora and Fauna Sanctuary in Columbia and the Galapagos Marine Reserve in Ecuador). In 2011, Columbia, Ecuador and Panama were classified by the National Oceanic and Atmospheric Administration as countries with outstanding enforcement challenges. In alliance with the government authorities in the region MarViva Foundation, Conservation International and Costa Rica Forever have partnered with Oceans5 to deter IUU fishing. Opportunities such as this exist to enhance enforcement in large transboundary MPAs through capacity building and assistance with cost sharing, technology transfer and training.

[Case Study 13: Project Eyes on the Seas]

4.5 Compliance regime

82. Seven elements of effective compliance programmes are set out by IMO in the PSSA Guidelines (IMO, 2007:3) as follows:

- Compliance monitoring: routine inspections, surveys and/or examinations;
- Detection and policing ‘patrols’;
- Reporting procedures and incentives;
- Adequate investigations of violations;
- A system of adequate sanctions;
- Education and public awareness programmes; and
- Cooperation and coordination with other parties.

83. For large transboundary MPAs cross agency cooperation, transnational cooperation across borders and multi-lateral agreements are needed. In theory such arrangements should share costs and reduce redundancy. Management of MPAs can be associated with the broader context of MCS functions. In this respect best practice lessons can be drawn from pollution prevention and counter pollution collaboration arrangements such as those of The Bonn Agreement www.bonnagreement.org and North Sea Network of Investigators and Prosecutors.

84.

[Case Study 14: US Pacific Marine Monuments]

4.6 Mediterranean situation

85. As it has been previously described, without efficient MPA enforcement, effective MPA conservation is likely not to occur. In this sense, many publications (Rodríguez-Rodríguez, D. 2014, NEF 2013, Gabrié C. et al 2012, P.B. Fenberg et al. 2012, Guidetti, P. et al 2008, Ameer et al 2008, UNEP-MAP 2004) indicate that there is much scope for improving MPA enforcement in the Mediterranean Sea and that conservation efforts in the Mediterranean are currently insufficient for protecting the highly valuable and threatened marine biodiversity of its ecosystems (Mazor et al., 2013).

86. Some of the conclusions from the MedPAN Workshop on Enforcement (Hyères, France, 12-14 November 2013) reflect some hot topics about enforcement in the basin:

- MPA enforcement is not a political priority, even in European countries;
- There is a need to look for complementary financial mechanisms (private, NGOs, etc.), as current means are scarce. In addition, enforcement plans must set priorities in terms of surveyed areas, activities and frequencies for the best use of limited resources;
- Competent authorities should be better coordinated to enforce MPA regulations;
- Legal gaps need to be addressed in order to effectively implement enforcement;
- Clear demarcation of MPA boundaries at sea is unusual, but should be considered to reduce non-compliance, especially in the most sensitive areas;
- Voluntary compliance schemes should be simple and convey just a few key, targeted messages;
- Lack of or deficient enforcement causes not only environmental damage, but also mistrust towards regulators by stakeholders;
- Automatic surveillance tools should be explored for efficient enforcement;
- Best practice in enforcement include: representative advisory committees; state-certified training for private guides; concessions to tourist companies being granted and kept on condition of regulation compliance; preventive deposits paid by concessional companies to cover potential damages from non-compliance; and use of georeferenced photographs and videos as proof of offense.

87. Despite the challenges, we are much closer to providing transparent and useful advice on the location of pelagic MPAs than is commonly thought, but the creation of offshore MPAs will require considerable cooperation between countries in order to avoid paper parks or MPAs with no enforcement. Cross-country collaboration could be streamlined by considering the international guidelines designed to improve environmental compliance and enforcement in the Mediterranean region (UNEP-MAP, 2004). MPA administrations can seek alliances for regulation enforcement and biodiversity mainstreaming with other national or international administrations in charge of policing the sea such as the coast

guard, the police or the army. As it has been explained, these agreements may entail the joint use of facilities, means and data, and the shared responsibilities of enforcing (by surveying, inspecting and sanctioning) the country's or shared common goods.

88. Such collaborative initiatives have taken place among different countries in the Western Pacific (De Santo, 2013) demonstrating that bilateral or multilateral agreements can also turn into useful and cost-effective means for shared governance, management and enforcement of MPAs, especially in the high seas (De Santo, 2013; Mazor et al., 2013). According to some models, substantial savings of up to 77% of the total opportunity costs (lost benefit) to commercial and recreational fishing have been estimated from fully coordinated basin-wide collaboration when compared to each country planning and enforcing conservation regulations over the same areas independently (Mazor et al., 2013). However, according to this model, savings and costs are unequally distributed among countries, with the majority of countries saving most from fully coordinated efforts and a few countries incurring greater costs, which suggest that some cross-country compensation or subsidy measures should be implemented for the sake of equity (Rodríguez-Rodríguez, 2014).

[Case Study 15: SOCIB]

5. Governance considerations

5.1 Governance systems

89. Day et al., 2015 explain that arrangements for MPA governance can be through international conventions, between neighbouring countries at a sub-regional level and at national or local level. Their analysis states that 'the majority of the world's MPAs are governed by laws and regulatory mechanisms established at the national or sub-national government level'. France, for example, has set up a national Marine Protected Area Agency with responsibility for both national waters and French Overseas Territories (http://www.pimrisportal.org/mpas).

90. Obligations can be legally binding 'hard' laws or 'soft' non-binding laws.

91. Failure to secure governance as a means to cooperative management can undermine conservation intentions. As an extreme example, the legality of the Chagos Archipelago MPA is now in question despite it's scientific credentials (the area recovered within 10 years from the 1998 coral bleaching event to boast 20-50% of the Indian ocean reef area remaining in excellent condition (Sheppard et al., 2012)).

[Case Study 16: Chagos Archipelago]

92. Jones (2014) provide a recent analysis using 20 case studies to establish a governance analysis framework (MPAG). This framework recognises governance complexity and diversity. In the MPAG, 'social-ecological' resilience building is advocated through approaches combining both institutional and biological diversity. The MPAG analytical framework considers socio-economic context metrics (e.g. per capita GDP and growth rate, unemployment rate etc.); MPA objectives; drivers and conflicts; effectiveness; economic, interpretative, knowledge, legal and participative incentive categories (and how they interact and are combined); and cross cutting themes of leadership role, NGO role and equity issues. Building on earlier work (Jones et al., 2011), MPAG identifies five governance approach categories: government-led; decentralized governance; community-led; private-led; and ineffective. Political will conferring strong legal incentives, community stewardship and balancing trade offs between effectiveness and equity are highlighted as key MPA aspects for management success.

93. Political will to better manage MPAs may be strengthened in the near future by agreement of Sustainable Development Goals (SDGs). SDG 14 calls for the conservation and sustainable use of 'the oceans, seas and marine resources for sustainable development'. SDG 14 gives specific goals related to marine pollution, management of marine ecosystems and the conservation of MPAs.

5.2 Regional and sub-regional governance models

94. For extensive transboundary MPAs, governance arrangements are most likely to be established at the regional or sub-regional level. Rochette et al. (2014) emphasize the strengths of regional cross-sectoral cooperation. In particular better coherence between conservation and fisheries management, including overlap between MPAs and fisheries closures as has been achieved in the North-East Atlantic (O'Leary et al., 2012; Hoydal et al., 2014), can lead to stronger compliance with legal commitments and policy convergence. Regional governance can benefit from the same Contracting Parties being members of different regional instruments promoting synergies and institutional interplay (Dotinga and Molenaar, 2008; Kvalik, 2012). OSPAR has developed formal bilateral Memoranda of Understanding (MoUs) with fisheries, shipping and seabed mining authorities, promoting information exchange and reciprocal granting of Observer status. UNEP Regional Seas Partnerships have pioneered legal frameworks that reflect States' willingness to cooperate to protect extensive transboundary areas (see Annex 1). Some other transboundary areas not covered by Regional Conventions, such as the Sargasso Sea (Freestone et al., 2014), have also made significant progress in compiling scientific information and establishing dialogue with third parties but are struggling to implement management measures. Regional frameworks have also been promoted by NGOs, for example Worldwide Fund for Nature (WWF) and The Nature Conservancy (TNC) have defined Marine Ecoregions whilst Conservation International promotes regional 'seascapes'. In some parts of the world sub-regional agreements between two or more States have also created robust governance frameworks

[**Case Study 17: Wadden Sea**].

95. In the past five years a series of symposia and academic debates on scenarios and options for governance arrangements have applied foresight methodologies, making explicit assumptions regarding the future, to MPAs in ABNJ. These discussions have recognised the risk of deadlock and the political and economic costs of heavy negotiations, as well as the need to strengthen regional capacities.

96. Convened by IDDRI, the French Marine Protected Areas Agency and IUCN in Boulogne-sur-Mer, France (19-21 September 2011), the first of these expert debates entitled 'Towards a legal framework for the creation and management of cross-sectoral marine protected areas in areas beyond national jurisdiction' envisaged four scenarios for 2030 (Druel et al., 2011). Each scenario followed a common four-step outline: What is the legal basis for MPA establishment?; How are they created?; How are management measures adopted?; and How are these management measures (including monitoring, control and surveillance) implemented? One of the scenarios envisaged evolutions and initiatives taking place at the regional level, noting the issue of third countries for which management measures are not legally binding as a short-coming to be overcome (Druel et al., 2012). This scenario envisaged the creation of a 'management councils' within Regional Seas Conventions to set up the coordination of management measures.

97. Subsequent workshops in Postdam Germany, hosted the Institute for Advanced Sustainability Studies and IDDRI, in both 2013 and 2014, have sought to advance creative thinking and put forward governance options including more efficient regional governance. An underlying assumption is that legal instruments and governance approaches at global and regional levels would complement each other. Consensus was also that an advantage of regional cooperation is a governance model specific to each region's needs. Such governance mechanisms are most likely to achieve meaningful public consultation for large-scale centrally planned MPAs. Ban et al. (2014) advocated the need for an improved global legal regime incorporating systematic planning as well as the expansion of existing and new regional agreements and mandates.

5.3 MPAs within Planning Frameworks

98. Christie and White (2006: 184) state that 'to be effective on a wide scale, MPAs should be embedded within large planning frameworks such as integrated coastal management (ICM) or ecosystem-based management (EBM)'. They counsel that these 'broad models' or 'comprehensive frameworks' should 'emerge incrementally from past management practices and match institutional human and fiscal capacity'. Fraschetti et al. (2011) also consider MPAs as a key management tool to achieve some of the goals of a 'largely untested' EBM approach[5].

99. Agardy et al. (2011: 226) also envisage MPAs achieving their objectives within supportive legal and jurisdictional frameworks, stating that:

'A blind faith in the ability of MPAs to counteract loss of biodiversity is fraught with risk, especially when MPAs are poorly planned and when the consequences of establishing MPAs are not adequately thought out. MPA shortcomings are categorized as one of five main types: (1) MPAs that by virtue of their small size or poor design are ecologically insufficient; (2) inappropriately planned or managed MPAs; (3) MPAs that fail due to the degradation of the unprotected surrounding ecosystems; (4) MPAs that do more harm than good due to displacement and unintended consequences of management; and (5) MPAs that create a dangerous illusion of protection when in fact no protection is occurring. A strategic alternative, which fully utilizes the strengths of the MPA tool while avoiding the pitfalls, can overcome these shortcomings: integrating marine protected area planning in broader marine spatial planning and ocean zoning efforts'.

100. The philosophy of marine or maritime spatial planning (MSP) is that it reduces conflicts between sectors creating synergies and making trade-offs explicit. In theory MSP should help increase coordination between administrations; encourage investment through predictability and investment; increase cross-border cooperation; and protect the environment through early identification of impacts and defining opportunities for multiple uses of space and strict protection. In many parts of the world climate change and biodiversity protection challenges are being closely aligned within MSP initiatives. In

[5] For a comprehensive explanation of EBM see McLeod, K. and Leslie, H. (eds.) (2009) Ecosystem-based Management for the Oceans. Island Press, 392pp.

other areas (e.g. Somalia), MSP on the basis of post crisis appraisals and assessments could help find solutions to social and environmental costs created by prolonged conflicts.

[Case Study 18: Seychelles Marine Spatial Planning Initiative]

5.4 An evolving EU Maritime Governance Agenda

101. The European Union has recognised that 'healthy seas and oceans are drivers for national economies and hold great potential for innovation and sustainable growth. An increasing number of countries around the world are recognizing the added value of marine protection and maritime activities are moving towards a more structured approach and systematic collaboration on maritime affairs'. This strong economic emphasis, promoting oceans as a rich source of innovation, growth and employment, has been supported by messages on the need to integrate multiple policy objectives to meet MPA targets (EEA, 2014).

102. The Commission have summarised this approach stating that:

> *'The EU's Integrated Maritime Policy (IMP) seeks to provide a more coherent approach to maritime issues, with increased coordination between policy areas, and through the implementation of cross-cutting tools such as marine data and knowledge, maritime spatial planning, integrated maritime surveillance, and sea basin strategies. The objectives and actions for an integrated approach to all sea-related human activities are detailed in the 2007 Commission Communication on an Integrated Maritime Policy (IMP) for the EU and its Action Plan (referred to as 'Blue Paper')[6], followed by the 2012 Commission Communication on Blue Growth[7], which represents IMP's contribution towards achieving the goals of the Europe 2020 strategy for smart, sustainable and inclusive growth. Since 2012, a set of legislative and non-legislative initiatives addressing specific Blue Growth areas have been adopted[8]. With IMP and Blue Growth Agenda being defined at EU level, implementation process in EU countries is in progress'.*

103. Specific initiatives to support this overall strategy have been:

- Directive 2008/56/EC: the Marine Strategy Framework Directive;
- European Strategy for Marine and Maritime Research (3 September 2008);
- Limassol Declaration: A Marine and Maritime Agenda for Growth and Jobs (8 October 2012); and

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[6] *COM(2007) 575 final and SEC(2007) 1278*

[7] *COM(2012) 494 final.*

[8] *Since 2012, a set of legislative and non-legislative initiatives addressing specific Blue Growth areas have been adopted as follows:*

- *Communication on Strategic Guidelines for the sustainable development of EU aquaculture;*
- *Communication on Blue energy: Action needed to deliver on the potential of ocean energy in European seas and oceans by 2020 and beyond;*
- *Communication on A European Strategy for more Growth and Jobs in Coastal and Maritime Tourism;*
- *Communication Innovation in the Blue Economy: realising the potential of our seas and oceans for jobs and growth;*
- *Directive establishing a framework for maritime spatial planning.*

- A third major reform of the Common Fisheries Policy in January 2014.

104. MSP is acknowledged by the EU as a key pillar of IMP. 2008 Commission Communication9 set out a roadmap based on 10 EU MSP Principles. This was supported by a legal aspects study (2008), an economic effects study (2010) and associated Workshops, Pilot Projects and Preparatory Projects. Directive 2014/89/EU (23 July 2014, entered into force in September 2014) recognises MSP as a cross-sectoral tool and MSP as a national competency.

5.5 Mediterranean situation

105. As outlined at the 2009 Commission Communication 'Towards an Integrated Maritime Policy for better governance in the Mediterranean', IMP approaches are particularly relevant for the entire Mediterranean Sea basin, which is semi-enclosed, surrounded by 21 countries, and whose resources are already under heavy and varied pressures, some not sustainable in the long run.

106. IMP is primarily to be implemented at national level. Still it is also important to promote IMP and its tools in the Mediterranean Sea basin as a means to further enhance maritime co-operation among countries, which in turn would lead to better management of marine and maritime activities, entrepreneurship, job opportunities and more sustainable and diversified investments in maritime sectors (now labelled as "blue economy"), better protection of the marine environment (including climate change considerations) and maritime heritage, improved safety and security at sea.

107. The EU launched an IMP-MED project in 2010, for an initial 2-year period, primarily to raise awareness and knowledge of IMP concept and its tools among Neighbourhood South countries. The IMP-MED project was extended until end 2014, with a stronger focus on initiating concrete IMP developments at national and regional levels, while continuing to support regional exchanges, in particular through the annual meetings of the working group on IMP in the Mediterranean organised by the European Commission. The on-going EU-funded project "Promoting Blue Economy concept in the service Mediterranean Sea basin" aims to further raise awareness on blue economy concept and to bridge the gap between two ENPI-South funded projects supporting IMP in the Mediterranean.

108. Making IMP a reality is an ambitious and long-term objective - even in the EU – and the EU's support to IMP in the ENP South region must be sustained in the long term to consolidate and expand further what the IMP-MED project has initiated. This will be ensured via the project. The IMP is strongly steered by the European Commission.

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9 COM(2008) 791 final

109. In addition, several pilot projects to shape governance models in open-sea priority areas for conservation in the Mediterranean have been developed in the last years. Among them, the cases of the Alboran Sea and the Adriatic and Ionian Regions are described below.

110. ***The Alboran Sea:*** In 2007, representatives from Algeria, Spain and Morocco and IUCN coming from research institutions, universities, governments and NGOs, gathered for the 1st International Meeting for the Conservation and Sustainable Development of the Alborán Sea, which was held in Malaga (Spain). In April 2009 the 2nd International Meeting for the Conservation and Sustainable Development of the Alborán Sea was held in Oujda (Morocco). At this second meeting it was agreed that an Action Plan be drawn up for the Alborán region based on the document: "*Oujda Declaration on the Conservation and Sustainable Development of the Alboran Sea*" (IUCN 2010).

111. Within the framework of the European Initiative of the Spain-External Cross-Border Cooperation Programme (POCTEFEX), the Alboran Project on "Common management of natural cross-border space" which was implemented in the biennium 2012-2013, aimed to support riparian countries of the Alborán Sea in strengthening the dialogue and cooperation to promoting a sustainable management of its environment.

112. The project MedRAS and NEREUS, financed by the MAVA Foundation, choose the Alborán Sea as a pilot site to start the process of defining a representative network of conservation areas for the Mediterranean region, based on the identification of physical, biological and social characteristics, of their development and their existing and potential threats.

113. ***The Adriatic and Ionian Initiative:*** With the framework of the Adriatic and Ionian Initiative, the European Commission adopted a Communication on the EU Strategy for the Adriatic and Ionian region accompanied by an Action Plan. The new Strategy incorporates the Maritime Strategy for the Adriatic and Ionian Seas, adopted by the Commission on 30 November 2012.

114. Both of these projects are now seeking means to take advantage of the existing EBSAs, as well as the areas identified by the RAC/SPA to become potential SPAMIs, in order to promote the adoption of a common methodology and the development of transboundary governance processes, providing a supportive policy environment for effective management and enable the achievement of beneficial development outcomes.

115. Initial views have highlighted the possible added values of using the umbrella of the Union for the Mediterranean[10]. The Union has the aim of promoting stability and prosperity throughout the Mediterranean region. Providing a supportive policy environment for effective management the Mediterranean touches directly on the Union for the Mediterranean mandate on environment, in particular, the Secretariat engagement in facing the multiple environmental threats that the Mediterranean region is currently experiencing.

10 The Union for the Mediterranean (UfM) is a multilateral partnership of 43 countries from Europe and the Mediterranean Basin: the 28 member states of the European Union and 15 Mediterranean partner countries from North Africa, the Middle East and Southeast Europe. It was created in July 2008 as a re-launched Euro-Mediterranean Partnership (the Barcelona Process).

6. Conclusions and Recommendations

116. Edgar et al. (2014) demonstrated that the conservation benefits of 87 MPAs they investigated worldwide were attributable to five key features: no-take, well enforced, old (>10 years), large (>100 km2) and isolated by deep water or sand. Only four MPAs in their study had all five features and most (59%) only had one or two features. The latter were not ecologically distinguishable from fished sites and had failed to reach their full potential in terms of conserving fish biomass and species richness. On this basis their study advocated more emphasis on better MPA design, durable management and compliance.

117. The review of best practices and case studies related to MPAs in large marine transboundary areas presented here also highlights wider benefits of MPAs, complementary work being undertaken in different maritime sectors to protect marine biodiversity, legal complexity and current negotiations at the global level. The report has attempted to summarise these different aspects for the Mediterranean region.

6.1 Establishment of MPAs

118. Definitive assessment of extent and location of MPAs worldwide is difficult given that most States have on-going programmes of work and a number of legal boundaries are under review. However, the most recent estimates suggest:

- In April 2014 there were 7,318 MPAs, representing 3% of total global ocean area or 6.6% of seas under national jurisdiction against the CBD 10% target (Watson et al., 2014)
- This coverage has quadrupled in the last 10 years but 53% of the total area comprises 10 vast remote MPAs. Only time will tell whether these politically inspired ‘mega’ MPAs will be effective; and
- Marine components lag behind the 12.5% of terrestrial protected areas.

119. In a commentary on lack of progress with MPA establishment in Canada[11], Dearden (pers.com.) identified the following seven barriers that in the opinion of the authors have a generic relevance and help explain why to date insufficient MPAs have been established globally:

- Lack of political will
- No effective plan to meet targets
- Poorly coordinated approaches (between ministries and countries)
- Bureaucratic inertia

[11] *In 2014, 17 years after passage of the Canadian Oceans Act, eight MPAs had been designated.*

- Lengthy establishment processes
- Jurisdictional squabbles; and
- Failure to include key stakeholders

120. Furthermore, simple percentage coverage is not sufficient. A common consensus is that networks of MPAs should be representative of the features to be protected, ecologically coherent and 'future proofed' (e.g. areas resilient to ocean acidification / aragonite saturation). Guidelines have been developed to plan and implement MPAs and optimal network designs using tools such as Marxan and MarZone can factor in multiple variables to help identify critical core areas, buffer zones and interlinkages. Steps for including costs in regional conservation prioritization, within heavily exploited regions, could also use spatial optimisation tools (Micheli et al., 2013a). The CBD EBSA process provides useful baseline data and expert judgement that can assist States and competent international organisations considering future transboundary MPA possibilities.

121. In the Mediterranean as elsewhere, more MPAs have been established in the coastal zone than offshore. Distribution of MPAs in the Mediterranean is also skewed in favour of the basin's north-western shore and pelagic protected areas are a missing dimension. It is important to acknowledge that in areas where the political situation is complex and there are human-dominated environments, systematic conservation prioritization schemes should implicitly take into account the spatial variability of anthropogenic uses and the associated cost of excluding uses for conservation needs (Ando et al., 1998; Naidoo et al., 2006; Marshall et al., 2009; Katsanevakis et al., 2011). The establishment of MPAs or other management measures in priority conservation areas may restrict economic activities, particularly extractive industries. In human-dominated environments, like the Mediterranean Sea, such considerations cannot be disregarded (Micheli et al 2013a).

122. ***Recommendation*:** Generation of political will among all stakeholders to establish additional MPAs, making explicit the cost-benefit trade-offs involved, is needed to meet biodiversity goals. Including all sectoral designations in any analysis of progress against targets provides a more optimistic picture and collaboration between resource managers to achieve this should be encouraged. In the Mediterranean overall conservation objectives would benefit from specific incentives to establish MPAs in offshore locations and within the south-eastern quadrant of the basin. Micheli et al. (2013a) conclude that 'collective prioritized action' is needed in the North-west and High Seas and 'information-based plans' for the South an East of the basin.

6.2 Management of MPAs

123. Effective management of MPAs is essential and must be underpinned by a clear scientific rationale. As far as possible knowledge and understanding of the ecosystem(s)

concerned and any threats to continued functioning should inform management actions, which in turn require sustainable financing. Edgar et al. (2014) stressed no-take fisheries areas as the single most important management action. In 2008 only 0.08% of the world's oceans benefited from this measure (Wood et al., 2008), a very low baseline that subsequent actions by RFMOs and more recent designations such as Pitcairn MPA will have improved .

124. Direct and indirect management techniques are applied by MPA managers to monitor ecological condition of the MPA and control adverse human impacts. Day et al. (2015:629) state that 'management is usually considered to be a continuous, interactive, adaptive and participatory process, comprising a set of related tasks that all need to be undertaken to achieve a desired set of goals and objectives'. Management plans formalize these systems.

125. In this report the adaptive approach taken by the Great Barrier Reef Marine Park Authority to managing the MPA has been highlighted. This Australian example of an extensive MPA illustrates the importance of interaction between government agencies and stakeholder communities. Fernandes et al. (2005) list the following success factors as having global relevance:

- Focusing initial communication on the problem to be addressed;
- Applying the precautionary principle
- Using independent experts and facilitating input to decision-making;
- Conducting extensive and participatory consultation;
- Having an existing marine park that encompassed much of the ecosystem and having legislative power under Federal law;
- Developing high-level support and ensuring agency priority and ownership; and
- Being able to address the issue of displaced fishers.

126. Likewise, sectorial cases of spatial management in offshore areas described in this report, mainly PSSAs and fishing closure areas by RFMOs, have emphasized how management can be effective with high rates of compliance when a clear mandate is established and acceptance/understanding by the sectoral stakeholders is achieved.

127. For the Mediterranean this report highlights a study by Gabrie et al. (2014) that surveyed 80 MPAs to ascertain management efforts. Overall management is very variable, with examples of good practice and examples of shortcomings. The study considered coastal MPAs and some aspects of the analysis are not directly transferable.

128. ***Recommendation*:** MPA management implications including appropriate measures, their implementation and long-term financing should be considered at the outset. For extensive transboundary areas opportunities exist for collaboration with sectoral interests and other stakeholders (such as NGOs or Trust Funds with interests in specific scientific aspects). A well-conceived communication strategy is important together with

periodic analysis of the effectiveness of management in the context of a management plan.

6.3 Surveillance and enforcement of MPAs

129. The majority of the relatively small number of extensive transboundary MPAs established to date have been centrally planned by strong institutions, latterly with the interest and financial support of philanthropic NGOs. Examples such as the Great Barrier Reef Marine Park have required considerable financial resources for monitoring and policing. However, this report concurs with McCauley (Pressey et al., 2014: 29) who argues that 'conventional forms of monitoring are not tenable in areas larger than some countries'. He asserts that 'States should explicitly fund the development of next-generation enforcement' – i.e. satellite and drone-based patrols.

130. Conventional surveillance approaches can involve cooperative tools or non-cooperative platforms and sensors. New technologies have great potential to provide cost-effective, robust platforms for remote sensing surveillance. Fisheries and shipping authorities have significantly more experience and expertise than environmentalists in undertaking surveillance and enforcement, hence partnerships hold the key to integrated management. Environmental NGOs with marine portfolios have achieved successes by aligning their campaigns against illegal activities with those interested in conserving key species, habitats and fish stocks. Dialogue at the regional level is productive.

131. ***Recommendation*:** Surveillance and enforcement is a particular management consideration for extensive transboundary MPAs if they are not to be 'paper parks'. Better coordination and trust should be fostered between representatives of littoral States and between those States and competent national and international authorities. Surveillance specifications should be set as a challenge to be met by new technologies giving due consideration to cost, endurance and interaction with other maritime users.

6.4 Governance of MPAs

132. Notwithstanding the complexity and so-called 'alphabet soup' of acronyms associated with marine governance, political commitments to MPAs are essential in offshore transboundary situations. Portugal provides an example of ambitious future commitments and political will, combining existing MPA designations to achieve coherent larger areas [**Case Study 19: Progress and Perspectives in Portugal]**. Marencic and Vlas, (2009) state that 'Political declarations, in which agreements are made between governments, are an integral part of the management of nominated property to which the governments have committed themselves'.

133. Day et al. (2015: 625) add that 'It is the combination of legal and economic incentives with other interpretation, knowledge and participatory incentives that are important for

effective governance. Twenty global case studies identify that no single governance approach is likely to be most appropriate.'

134. Regional and sub-regional models have been exemplified in this report. MPAs established to date in the High Seas or Area Beyond National Jurisdiction have all been achieved by Regional Conventions. Much discussion is currently taking place on how to scale up MPA coverage in ABNJ. Recent debates favour a twin track approach, the creation of a global governance instrument for biodiversity in ABNJ and strengthening regional mandates and coverage.

135. MPAs must also fit within broader spatial planning and management frameworks. Links have been made in this report between MPAs and the climate change and blue economy agendas. The European Union has taken a lead in promoting an Integrated Maritime Policy both for the Mediterranean and other European sea basins. Sub-regional projects have explored the advantages of integrated governance models. Pressey and Bottrill (2009), propose a framework that includes 11 core steps for systematic conservation planning. Micheli et al. (2013a), built on this existing framework to include the complexities that characterise the Mediterranean region, proposing 4 additional steps to be explicitly added to those described by Pressey and Bottrill. In politically complex situations, such as in the Mediterranean basin, to ignore these issues is likely to disrupt the entire conservation planning effort.

136. At face value, this adapted framework for systematic regional marine conservation planning seems highly appropriate for a region with multiple conservation strategies, organisations and initiatives. It has the added advantage of having been informed by 'region-specific' expert opinion.

137. ***Recommendation:*** Extensive transboundary MPAs are most likely to be achieved with a Government-led governance approach. Stakeholders must include other regulators as well as maritime sectors using the areas. Proponents should make MPA benefits and trade-offs explicit and seek to embed MPAs into EBM and MSP.

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Annex I: Regional Seas Programme (RSP)

(Excerpt adapted from UNEP, 2014, pp 19-21)

Launched in 1974 with a remit to address the accelerating degradation of the world's oceans a total of 18 Regional Seas Conventions and Action Plans across the world provide a legal framework and reflect political will for coordinated action to tackle common marine environmental issues. Of these 13 are established under UNEP auspices and 5 are partner Programmes (see Table A.1).

RSCAP	Convention	Year adopted	Year entered into force	No. of States[12]
1.Mediterranean	Barcelona	1976/1995	1978/2004	22
2. ROPME[13] Sea Area	Kuwait	1978	1979	8
3. Western and Central Africa	Abidjan	1981	1984	22
4. South-East Pacific	Lima	1981	1986	4
5. Red Sea and Gulf of Aden	Jeddah	1982	1985	8
6. Wider Caribbean	Cartagena	1983	1986	28
7.Eastern Africa	Nairobi	1985	1996	10
8.South Pacific	Noumea	1986	1990	19
9.Black Sea	Bucharest	1992	1994	6
10.North-East Pacific	Antigua	2002	Action plan in force	8
11.East Asian Seas	None	1984 (Revised in 1993)	Action plan in force	9
12. North-West Pacific	None	1994	Action plan in force	4
13. South Asian Seas	None	1995	Action plan in force	5
14. Baltic Sea	Helsinki	1974/1992	1980/2000	10
15. North-East Atlantic	Oslo-Paris (OSPAR)	1974/78/92	1998	16

[12] It should be noted that the number of countries covered in the Programme does not necessarily correspond with the number of countries that have ratified the respective Conventions.

[13] The Regional Organisation for the Protection of the Marine Environment Sea Area covers 8 states that joined together in 1978 to adopt the Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution, otherwise known as the Kuwait Convention and 4 associated Protocols.

16. Antarctic	Antarctic Treaty/CCAMLR[14]	1959/1980	1961/1982	32
17. Caspian Sea	Tehran	2003	Not in force	5
18. Arctic/PAME	None but Arctic Council working group(s)			8

Table A.1: *Summary of the Regional Seas Programme and implementing Conventions (1-13 UNEP auspices, 14-18 Partners)*

For those entities within the RSP, joint coordination is generally engendered through an Action Plan, or collectively agreed Strategy, which for most is legally underpinned by a regional Convention and associated Protocols (or Annexes). Thus whilst each Regional Seas Convention and Action Plan (RSCAP) is part of a common global family with a collective mandate, and each is ratified by relevant States or in the case of some adopted Action Plans recognised by States as a soft legal instrument, their work programmes and approaches to management are based upon the region's particular environmental concerns and challenges as well as its socio-economic and political situation (UNEP, 2005b). Evaluations of the Regional seas experience (e.g. Rochette and Chabason, 2011) highlight significant achievements, but also place emphasis on differences between regional arrangements and variations resulting from intrinsic limitations reflecting fragmented international governance (for example in all regions the International Maritime Organisation is the competent organization for regulation of international shipping but in some regions the pressure and volume of shipping traffic merits specific regional attention). The latter has fuelled calls for an improved global legal regime as well as the expansion of existing and new regional agreements and mandates for managing the high seas (e.g. Ban et al., 2013).

Successive efforts to set common Strategic Directions for the Regional Seas Programme (2004-2007, 2008-2012, 2013-2016) have recognised the value of an action-orientated approach to common integrated priorities based on an ecosystem approach. Most RSCAPs have undertaken trans-boundary diagnostic assessments and some prepared strategic action programmes. Most also carry out regular assessments of the state of the marine environment and issue state of the regional marine environment reports.

However, the differing levels of implementation of individual regional Action Plans (reflecting variation in governance arrangements, funding, activity and influence) have so far not been systematically centrally monitored to indicate the level of achievement of the implementation of Action Plans in different regions. Thus there is a need for enhanced result-based monitoring and evaluation of policies, programmes and projects based on measurable indicators of success. The ecosystem-based approach, object and target setting and associated monitoring are inter-related.

Each set of Strategic Directions has emphasized the need to take up and adopt an Ecosystem Approach but UNEP has recognised barriers present in some current arrangements (see Table A.2).

Common elements of an Ecosystem Approach at the regional level

[14] *The Commission for the Conservation of Antarctic Living Resources (www.ccamlr.org)*

Geographical coverage respects ecological functions and continuity as well as political boundaries
Assessment considers all ecosystem processes and functions including human socio-economic activities
Optimal use of ecosystem goods and services is combined with equitable benefit sharing
Sources of stress and threats are addressed to maintain ecosystem integrity
Barriers to introduction of an Ecosystem Approach at the regional level
Political considerations determine geographic coverage
Failure to identify drivers for ecosystem change
Lack of integration with governance of key sectors (e.g. fisheries)
A focus on normative action rather than pollution sources and threats to ecosystem functioning

Table A.2: Ecosystem Approach common elements and barriers (adapted from UNEP 2012)

Annex II: Case Studies for Offshore and Transboundary Marine Protected Areas

Case Study 1: Clarion-Clipperton Zone (International Seabed Authority)

[Source: text extracted from Johnson and Ferreira, 2015]

The abyssal sediments of the extensive Clarion-Clipperton Zone (CCZ) in the central Pacific represent an established location where a number of State and State Party Contractors to the ISA have been undertaking exploration activities since 2001 and others, including private sector mining corporations, have subsequently been granted exploration licenses (Lodge et al., 2014).

Eventual exploitation in the CCZ will be informed by an Environmental Management Plan (EMP) adopted by the ISA in 2012.

The CCZ-EMP sets out a framework of license blocks containing Preservation Reference Areas within each license block, as well as a mosaic of nine large Areas of Particular Environmental Interest (APEIs) outside the license areas (see Figure 1). The size and location of such APEIs (or preservation reference areas as they were designated then) were proposed at a workshop held in Hawai'i 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.

Experts thus recommended "that the zone be divided into three east-west and three north-south strata, with representative preservation reference areas being placed in each of the nine resultant subregions". They further recommended that, in order to "preserve representative and unique habitats, all habitat types for a subregion should be included within a preservation reference area". However, experts acknowledged that whereas "a variety of general habitat types can be recognised" within the CCZ, the biota of seamounts and fracture zones remain "essentially unstudied so the uniqueness of associated biota cannot be assessed". Results from the "Kaplan Project", designed to assess the biodiversity, species ranges, and gene flow in the abyssal Pacific nodule province (CCZ) indicated "high, unanticipated, and still poorly sampled levels of species diversity" of sediment-dwelling faunal components at the sampling locations, and higher habitat heterogeneity than previously assumed. These findings suggest the existence of a characteristic fauna of the abyss, but one which may differ substantially across the CCZ, increasing concerns regarding appropriate representativeness of selected reference protection areas.

The original intention was to protect 30–50% of the total CCZ management area, capturing the full range of habitats and communities therein. The size of each protected area should allow for the maintenance of viable population sizes of potentially endemic species. The final proposal established a mosaic of nine APEIs, one in each biogeographic subregion. Each APEI includes a core area of 200 km x 200 km (40,000km^2), surrounded by a buffer zone 100 km wide (120,000km^2), resulting in a total area per APEI of 400km x 400km (160,000 km^2). This proposal placed roughly 24% of the CCZ management area under protection. The proposed terminology of APEIs was selected, provisionally, to avoid confusion with other initiatives to establish marine protected areas (MPAs) in the high seas.

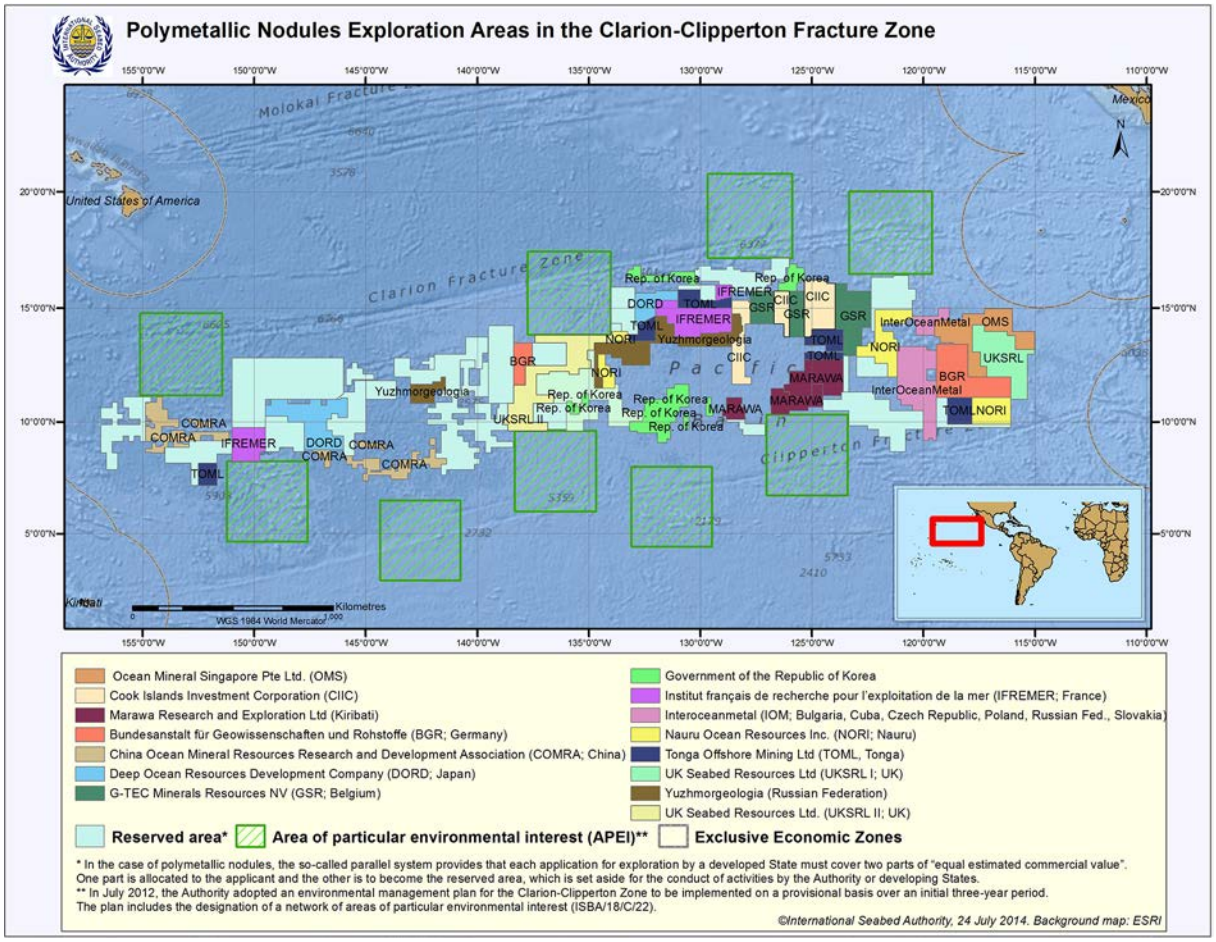

Figure 1 Map of the Clarion-Clipperton Fracture Zone showing license areas for polymetallic nodule exploration and the location of APEIs. The figure also shows the areas reserved for ISA. Map used with permission from the ISA.

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Case Study 2: CCAMLR - South Orkney Islands Southern Shelf MPA

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) was established by international convention in 1982 with the objective of conserving Antarctic marine life. CCAMLR has four categories of conservation measures (compliance, general fisheries matters, fishery regulations and protected areas). Three protected areas (Category 91) measures are highlighted here.

Conservation measure 91-02 (2012) Protection of the values of Antarctic Specially Managed and Protected Areas recalled the 1991 Protocol of Environmental Protection to the Antarctic Treaty and confirmed CCAMLR powers to create any Antarctic area as an Antarctic Specially Protected Area (ASPA) or an Antarctic Specially Managed Area (ASMA). Competences and relationships were clarified and affirmed, specifically Decision 4 (1988) – Marine Protected Areas and Decision 9 (2005) – Marine Protected Areas and Other Areas of Interest to CCAMLR. In 2011 CCAMLR held an MPA Workshop to consider harmonized approaches in the Antarctic Treaty System to spatial protection.

Conservation Measure 91-03 (2009) formalized protection of the South Orkney Islands southern shelf (Subarea 48.2) in accordance with Article II and Article IX of the Convention (South Orkney Islands Southern Shelf MPA). Specifically the measure specifies:

- Endorsement of the work programme of the Scientific Committee to develop a representative network of MPAs (CCAMLR-XXVII, paragraphs 7.2 and 7.3)
- Recognition of scientific importance – this MPA is representative of key environmental and ecosystem characteristics in the region
- Need to provide a scientific reference area, conserve important predator foraging areas and representative examples of pelagic and benthic bioregions
- Measures to prohibit - commercial fishing activities, waste discharges from fishing vessels, trans-shipment activities involving fishing vessels + voluntary vessel traffic reporting
- Awareness raising including at the Antarctic Treaty Consultative Meeting
- 5-yearly reviews

Conservation measure 91-04 is the General framework for the establishment of CCAMLR Marine Protected Areas. Article IX.2(f) and 2(g) of the CAMLR Convention state that conservation measures may designate the opening and closing of areas, regions and sub-regions for the purposes of scientific or conservation (consistent with international law and best available scientific advice). As such South Orkney Islands southern shelf MPA as a first step towards a network. CCAMLR MPAs aim to contribute to sustaining ecosystem structure and function, including areas outside the MPAs, and to maintaining the ability of the ecosystem to adapt in the face of climate change and reduce the potential for invasion by alien species as a result of human activity (for CCAMLR conservation includes rational use and military activities are excluded). Objectives include representative examples of marine ecosystems; protection of key ecosystem processes, habitats and species including populations and life-history stages; scientific reference areas for monitoring natural variability and long-term change as well as harvesting and other human activities; protection of vulnerable areas including unique, rare or highly biodiverse habitats and features; and areas to maintain resilience or ability to adapt to the effects of climate change. MPA descriptions

should include objectives; boundaries; activities to be restricted/prohibited/managed; priority elements for a management plan/administrative arrangements/ research and monitoring plan/ interim management required until the former is adopted; and appropriate actions by other competent international organisations.
Notwithstanding this mandate and substantial efforts to establish additional MPAs in the Southern Ocean such as the Weddell Sea (Teschke et al., 2013), lack of political consensus is currently frustrating the process.

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Case Study 3: Pitcairn Islands Marine Reserve

'The Pitcairn Islands are some of the most remote on Earth. The surrounding waters contain intact deep-sea ecosystems, and their coral reefs harbor abundant sharks and large fishes. In March 2015 the U.K. government established the area as a no-take marine reserve—the largest single reserve in the world' (National Geographic, 2015).
In September 2012, the Pitcairn Council voted to extend protection from 12nm to entire EEZ. Only 50-60 people live on Pitcairn, they expressed concerns regarding illegal fishing by foreign fleets. Pitcairn is the last remaining British Overseas Territory in the Pacific.
This is a precautionary MPA. The science is compelling but limited. Friedlander et al. (2014) reported on the first quantitative description of the structure and function of the marine ecosystem from a baseline survey undertaken in 2012 (previously only lists of species and qualitative estimates of abundance for major groups were available). Their surveys (see Figure 1) reported:

- High levels of regional endemism in fish assemblages
- 48 of 1200 recorded species are threatened
- healthy coral reef communities at the eastern limits of the Indo-Pacific Province; and
- uniqueness and high biodiversity, one of least impacted locations in the Pacific, endorsing a need for immediate protection

NGO campaign www.GreatBritishOceans.org - a coalition of MCS, RSPB, Pew Charitable Trusts, ZSL, Blue Marine Foundation, Greenpeace UK, and National Geographic Society – lobbied the UK government to create an MPA.
As of March 2015 Pitcairn MPA was declared as the world's largest contiguous ocean reserve with:

- No fishing or sea-bed mining, except traditional fishing by local population
- An established partnership with NGOs to strengthen science; and
- Independent resources pledged to support surveillance and enforcement.

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Case Study 4: EBSAs to MPAs: Transboundary prospects in the Western Indian Ocean

An encouraging future potential for transboundary MPAs lies with extended continental shelf claims where these are coincident with descriptions of Ecologically or Biologically Significant Areas (EBSAs). For example, a selection of areas for which EBSA descriptions were confirmed by the Southern Indian Ocean (SIO) Regional Workshop to facilitate the description of EBSAs held in Mauritius 31 July – 3 August 2012 are currently under consideration as future MPAs . These are:

a. Saya de Malha Bank
Largest of the shallow banks forming the Mascarene Plateau (SOI.32), along the Mascarene Ridge that spans the distance between Seychelles and Mauritius. The Bank supports the largest seagrass beds in the world with associated species endemism and significant aggregations of marine mammals and seabirds. In 2010 the Mascarene Plateau was the subject of a successful joint submission by Seychelles and Mauritius to the Commission on the Limits of the Continental Shelf, hence the seabed is jointly managed by those States whilst the water column remains in the High Seas. Both countries are currently developing a management strategy and regime for their extended continental shelf in this region on the basis of a Join Management Agreement.

b. Northern Mozambique Channel initiative (NMCi)
This holistic initiative aims to secure sustainable integrated management of marine based activities. It will be informed by EBSA descriptions for the Mozambique Channel (SIO.19) and Iles Eparses (SOI.20) and Northern Mozambique Channel (SIO.24), the latter two being largely nested within the first. EBSA templates highlight globally unique eddy and gyre dynamics together with upwelling on the Madagascar Plateau that contribute to highly connected and highly productive marine communities. The area is rated second in the world to the Coral Triangle for its outstanding biodiversity. The proposal is to develop a sub-regional integrated ocean management framework and to secure funded needed for its implementation as an exemplar for an integrated management approach.

c. Trans-boundary MPA proposal between Kenya and the United Republic of Tanzania – this transboundary area encompasses two EBSAs, namely Pemba-Shimoni-Kisite in Kenya (SIO.13) and the Tanga Coelacanth Marine Park in Tanzania (SIO.12). The intention is to create a multi-zoned system incorporating three areas that are already marine parks, to achieve policy and management harmonization, engaging the community and private sector as well as government agencies.

All three projects are seeking GEF finance to enable implementation.

Case Study 5: Coral Sea PSSA

[Source: Information drawn from submissions by Australia to IMO MEPC 68]

The International Maritime Organisation has adopted 15 PSSAs since 1990 on the basis of Guidelines last revised in 2007. The most recent of these PSSAs is an extension to the Great Barrier Reef and Torres Strait PSSA to include an area of the south-west Coral Sea.

The Coral Sea is a remote oceanic ecosystem covering approximately 4, 791, 000 km2. It contains outstanding examples of reef communities, diverse sandy cays, islands, deep-sea plains, seamounts and canyons. It is internationally recognised for rich biodiversity, unique species and important heritage values. Coral Sea habitats provide 'stepping stones' for the dispersal of species between the Great Barrier Reef and the greater Pacific Ocean region. In addition to protecting the Coral Sea the PSSA aims to provide additional protection for the Great Barrier Reef.

The PSSA covers approximately 564, 000km2 (12% of the Coral Sea), the area of highest shipping risk. It is within the Australian EEZ and the Coral Sea Commonwealth Reserve (an area nearly twice the size of the PSSA protected by the Australian Government under National Environmental Protection legislation). The PSSA contains three key large-scale ecological features: the Queensland Plateau, the Marion Plateau and the Tasmantid Seamount Chain. Maintaining the overall integrity and resilience of these features is important. For the reefs, cays and islands their small size and isolation from each other, as well as high exposure to cyclones and storms combine to make them more vulnerable to environmental impacts than the contiguous reef systems of the Great Barrier Reef. Australia demonstrated that critical habitat for a selection of threatened and/or migratory Coral Sea species occurs throughout the PSSA.

Vulnerability of the area to impacts from shipping activities is due to a combination of its ecological sensitivity, isolation, increasing vessel traffic, shallow water features and hydrographical and meteorological conditions. The case for protection was exemplified with details of 'near miss' incidents. Vessel traffic characteristics and existing protective measures are taken into account when considering the case for a PSSA. Associated Protective Measures for the Coral sea PSSA are an Area to be Avoided (ATBA) and two supporting five nautical mile wide 'two-way' routes either side of the ATBA. These aim to reduce risk of groundings and collisions, as well as accommodating future increases in shipping traffic.

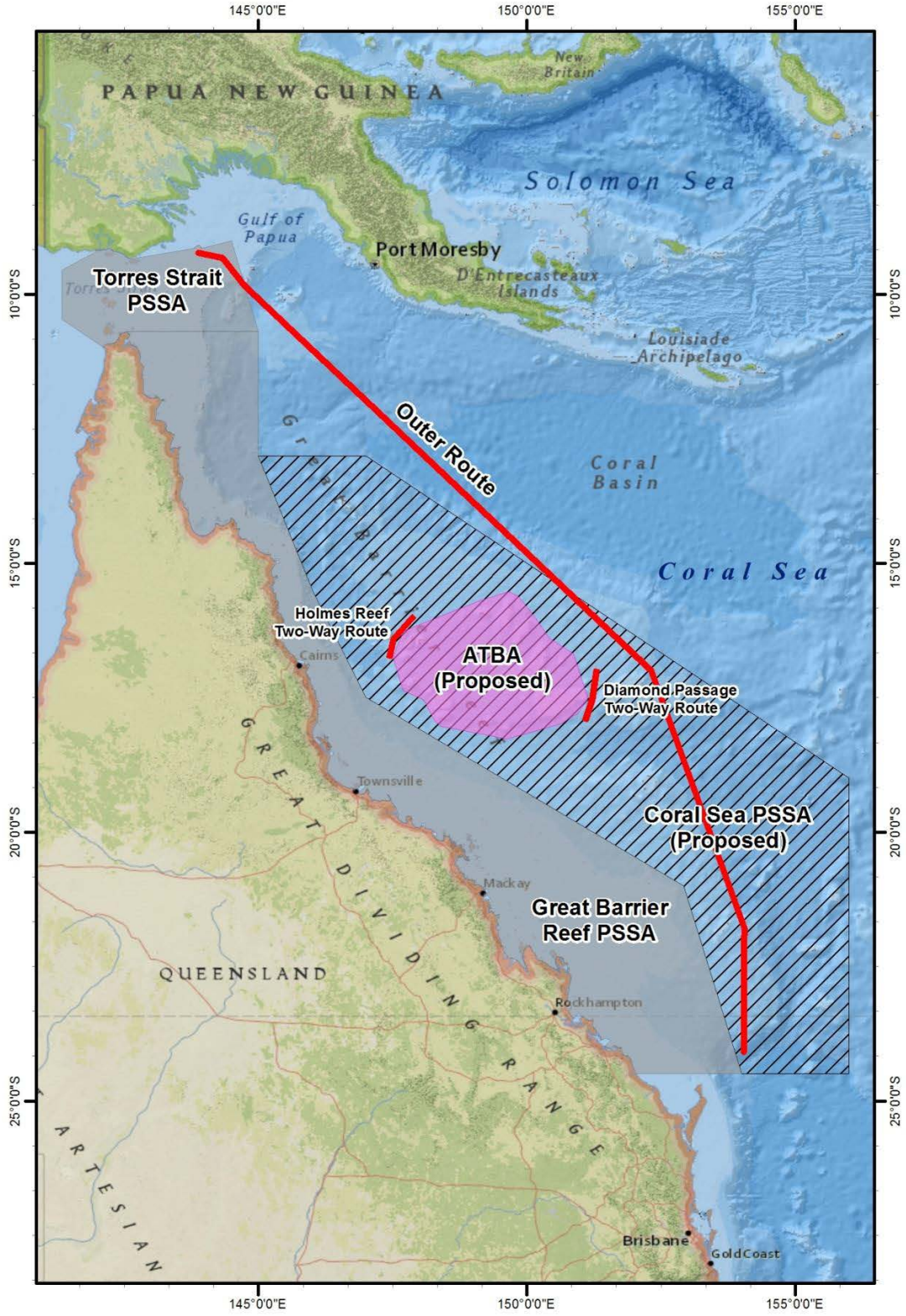

Figure 1: Source IMO MEPC 68/10/1

Case Study 6: The Pelagos Sanctuary for Mediterranean Marine Mammals - a Mediterranean MPA that spans territorial and high seas waters.

The Pelagos Sanctuary for Mediterranean Marine Mammals (formerly the International Ligurian Sea Cetacean Sanctuary) is arguably the first High Seas intergovernmental MPA. It was created with the objective of establishing a sanctuary for marine mammals and managing the negative impacts of human activities (Tilot 2006; Le Hardy 2001). Ratified through a formal agreement with France, Italy, and the Principality of Monaco in 1999, it entered into force in 2002 (Scovazzi 2001; IWC CC 2007). In 2001, it was accepted by the Barcelona Convention as a Specially Protected Area of Mediterranean Interest (SPAMI). The Sanctuary is in the Corso-Ligurian marine area, northeast of the western Mediterranean Sea, spanning internal and territorial waters of France, Italy, and the Principality of Monaco, as well as international waters. A total of 46,371 km2 of the 87,492 km2 area of the Sanctuary is in the High Seas (water column).

The presence in the area of a permanent frontal system, and consequent upwellings of deep, nutrient-rich waters is responsible for substantial primary productivity, a striking contrast with most of the Mediterranean pelagic domain. The high abundance of the Mediterranean euphausiid, *Meganyctiphanes norvegica*, of cephalopods and of fish attracts eight species of cetaceans including fin, sperm, Cuvier's beaked, long-finned pilot whales, striped, Risso's, bottlenose, and short- beaked common dolphins. The habitats of these pelagic cetaceans lie largely in international waters.

In the Mediterranean Sea, where exclusive economic zones have not been created, management and conservation of these High Seas (water column) resources beyond 12 nautical miles can be problematic. A special area of ecological protection (ZPE) was created by France, Italy, and Monaco in 2004 within the sanctuary to enforce the law against negative impacts of pollution and scientific research. Several international conventions and instruments have been employed to lend support to the Sanctuary.

A management plan is based on the ecosystem approach and adaptive management (Tilot, 2004). Stakeholders were involved from the beginning in the development of the management plan, and support it. Management measures have been adapted to each zone, setting limits with the objective of balancing conservation and the sustainable use of resources, including both traditional and commercial uses. Regulated activities within the region include, inter alia, fisheries, aquaculture, commercial and leisure navigation, offshore racing and other high-speed maritime transportation, prospecting, exploration, coastal urbanization, tourism, whale-watching, military activities, and scientific research. In contrast, enforcement is still insufficient.

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Case Study 7: Global Environment Facility Large Marine Ecosystem Projects (GEF-LMEs)

[Source: excerpt from UNEP, 2014]

The world's 64 LMEs as defined by the US National Oceanic and Atmospheric Administration (NOAA) are discrete marine areas (typically about 200,000km2) identified by ecological criteria (bathymetry, hydrography, productivity and trophic relationships) adjacent to the continents in coastal waters (Sherman and Hempel, 2008). Collectively countries sharing an LME can consider the root causes of degradation of their coastal areas and contributing basins and the need to integrate changes in sectoral economic activities (Duda and Sherman, 2002). The Global Environment Facility (GEF) is a funding agency assisting developing coastal countries to meet ecosystem-related targets. GEF recommends the use of LMEs as the geographic focus for ecosystem-based strategies to reduce coastal pollution, restore damaged habitats, and recover depleted fisheries. Within the marine and coastal portfolio of the International Waters focal area of GEF there are currently 18 GEF-LME Projects.

In a GEF-LME project funding is typically linked to development of a Transboundary Diagnostic Analysis (TDA) and a Strategic Action Plan (SAP). The latter is negotiated with the intention of creating the enabling conditions and prioritising Project actions to remedy issues identified in the TDA. The process establishes Project goals and milestones having identified the driving forces of ecosystem change. The LME approach uses the NOAA 5-module suite of ecosystem condition indicators (productivity, fish and fisheries, pollution and ecosystem health, socioeconomics, governance) to provide the scientific and economics foundation for management actions as shown in Figure 1 (for more details see Sherman and Duda, 1999). Establishment of a baseline condition against which to measure the success or failure of management actions is stressed as a prerequisite.

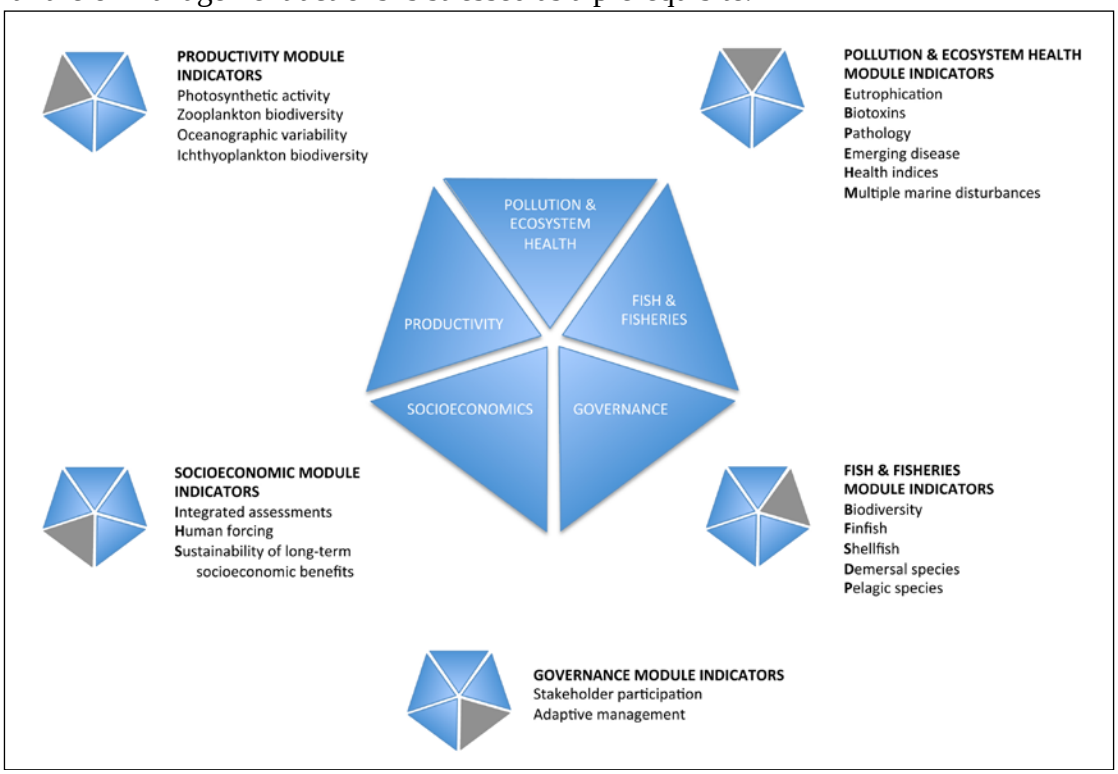

Figure 1: LME 5-module model for sustainable development (Sherman and Hempel, 2008 p.8)

Linkages between the 5 LME Modules and the TDA/SAP processes are shown in Table 1. The intention of the GEF-LME Projects is ultimately to create an adaptive, self-financing, management regime for LMEs located within or in relation to Regional Seas areas[15]. Periodic assessments (TDA updates) are envisaged. The assessment and management cycle fosters an adaptive management approach by establishing monitoring and evaluation indicators. However, GEF funding was always intended as a catalytic means to address degradation of coastal waters in developing countries and the long-term viability of GEF Projects is uncertain.

LME Module	TDA	SAP
1. Productivity	Transboundary issue, identify threats and root causes	Regional and national reforms to maintain productivity
2. Fish resources and Fisheries	Transboundary issue, identify threats and root causes	Regional and national reforms to sustain fisheries
3. Pollution and Ecosystem Health	Transboundary issue, identify threats and root causes	Regional and national reforms to reduce pollution and sustain ecosystem
4. Socioeconomics	Socioeconomic impact analysis, including prioritization of issues	Economic instruments, investments etc., as tools for SAP implementation
5. Governance	Governance analysis, stakeholder analysis	Legal, policy and institutional reforms; ministerial level adoption; stakeholder involvement (private sector and civil society)

Table 1: Linkages between 5 LME Modules and TDA/SAP processes (Olsen et al., 2006)

Olsen (2003) developed a framework suggesting 'sets of indicators to trace the evolution of an LME management system as it progresses from the baseline conditions documented by the TDA to (hopefully) progressively more sustainable conditions and patterns of use' (Olsen et al., 2006 p.27). Four sets of indicators identified were i) indicators serving as markers for the preconditions needed for ecosystem-based management; ii) stress reduction indicators; iii) environmental status indicators; and iv) indicators showing a dynamic equilibrium between both social and environmental qualities.

The Canary Current LME (CCLME): has received GEF Foundational funding of $8.79m (towards enhanced understanding, bringing countries together), which usually ensures follow-up funding if the project goes well. The Secretariat of the Abidjan Convention serves as executing agency for project component 3 on water quality, habitat and biodiversity of the CCLME project and sits on the project Steering Committee. CCLME countries are also, at the exception of Morocco, countries of the Abidjan Convention zone. CCLME already targets representatives of environment and fisheries (e.g. Senegal – focal point and technical coordinator) who then nominate experts for working groups. There is a push by CCLME for the two sectors to work together with inter-ministerial Working groups, plus efforts to work

[15] *Some of the LMEs, such as the Somali Current LME, cover geographic areas outside the Regional Seas Programme geographic boundaries*

together. For example, a demonstration project on MPAs as a tool to generate profits for managing multiple resources has been designed to show the potential benefits of MPAs in the co-management of artisanal demersal fisheries. In this context a Regional Workshop on implementation of the FAO Technical Guidelines on MPAs and Fisheries and planning of CCLME activities was held 5-7 November 2012 in Dakar, Senegal. CCLME is also working on integration of management with other overlapping LMEs (Guinea Current and Mediterranean)(http://www.canarycurrent.org)

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Case Study 8: Management Recommendation for the Milne Seamount Cluster MPA

[Source: OSPAR 10/23/1-E, Annex 35]

OSPAR Recommendation 2010/12 on the Management of the Milne Seamount Complex Marine Protected Area is drafted to a standard intergovernmental format comprising a preamble and the substantive text of the Recommendation. The purpose of the preamble is to set the measure in context, recalling relevant articles of the OSPAR Convention and agreed strategies, conservation objectives and related global legal instruments. It also includes statements requested by Contracting Parties such as a 'sans prejudice' clause. In other words, the MPA does not prejudice the sovereign rights and obligations of coastal States to the continental shelf, including their inherent right to delineate outer limits of the continental shelf in accordance with UNCLOS. It also recognises the range of human uses occurring and notes the MoU between OSPAR and the North East Atlantic Fisheries Commission (NEAFC).

The substantive text of the Recommendation agrees a set of definitions relevant to the measure and the purpose and scope of the Recommendation. As this is a precautionary measure, the 'sans prejudice' clause is reiterated. However, the Programmes and Measures section of the Recommendation determine exactly what Contracting Parties must undertake and these are transposed below directly from the Recommendation text:

3. Programmes and Measures

3.1 The management of human activities in the Milne Seamount Complex MPA should be guided by the general obligations in Article 2 of the OSPAR Convention, the Ecosystem Approach[16], and the conservation vision and objectives at Annex 2.

3.2 The management framework[17] for the Milne Seamount Complex MPA should be implemented. Such implementation implies the commitment by each Contracting Party of an appropriate level of resources in order to achieve the conservation objectives of the MPA at Annex 2.

3.3 To achieve the conservation objectives of the Milne Seamount Complex MPA, OSPAR Contracting Parties should:

3.3.1 Awareness Raising

a) promote awareness at a national level of the establishment of the Milne Seamount Complex MPA and the objectives the OSPAR Commission has set for its conservation.

b) This should be achieved through actions such as notification of relevant stakeholders through competent national authorities and the inclusion of the Milne Seamount Complex MPA in sea charts and other maps, as appropriate; and

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[16] As defined by the Statement on the Ecosystem Approach to the Management of Human Activities "Towards an Ecosystem Approach to the Management of Human Activities" adopted in 2003 by the Joint Ministerial Meeting of the Helsinki and OSPAR Commissions.

[17] The management framework consists of Decision 2010/1, this Recommendation on associated management actions, and measures taken by the OSPAR Commission for achieving the conservation objectives of the Milne Seamount Complex MPA. Such future measures should clearly stipulate that they are to be considered as part of the management framework.

a. *aim, through awareness raising and voluntary agreements, to encourage vessels flying their flags to comply with the management framework and meet the conservation objectives for the Milne Seamount Complex MPA.*

3.3.2 Information Building

a) *nationally engage with relevant stakeholders in building and sharing information and knowledge of the biodiversity and ecosystems of the Milne Seamount Complex and the impacts of human activities taking place in the Milne Seamount Complex MPA; and*

b) *report to the OSPAR Commission any scientific and technical information and knowledge gained at a national level on the biodiversity and ecosystems of the Milne Seamount Complex and on the impacts of human activities taking place in the Milne Seamount Complex MPA.*

3.3.3 Marine Science

a) *promote the application of the "OSPAR Code of Conduct for responsible Marine Research in the deep seas and high seas of the OSPAR area" (OSPAR Agreement 2008-1) by national research vessels or national research institutions involved in international research programmes in the Milne Seamount Complex MPA;*

b) *encourage and, where appropriate, support and initiate scientific research projects and programmes to enhance the knowledge base of the site, of the impacts resulting from human activities, and of the solutions to achieve the conservation objectives;*

c) *encourage inclusion of the Milne Seamount Complex MPA as a reference area in scientific research programmes on climate change and the oceans;*

d) *identify suitable mechanisms for monitoring the achievement of the conservation objectives for the area; and*

e) *identify activities and mitigating actions that promote the achievement of the conservation objectives for the area.*

3.3.4 New Developments

a) *make publicly available and bring to the attention of the OSPAR Commission plans for human activities in the Milne Seamount Complex MPA, or any measure outside the area that may be potentially conflicting with the conservation objectives and likely to cause a significant impact to the ecosystems of the Milne Seamount Complex MPA;*

b) *ensure, where appropriate, that a human activity in the Milne Seamount Complex MPA, or any measure outside the area that may be potentially conflicting with the conservation objectives of the Milne Seamount Complex MPA is subjected to an*

Environmental Impact Assessment (EIA) or Strategic Environmental Assessment (SEA), and that appropriate measures are taken[18]*;*

c) *ensure the involvement of relevant stakeholders in the process of planning new activities and assessing their potential impacts on the Milne Seamount Complex MPA. Engaging stakeholders should be guided by the "OSPAR Guidance for good practice for communication with stakeholders on the establishment and management of marine protected areas" (OSPAR Agreement 2008-2), and;*

d) *use best-available scientific advice when planning new activities and assessing their potential impacts on the Milne Seamount Complex MPA.*

3.3.5 Third Parties

a) *engage with third parties and relevant international organisations, as appropriate, with a view to promoting the delivery of the conservation objectives that the OSPAR Commission has set for the Milne Seamount Complex MPA and to encourage application of the above programmes and measures, as relevant.*

[18] *Taking into account relevant OSPAR or other international standards and guidelines for the specific activity under consideration.*

Case Study 9: Towards a Management Plan for the Sedlo Seamount

The project OASIS 2002-2005 (Gubbay, 2005) integrated physical, biogeochemical and biological studies to provide a holistic assessment of seamount ecology in the North-East Atlantic using two sites as case studies to apply the scientific knowledge to developing possible options for sustainable management. Sedlo Seamount lies within the 200nm EEZ of Portugal in the autonomous region of the Azores. It is a 75km long feature, 30km at its widest point and comprises three distinct peaks rising steeply from 2,800m to 804m, 713m and 660m respectively. It is an area assumed to exhibit a high degree of naturalness with little human activity and is an important spawning ground for fish of high commercial and ecological importance.

'Towards a Management Plan for Sedlo Seamount' was one of the final products of the OASIS project with regard to the management aspects. The draft management plan produced was comparable to the format recommended for OSPAR MPAs (OSPAR, 2003-18). The process started with a desk study. This generated draft proposals and an outline management scheme for circulation to stakeholders – OASIS scientists, representatives of the Regional Government of the Azores and user groups.

The proposed overall goal was '*To manage human activities around Sedlo in a way that protects it ecosystem function, biodiversity and significance as an unexploited example of a seamount within a network of marine protected areas in the Azores'*. Boundaries incorporated both the seamount itself and a buffer zone determined by modeling of water currents. A strictly prohibited zone around Sedlo effectively closed the area to all fisheries. Scientific research was subject to licensing by the MPA management body. A multi-agency group was envisaged to be the overseeing management committee for the MPA including a wide range of stakeholders.

Management measures proposed required introduction of regulations comprising key statutes as part of the designation of the MPA by the Regional Government of the Azores. Regulation of fishing activity beyond 100nm needed separate provisions from the European Commission and ICAAT. It was stressed that MPA proposals should not be viewed in isolation but would benefit from being set in the context of fisheries and biodiversity strategies for the Azores EEZ.

The draft Management Plan sets out goals and objectives; a series of management tactics (boundaries and zoning, regulations, education and public awareness); administration provison; surveillance and enforcement; monitoring and evaluation of plan effectiveness; and a timetable for implementation.

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Case Study 10: Stakeholder participation in decision-making processes for the Sur de Almería MPA: Building consensus to conserve Mediterranean cetaceans and sea turtles

Marine protected areas are complex social-ecological systems. In recent decades, stakeholder participation has been widely encouraged in MPAs' design and management to enable these conservation projects to last over time and produce the expected results.

The south of Almeria-Seco de los Olivos is a marine area with an extension of 2,829 square kilometres, located to the south of the Iberian Peninsula and characterized by the immense productivity of its waters which contain a wide range of marine species and habitats. Shallow coastal areas, abyssal plains, mountains and submarine canyons are all part of its seabed, providing a diversity of environments that support a wide variety of marine organisms. Due to the influence of both Atlantic and Mediterranean water masses, the complex underwater morphology and the weather conditions of the Strait of Gibraltar, a great upwelling of deep, cold and nutrient-rich water is produced in the coastal zone and in the environment surrounding its submarine mountains. Whales, dolphins, turtles and seabirds all come to this area in order to take advantage of these productive conditions and the availability of food in the water column. Large slow growing predators, like sharks, are also common in these waters. Fishing activity, high levels of pollutants, high by-catch of cetaceans and turtles in fishing gear and maritime traffic all pose a major threat to the biodiversity of the Area.

ALNITAK, an NGO that has been working in the Area since 1990, developed a strategy by which to build solid relations with the main stakeholders of the area (fishermen, marine transport sector, military defence, tourists and teachers). Through different LIFE EU Projects they were able to develop activities and research experiments to improve the conservation status of sea mammals and turtles off the southern coast of Spain turning the conservation challenges of these species into success stories.

The first step was to develop a comprehensive stakeholder map in order to visualize the best way to communicate with, work with and approach each stakeholder group. The approach taken for each group differed but generally began with one-on-one meetings and then continued to group meetings.

Building trust and discussing scientific data was a key element to overcome initial difficulties with commercial sectors. A long-term programme of workshops in which the fishermen could find out about the results and have input into the process was a key element. This was supported by a number of fishing trials, changing the bait the fishermen used and the depth they fished at. These two simple measures reduced the number of bycatch turtles from over 20 000 to almost zero before any official fisheries regulation was drafted. They also carried out research on dolphins entangled in fishing nets which led to a more positive perception of the dolphin by the fishermen. Since all these measures were developed with a bottom-up approach compliance was close to 100%.

Another success story was the work with the marine transport sector. The Mediterranean Sea is one of the most heavily used shipping regions in the world, with over 220,000 vessel (4 100 gross tonnage, GT) transits each year. Vessel strikes in the region pose a significant threat to fin whales, and some smaller whale species (Nortabartolo 2010). Until 2009, this area was intersected by the Cabo de Gata Traffic Separation Scheme (TSS), established in 1998 by the IMO, routing 35,000 vessel transits to and from the Strait of Gibraltar and ports along the northern coast of the Mediterranean annually (Fig. 1). The TSS also intersected rarely-used fishing grounds until around 2001 when increased bottom trawling activities increased the risk of vessel collisions. At the same time, maritime traffic authorities became increasingly concerned with high traffic volume in relation to the sensitive coastal and marine habitats

designated as Sites of Community Importance (European Union Habitat Directive) and in relation to the numbers of cetacean species and loggerhead sea turtles (Caretta caretta) that occur in the region.

In May 2005, in line with their Stakeholder Involvement Strategy, ALNITAK, together with the Spanish DGMM submitted a proposal to the IMO that was designed to first reduce the risk of collision between vessels using the TSS and the increased numbers of fishing vessels, and second to enhance environmental protection. The proposal sought a modification of the Cabo de Gata TSS such that it would lie 20 nm seaward of the Cape (Fig.1). The proposal was adopted by the IMO and came into effect on 1 December 2006 along with a publication in Notices to Mariners and incorporation into nautical charts (Silber et al., 2012).

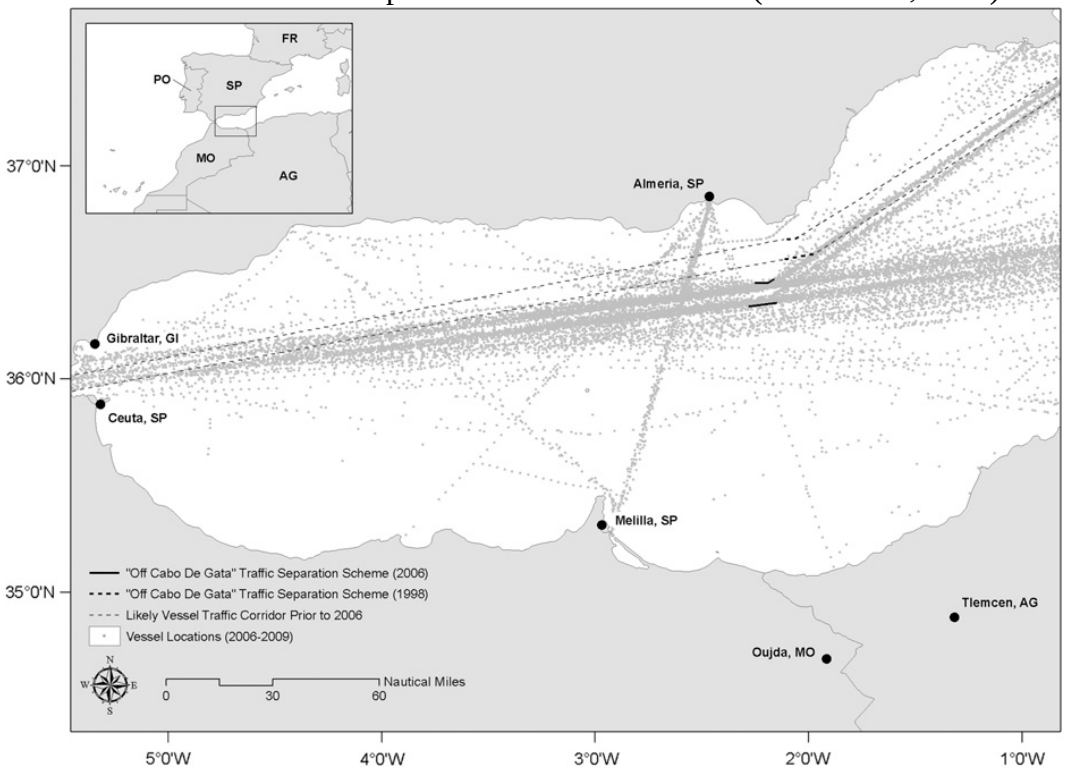

Figure 1. The original and the modified Alboran Sea Traffic Separation Scheme (TSS). Vessel locations (derived from AIS studies) are shown in the revised TSS.

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Case Study 11: The Strait of Bonifacio

Under the IMO, the MARPOL Convention assigns certain sea areas the denomination of "special areas" in which, for technical reasons relating to their oceanographically and ecological conditions and to their sea traffic circumstances, the adoption of special mandatory methods for the prevention of marine pollution is required. Under the Convention, these special areas are provided with a higher level of protection than other areas of the sea. The Mediterranean Sea has been designated as a Special Area under MARPOL Annexes I (oil) and V (garbage).

It is also possible for Contracting Parties to identify maritime zones that require additional protection from international shipping and request their designation as Particularly Sensitive Sea Areas (PSSAs). This is done by applying the Revised guidelines for the identification and designation of Particularly Sensitive Sea Areas[19]. These guidelines include criteria to allow areas to be designated as PSSAs if they fulfil a number of criteria, including: ecological criteria, such as unique or rare ecosystem, diversity of the ecosystem or vulnerability to degradation by natural events or human activities; social, cultural and economic criteria, such as significance of the area for recreation or tourism; and scientific and educational criteria, such as biological research or historical value. When an area is designated as a PSSA, at least one associated protective measure must be stipulated to control the maritime activities in that area, such as routeing measures, including traffic separation schemes and areas to be avoided, and surveillance measures such as installation of Vessel Traffic Services (VTS). These associated protective measures become mandatory under the relevant international conventions (e.g. SOLAS, MARPOL, etc.) and, therefore, must be complied with by international shipping.

The Strait of Bonifacio separates the Italian island of Sardinia from the French island of Corsica. The Strait takes its name from Bonifacio, the southernmost town of Corsica and it enables passage from the Sea of Sardinia in the west to the Tyrrhenian Sea in the east. Its width varies from eight to ten nautical miles. The Strait of Bonifacio falls into the category of "Straits used for international navigation" regulated by UNCLOS and its maritime traffic used to be represented mainly by merchant ships crossing the Strait along east-west direction (several dozens of ships per day) and passenger ships (approximately ten daily connections) in the direction north-south. In addition, there are about 5,000 pleasure craft crossing this area during the summer season.

The ecological significance of the Strait of Bonifacio region was internationally recognised when it was granted the status of Specially Protected Area of Mediterranean Importance (SPAMI) at the sixteenth session of the Conference of Contracting Parties to the Barcelona Convention for the Protection of the Mediterranean Sea against Pollution in 2009. The Area is also covered by the Pelagos Sanctuary[20] supporting species and habitats whose rarity or significance are recognised nationally, regionally and/or internationally.

As a result, in order to protect the area's environmental, cultural and economic attributes from the serious threats posed by international shipping, France and Italy requested (2010) to the IMO the designation of a PSSA covering the Strait and adjacent areas (see Figure 1).

The associated protective measures established by the PSSA included:

1. Adoption of a mandatory traffic separation scheme.

[19] *IMO resolution A.982(24)*

[20] *See previous Pelagos Sanctuary Case Study*

2. Promulgation of areas to be avoided close to reefs that present particular dangers to shipping.
3. Establishment of a vessel traffic system (VTS) in accordance with the provisions of the SOLAS Convention (regulation 8-2 of chapter V (Safety of navigation)).
4. Establishment of a mandatory pilotage system for ships following the Strait of Bonifacio and whose transit of the area resolution A.766(18) recommends flag States to prevent.

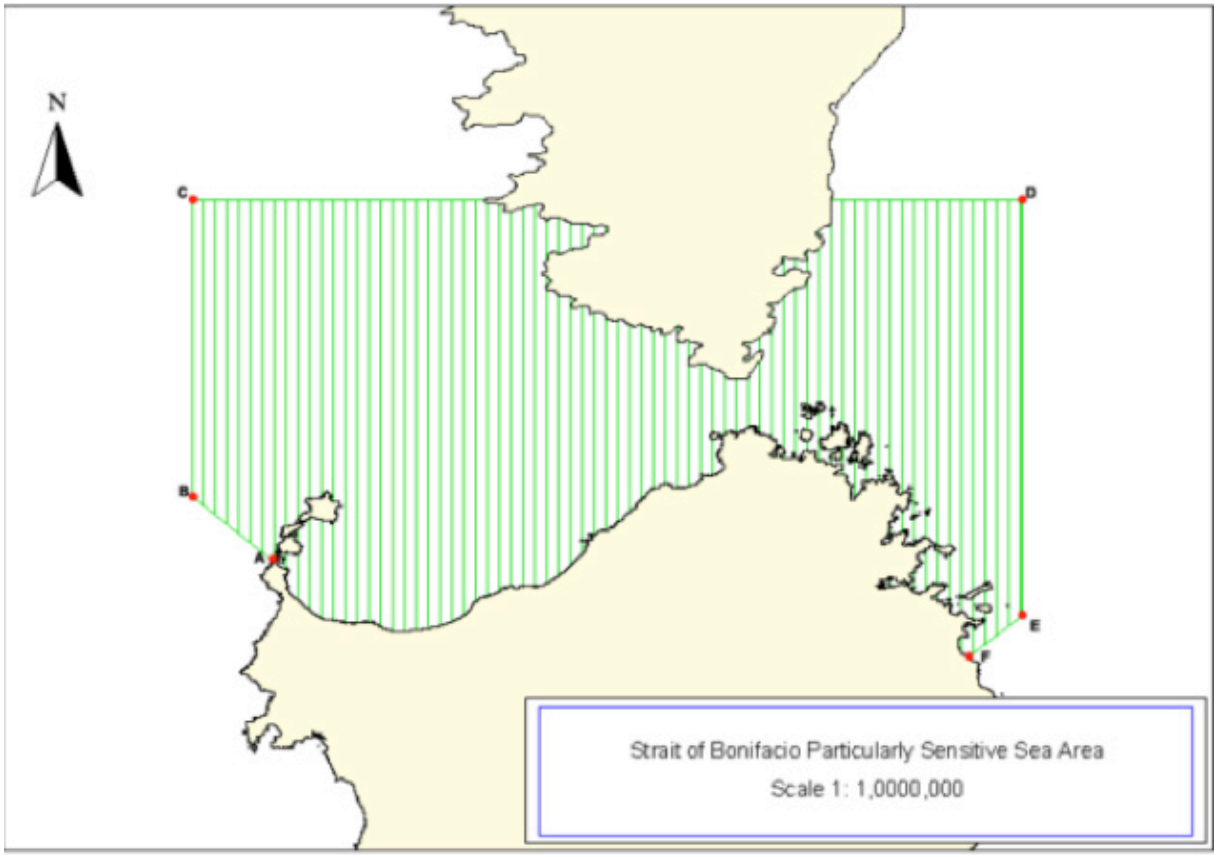


Figure 1: Strait of Bonifacio Particularly Sensitive Sea Area.

References:

- MEPC 61/9
- MEPC 61/INF.26

Case Study 12: Kerguelen Islands

Source: Brooke et al. (2010)

The Kerguelen Islands are a French Territory in the Southern Indian Ocean, 4000km from Australia and South Africa. The Islands have a sub-Antarctic climate and are uninhabited except for research stations and bases, which receive four supply trips a year.

The surveillance and enforcement problem to be addressed was Patagonian toothfish poaching. For this resource the CCAMLR catch quota is 5000 tonnes/yr and IUU fishing was estimated at 30-26,000 tonnes/yr. Surveillance challenges are the size of the area (3m km2), its remoteness and the heavy weather the aea experiences.

The surveillance approach taken has been to use synthetic aperture radar (SAR) satellite-based ship detection. The basic strategy is to coordinate SAR (4-5 passes per day, 7-10 images per pass, 20,000 images per year) with VMS. Images are transferred to La Reunion for verification. Surface patrol vessels then respond (5 French Navy vessels are based at La Reunion). Limitations are that only 10% of the EEZ is covered per day, with very long revisit times for specific sites, and costsof $5000 per image plus annual fees €2 – 2.5m

The solution has been to establish a ground station on Kerguelen. France purchased portable ground station called Sentry (data is transferred by email). This Canadian technology is a Certified Radarsat Network Station upgraded to receive and process Envisat ASAR data, which means it can communicate with relevant satellites, scheduling and tracking satellite passes, acquiring data and processing it. Time lag between image acquisition and download has been eliminated, so processing including ship detection and subsequent forwarding of ship detection products is approximately 2 hours.

Case Study 13: Eyes on the Seas

Source: Pew Charitable Trusts (2015) Project Eyes on the Seas: Pioneering technology to help end illegal fishing. *Available online at: http://www.pewtrusts.org/en/multimedia/video/2015/project-eyes-on-the-seas [Accessed 29 July 2015]*

Project Eyes on the Seas is designed to be a cost-effective global fisheries monitoring and enforcement tool for governments around the world, including the most resource-poor enforcement agencies, to monitor and detect illegal fishing and related activities.

The system combines:

- AIS and VMS;
- Satellite imagery -Synthetic Aperture Radar (SAR) and higher resolution optical imagery for smaller targeted ocean areas;
- Vessel databases – a repository combining international, regional and national vessel registries; and
- Automated analysis of algorithms to detect unusual vessel activity.

In formation is monitored by a so-call ‘virtual watch room’, where automatic alerts warn analysts of suspicious activity. ‘Case packages’ of evidence can then be referred to Government authorities.

Pew Charitable Trusts and UK-based company Satellite Applications Catapult are working to develop an equitable cost-model and considering use by seafood retailers and others. There are plans to incorporate crowd-sourced data and provide information to the public based on additional functionality including GPS-tagged photos, historical data inputs and predictive algorithms.

The Bertarelli Foundation announced a five-year commitment to support the monitoring of the Pitcairn Islands Marine Reserve as part of Eyes on the Seas when the MPA was designated.

Case Study 14: Pacific Marine Monuments

Source: Richardson (2012)

Marianas Trench, Pacific Remote Islands, and Rose Atoll (collectively the Pacific Marine Monuments) were declared as MPAs by George Bush in 2009. All commercial resource extraction is prohibited (explicitly commercial fishing).

An MCI review of performance of US law enforcement agencies in 2012 documented threat and inadequacies of the compliance regime. Their analysis determined that there were:

- A lack of enforceable regulations to prohibit commercial fishing by US vessels and insufficient sanctions;
- Conflicting legislative ambitions;
- Problems with under-funding and underequipment for the vast size of the area;
- Surveillance shortcomings - VMS and air/sea patrols only provided an incomplete picture;
- Shortcomings with outreach to ocean user groups; and
- No formal coordinating mechanism to foster cooperation between the three management and enforcement agencies (USCG, NOAA, USFWS).

A Pacific Monuments Enforcement Workshop held in Honolulu HI (25-26 April 2012) recommended:

- Specific policy/regulatory changes;
- Greater emphasis on innovation;
- Improved ocean user outreach; and
- Better coordination and transparency.

<u>Reference</u>

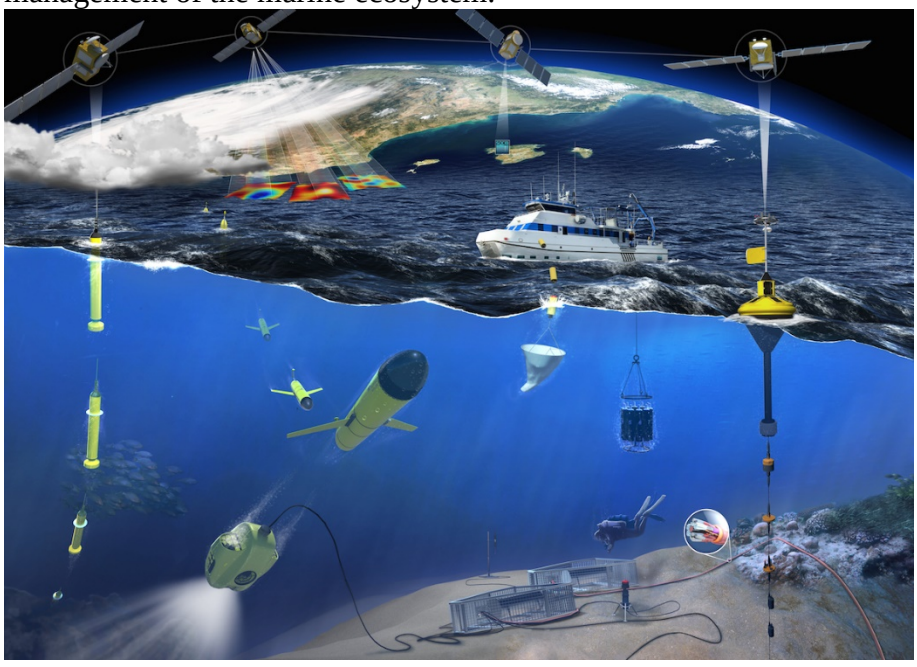
Richardson, M. (2012) Protecting America's Pacific Marine Monuments: A Review of Threats and Law Enforcement Issues. Marine Conservation Institute. 55pp.

Case Study 15: Balearic Islands Coastal Observing and Forecasting System (SOCIB) - using gliding Atlantic Bluefin Tuna, Loggerhead sea turtles and jellyfish to design and monitor Mediterranean MPAs

Operational ecology offers a unique opportunity to assess complex marine socio-ecological-systems. During last years, SOCIB has been working on the study of the interactions between environmental variability, organism abundance and human activities in order to develop new management approaches. SOCIB has focused on three key pelagic group species of interest as Atlantic Bluefin tuna, Loggerhead sea turtles and jellyfish that are particularly affected by environmental variability at different scales.

SOCIB has three major infrastructure components: (1) a distributed multiplatform observing system with appropriate instruments and technologies, (2) a numerical forecasting system with different types of predictive models, and (3) a data management and visualization system. The combination of the three elements enables real-time monitoring of the state of the ocean and the coastal zone and the prediction of its spatial and temporal evolution.

SOCIB specifically addresses the preservation and restoration of the marine environment and its biodiversity. The project “Gliding Atlantic Bluefin tuna, Loggerhead sea turtles and Jellyfish” is helping to design and monitor Mediterranean MPAs by considering new approaches such as science-based sustainable fisheries and MPAs optimal design to advance and progressively establish a more knowledge-based and sustainable management of the oceans and coastal areas. In addition, these projects contribute to the identification of priority areas in order to inform spatially dynamic ocean management of marine ecosystems, bring special attention from social community and citizens due to their importance in the goods and services of the oceans and their contribution to a more science and ecosystem based management of the marine ecosystem.



Case Study 16: Chagos Archepelago

A challenge was launched by Mauritius in 2011 into the legality of the Chagos Archepelago British Indian Ocean Territory (BIOT) MPA, claiming that the designation was carried out in defiance of political assurances given in 2009 by the UK government. Sand (2012) claims Chagos sets conservation priorities against human rights.

The historical position is that in 1965, three years before Mauritius gained independence, the UK decided to 'detatch' the Chagos Islands from the rest of its then Indian Ocean colony in breach of UNGA Res. 1514 (passed in 1960) which specifically banned the break up of colonies prior to independence.

Chagos archipelago as declared part of BIOT from which in 1971 the 1500 islanders were deported. The largest island, Diego Garcia, was leased to US as an airbase in 1966 (an agreement that expires in 2016). Resettlement is still disputed and a feasibility study by KPMG commissioned by the UK Government concluded 'there was not a clear indication of likely demand for resettlement, and costs and liabilities to the UK taxpayer were uncertain and potentially significant'.

In March 2015 a binding ruling was made by the UN International Tribunal of the Law of the Sea (ITLOS) that UK acted illegally in exercising territorial control. The Tribunal found that creation of the MPA breached the UK's obligations to consult nearby Mauritius and illegally deprived it of fishing rights. UK is accused of creating an MPA to suit its electoral timetable, in 'undue haste', and 'presuming to conclude – without ever confirming with Mauritius – that the MPA was in Mauritius' interest'. 2 of the 5 judges stated that the marine zone and fishing ban (on industrial tuna fishing) enacted in 2010 put UK and US interests above Mauritius's rights.

UK has stated that the creation of the MPA was 'without prejudice' to future court rulings on the rights of Chagossians and has agreed to return the Chagos islands to Mauritius when they are no longer needed for defence purposes.

The ITLOS Judgment declares 'The United Kingdom's undertaking to return the Chagos archipelago to Mauritius gives Mauritius an interest in significant decisions that bear upon the possible future uses of the archipelago. Mauritius' interest is not simply the eventual return of Chagos archipelago, but also the condition in which the archipelago will be returned'.

The Judgment puts the status of the MPA in jeopardy and orders the UK and Mauritius to renegotiate.

References

Sand, P. (2012) Fortress Conservation Trumps Human Rights? The 'Marine Protected Area' in the Chagos Archipelago. Journal of Environmental Development 21(1): 36-39.

Case Study 17: Wadden Sea Cooperation

The Trilateral Wadden Sea Cooperation between the Netherlands, Germany and Denmark has been in place since the 1982 Joint Declaration on the Protection of the Wadden Sea. In 1997 a Wadden Sea Plan and monitoring programme were agreed under the guiding principle agreed in 1991 'to achieve, as far as possible, a natural and sustainable ecosystem in which natural processes proceed in an undisturbed way'. The Wadden Sea is a transboundary 'open system' having many interactions with the adjacent North Sea and catchment areas of debouching rivers. In terms of spatial or area-based management the 14,700km2 Wadden Sea Area encompasses the 11,208.5km2 Conservation Area (including National Parks and nature reserves, man and biosphere reserves) and international protection regimes under the EC Birds Directive, EC Habitats Directive, Ramsar, IMO Particularly Sensitive Sea Area and a UNESCO marine World Heritage Site. An Agreement on the Conservation of Seals in the

Wadden Sea was concluded between the three countries in 1991. Wadden Sea countries are also contracting parties to OSPAR, the CBD, CMS, the Agreement on the Conservation of African-Eurasian Waterbirds (AEWA) and the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS). The Wadden Sea Area includes coastal provinces and municipalities and marine area within the 12nm boundary.
The Wadden Sea Plan includes the vision, shared principles, targets and policies and management measures combined with actions. Sector regulations cover agriculture, fisheries, hunting, dredging and dumping, sand and clay extraction, tourism, shipping, and energy (wind, gas, oil). Tourism regulation includes visitor guidance and temporal and spatial zoning including the closure of ecologically most sensitive sites such as breeding and moulting areas. About 3.7 million people live along the Wadden Sea coast with some 75,000 living inside the Wadden Sea Area.
Since 1987 a Common Wadden Sea Secretariat has administered the Trilateral Cooperation producing regular Quality Status Reports and proposing recommendations to Trilateral Governmental Conferences held every 3-4 years. A Trilateral Monitoring and Assessment Programme (TMAP) informs management by providing a scientific assessment of the status of the ecosystem as a means of evaluating the status of implementation of the trilateral targets of the 1997 Wadden Sea Plan.
Achievements set out in the 2009 Quality Status Report (Marencic and Vlas, 2009) include decreased nutrient inputs (although the Wadden Sea is still a 'eutrophication problem area'), decreasing concentrations of hazardous substances (as measured by contaminants in birds eggs), recovery of seagrass habitat and extent of saltmarshes, and improving numbers of many migratory birds and harbor seals. Recognised challenges include adaptation to climate changes and accelerated sea level rise, continued protection and restoration of natural dynamics, reduction of external impacts such as alien species and international cooperation on protection of migratory species (e.g. Bird Flyway Cooperation). Since 1991 a mosaic of 'zero-use' reference areas have been established in each country against which to judge monitoring and research.
The history of World Heritage Status exemplifies the lengthy process required to achieve this protective designation. First nominated in 1988, the area was then subjected to a Feasibility Study in 1991 and, after further consultations, the Netherlands and Germany began the formal nomination process in 2005. After due scrutiny by UNESCO and IUCN the Wadden Sea was included in the World Heritage List in 2009. To achieve this the area must be of outstanding universal value, meeting criteria to assess global importance, satisfying conditions of integrity with adequate protection and management in place.
The Wadden Sea exemplifies how a coherent approach to protection and management at an ecosystem level (considering the entire area, integrating all aspects and tackling external impacts) can protect the integrity of the system. Protection is informed by scientific information and monitoring, supported by communication, education and public awareness. The Wadden Sea Forum, an independent stakeholder forum with its own Secretariat, promotes stakeholder engagement and links to integrated coastal zone management and marine spatial planning initiatives. The value of international cooperation is a consistent approach together with local capacity building and training - top down and bottom up.

References

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Case Study 18: Seychelles Marine Spatial Planning Initiative

The Seychelles Marine Spatial Planning (MSP) Initiative is a Government-led process focused on planning for and management of the sustainable and long-term use and health of the Seychelles EEZ, a marine area covering 1,374,000 km2 and encompassing the Seychelles archipelago of 115 islands.

The aim is to produce a holistic climate-smart multi-use plan with input from the major sectors using or potentially in the future using the country's marine space. The plan will guide strategies and decisions of the Seychelles Conservation and Climate Adaptation trust (SeyCCAT) established as part of the Government-led Debt-for-Climate-Change-Adaptation swap. This recognises that Seychelles people and economy are vulnerable to climate change threats. The Nature Conservancy and Oceans5 are working to mobilize a US$80m debt-swap whereby public debt would be purchased or forgiven in exchange for marine conservation commitments and establishing a permanent trust fund endowment. Seychelles' external debt presently stands as 65% of GDP.

The intention within the MSP is to classify approximately 200,00 km2 as 'replenishment zones' to help protect important tuna feeding grounds. Climate adaptation includes restoration of coral and mangrove habitats to buffer sea-level rise, as well as ICM reform.

An MSP Consortium will provide a vehicle for national dialogue and public input, allowing stakeholders (such as the Seychelles Fishing Boat Owners Association) to inform and guide the planning process. Executive decisions will be made by a Governmental Ministerial Group informed by a MSP Steering Committee. Guiding principles have been adapted from the IOC-UNESCO MSP Manual (Ehler and Douvere, 2009) and the initiative will be a continuing, iterative process. Phase 1 is production of a blueprint comprising four multi-use zoning design scenarios and a set of associated management strategies. The MSP will better control unsustainable uses such as foreign-owned purse seiners in favour of coastal demersal fishing that only yields between 2,500 to 3,000 tonnes of fish per year. A Workshop held in January 2015 announced the Government's commitment to expanding the country's MPA network by 20-30%. According to the GOS/UNDP/GEF Programme Coordination Unit this is likely to be through expansion and strengthening of the protected area sub-system of the outer islands of Seychelles and its integration into the broader land and seascape.

<u>Reference</u>

Elher, C. and Douvere, F. (2009) Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme. IOC Manual and Guides No. 53, ICAM Dossier No. 6. Paris, UNESCO.

Case Study 19: Progress and perspectives in Portugal

Source: Antonio M Teixeira DGRM, presentation at 4th International Conference on Progress in Marine Conservation in Europe, 14-18 September 2015, Stralsund, Germany

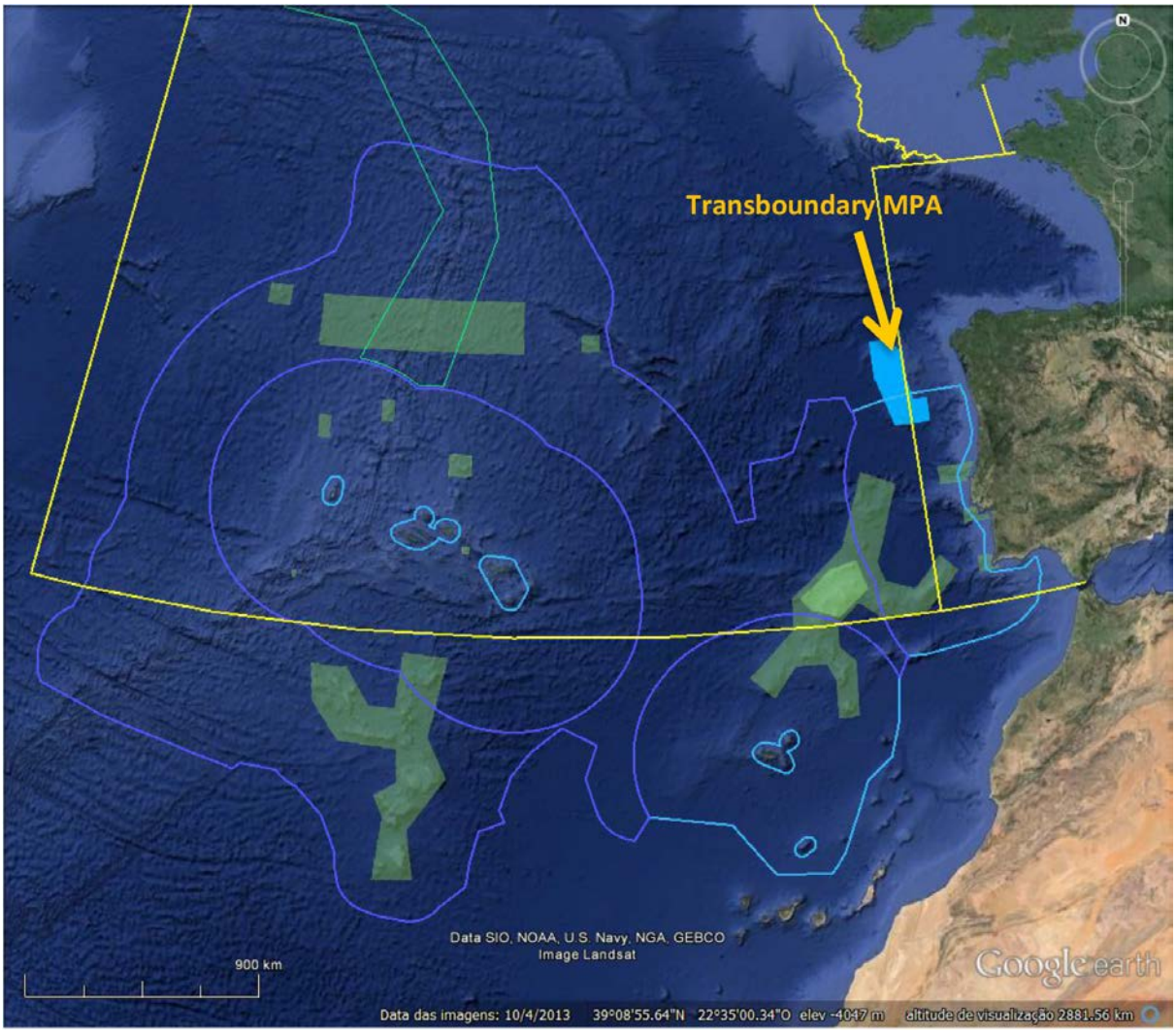
Portugal's marine estate, based on her submission to the Commission on the Limits of the Continental Shelf, make Portugal one of the world's largest maritime nations with a unique geostrategic position (Ferreira et al., 2015). The total area involved is some 50% of the whole marine area under national jurisdiction of all EU countries.

For area-based planning purposes several different boundary delineations apply to Portuguese waters. In addition to the 200nm EEZ and extended continental shelf submission these include EU marine regions (within Bay of Biscay and the Iberian Coast as well as Atlantic Ocean), the Macaronesia ecosystem, and the OSPAR Maritime Area (parts of Regions IV and V). Furthermore, Portuguese national authorities must coordinate with the Regional Governments of the Azores and Madeira in order to manage all areas under Portuguese jurisdiction.

Portugal envisages a future Portuguese network of Oceanic and Transboundary MPAs. This includes taking into account the four designated OSPAR High Seas MPAs (Altair Seamount, Mid-Atlantic Ridge North of the Azores, Antialtair Seamount and Josephine Seamount); a proposed new MPA (Madeira-Tore); and a proposed expansion of the limits of the Josephine High Seas MPA in order to link up with the proposed Madeira-Tore MPA. The concept is to create a single large MPA with a very wide depth range representative of many species and habitats associated with seamounts. In addition similarly ambitious proposal for a Great Meteor MPA is envisaged as an additional extensive MPA covering a major seamount complex south of the Azores. Consideration is also being given to a large transboundary MPA spanning Portuguese and Spanish waters.

At the same time Portugal is giving consideration to the description of four areas, comprising the areas covered by the Josephine/Madeira-Tore complex, Great Meteor MPA, and large areas of the Mid-Atlantic Ridge both north and south of the Azores as EBSAs for submission to the CBD process.

[see over for map]



Above: Portuguese oceanic and transboundary MPA

Reference

Ferreira, M.A., Pereira da Silva, C., Campbell, H., Conway, F., Andreade, F. and Johnson, D. (2015) Gold Rush or Pandora's Box? Towards a Transparent and Measured Approach to Marine Spatial Planning in Portugal. The International Journal of Marine and Coastal Law 30 (2015) 418-444. Brill Nijhoff.

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