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MARINE PROTECTED AREAS

Capitalising 25 years of project experience and feedback

INNOVATE | EXPERIMENT | SHARE

ACKNOWLEDGEMENTS AND DISCLAIMER

This report would not have been possible without the support and contributions of national authorities, project teams and all those involved in marine protected areas (MPAs) in the countries included in the sample.

For their assistance with the review of elements of this study, we would like to thank:

François Henry (fisheries economist), Romy Hentinger (Tara Ocean Foundation), Louis-Gérard d'Escrienne (MPA monitoring) and Romain Renoux (Executive Director, The MedFund).

This study is the result of work commissioned by the French Facility for Global Environment (FFEM), and undertaken by independent consultants, to capitalise upon 39 FFEM projects. The views expressed are those of the consultants and do not necessarily reflect those of the FFEM. This capitalisation task involved a limited sample of marine protected areas in tropical and Mediterranean regions. The aim is to share as widely as possible lessons learned through the projects in this sample. The study is intended neither to comprise a comprehensive state-of-the-art, nor a set of rules for establishing marine protected areas.

Preface

Since its creation by the French government in 1994, the French Facility for Global Environment (FFEM) has been working to reconcile environmental preservation with sustainable development in developing countries. It supports innovative pilot projects working closely with local communities, and uses the lessons learned to share solutions and trigger transition on a larger scale.

To this end, project evaluation and capitalising experience are key steps in bringing scientific understanding, local knowledge and innovative practices into the light to inform future action.

Capitalisation that draws on a variety of projects in a themed area enables us to take into consideration the wide range of different contexts, approaches taken, and solutions tested in the field. The challenge is to learn not only from successes and good practices, but also from obstacles overcome, so that the most effective solutions can be shared with stakeholders and rolled out in other locations or at larger scale. This approach also involves a considerate approach, working alongside stakeholders on the ground, and with other institutions in France and elsewhere, to share the lessons learned.

For over 25 years, the FFEM has been building strong expertise in innovative instruments for finance, networking, planning and development to preserve marine and coastal ecosystems. Technical and financial support from the FFEM has helped to create or consolidate nearly 200 marine protected areas (MPAs) around the world.

This publication, the first in a new series of "FFEM Capitalisation", addresses the core theme of preserving oceans and marine resources through the key tool of MPAs. Building on a previous volume on "FFEM Capitalisation" on MPAs published in 2010, it takes a fresh look at these areas, reflecting new observations, practices and perspectives, and the convergence between the challenges and solutions for both climate and biodiversity.

Although the 11th Aichi Biodiversity Target planned to conserve 10% of coastal and marine areas by 2020, worldwide only 7% of these areas were covered by MPAs in 2020, with not all being as effective or well connected as they could be.

Much more work clearly remains to be done, especially as proposals for the new Convention on Biological Diversity (CBD) framework now cite a global target of protecting 30% of marine areas by 2030.

The crisis of climate change and biodiversity loss, and its increasingly tangible impacts on coastal and island communities dependent on marine resources, means we must urgently support MPAs and their networking to set more ambitious targets, particularly in terms of sustainable fishing, biodiversity conservation, and the mitigation of, or adaptation to, climate change through nature-based solutions. This will position MPAs at the heart of transition pathways for the wider regions on which they depend. and which they irrigate. This publication presents experience-based recommendations to promote the creation, and informed sustainable management, of MPAs together with the development of a sustainable blue economy and the resilience of these ecosystems.

It is being published against the backdrop of the International Union for Conservation of Nature (IUCN) World Conservation Congress, the United Nations Biodiversity Conference COP 15 and Climate Change Conference COP 26, and alongside negotiations on a legally-binding treaty to protect the high seas. The document demonstrates the FFEM to be fully-aligned with French and international commitments to preserve the oceans, both strategically and operationally, while working closely with those on the ground and with local communities. This publication is also designed for both practitioners and decision-makers!

Stéphanie Bouziges-Eschmann
Secretary-General of the FFEM

Christophe Bories
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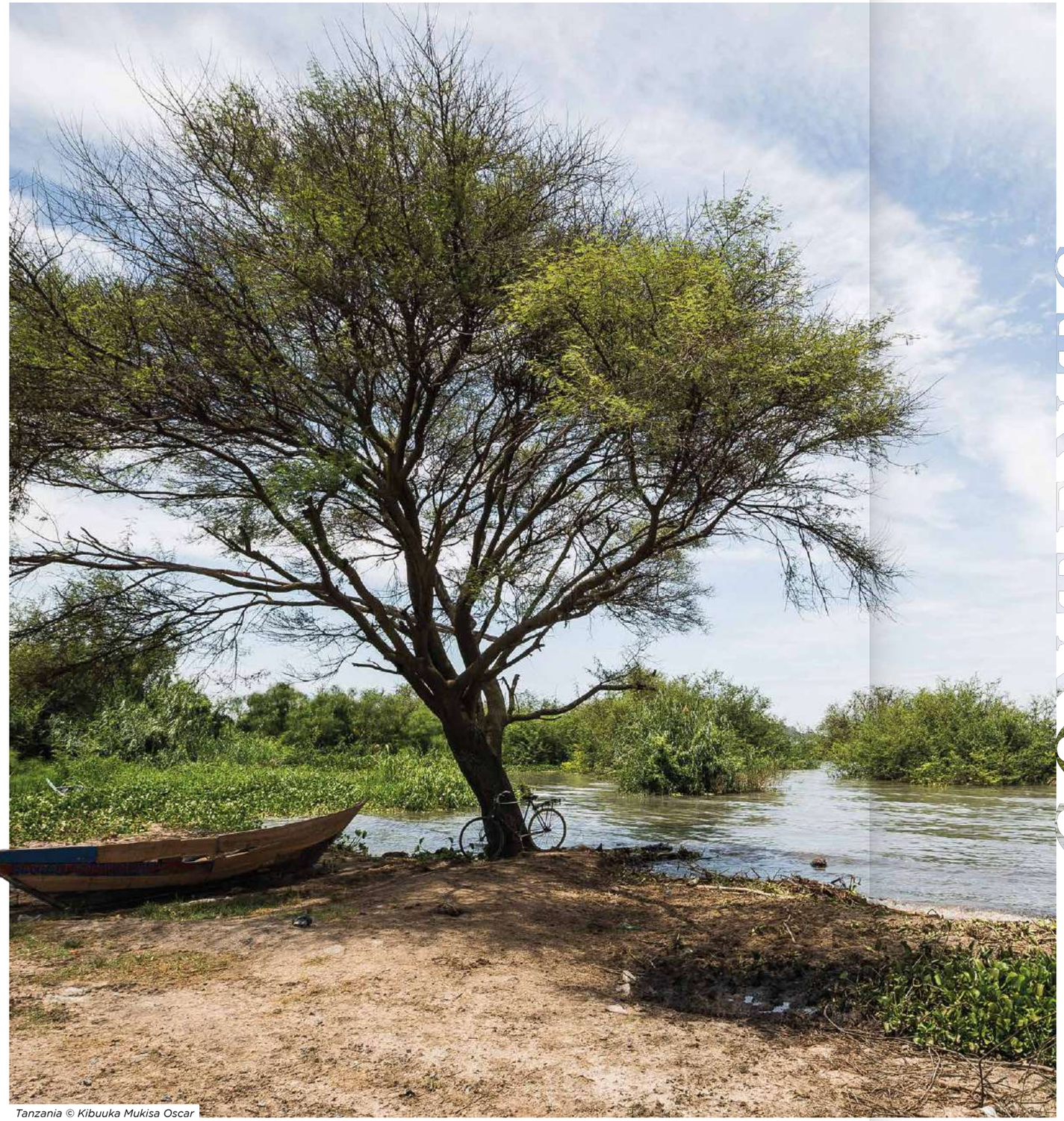
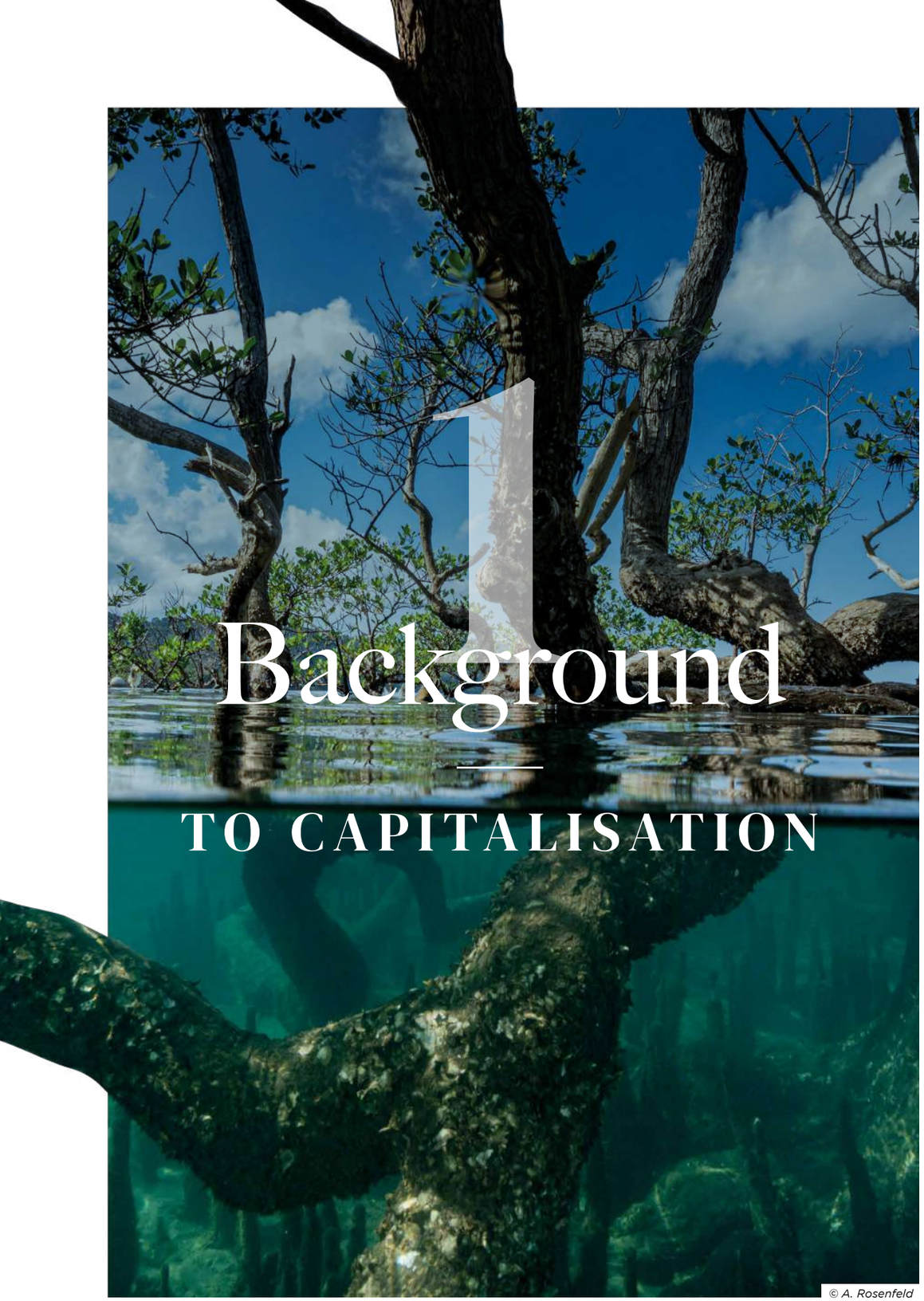


Tanzania © Kibuuka Mukisa Oscar

CONTENTS



1 Background

TO CAPITALISATION

© A. Rosenfeld

The marine environment: a major challenge

Oceans, seas and coastal areas are indispensable to the sustaining of life on the blue planet . They cover 70% of Earth's surface area and contain 97% of the planet's water. These environments are vital to global food security, with the livelihoods of over 3 billion people dependent on marine and coastal resources. They are the primary regulator of the world's climate (see box opposite), as well as enormous reservoirs of biodiversity. This close link between biodiversity, climate and oceans is now widely recognised.

Given these high stakes, and the degradation observed in fish stocks and environments (especially coastal), there is an urgent need to protect and enhance the resilience of marine and coastal ecosystems and the communities that depend on them.

Among the range of measures proposed – including reducing pollution and overexploitation of resources – well managed, robustly protected marine areas are recognised as key strategies, not only for conservation but also for development.

Until now, attention has been focused mostly on coastal areas. However, issues affecting the high seas in areas beyond national jurisdictions – particularly in terms of carbon sequestration and oxygen production – mean we now need to introduce specific tools for protection and ecosystem-based management. Current negotiations are therefore focusing on developing a legally-binding international instrument for the conservation and sustainable management of these areas.

> The ocean is at the very heart of the planet's climate system. It absorbs over 25% of anthropogenic CO2 emitted annually into the atmosphere, and provides 50% of the oxygen produced on Earth. It also absorbs more than 90% of the heat resulting from greenhouse gas emissions, so playing an essential part in climate regulation.
>
> ***Ocean & Climate Platform***

The Convention on Biological Diversity (CBD) and the Aichi Biodiversity Targets, which make up the "Strategic Plan for Biodiversity 2011-2020" for the planet have set 20 targets. Target 11 is that: *"By 2020, at least [...] 10% of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes."*

United Nations Sustainable Development Goal 14 has 7 targets, including pollution reduction; an integrated approach to sustainable management of marine and coastal ecosystems, particularly in matters of resilience and restoration; conservation of at least 10% of coastal and marine areas as marine protected areas; reduction of overfishing and illegal fishing; and support for artisanal fishers.

The FFEM

The French Facility for Global Environment (FFEM) has been working in this field in developing and emerging countries for over 25 years, financing projects that reconcile environmental preservation with local development, at the intersection of the themes of biodiversity, climate and society.

Among other things, the FFEM's work helps to implement the key international agreements on environmental protection to which France is party (CBD, climate, seas). The FFEM is contributing to the United Nations Sustainable Development Goal 14 (SDG 14) and to Aichi Biodiversity Target 11 (see previous page). Both explicitly recognise the need to create networks of effective MPAs to help to preserve and restore ocean ecosystems, rebuild biodiversity in oceans and coastal areas, and support the global human population.

To date, the FFEM has contributed nearly EUR 50 million to over 40 projects, spanning every ocean of the world and over 50 countries, supporting over 200 MPAs. These initiatives range from the smallest community MPS to the largest, consolidating knowledge of marine regions that are at times little known. They have contributed to negotiations about the high seas and have supported coastal communities in increasing their resilience.

The FFEM takes a partnership approach, and it is thanks to ongoing collaboration with numerous stakeholders that progress on these themes has been possible. These structured partnerships ensure that projects are robust.

Mayotte © I. Bonillo / AFD

The French Facility for Global Environment is a bilateral public fund created by the French government in 1994, following the Earth Summit in Rio.

Entrecasteaux © T. Clément

FFEM strategy in relation to the marine environment

PROTECTING AND BUILDING UPON BIODIVERSITY

As with climate change, the massive erosion of biodiversity, at global scale, often penalises the most vulnerable populations. Projects supported by the FFEM aim to preserve biodiversity through effective protected area systems, while building upon this as a driver of equitable and sustainable socio-economic development. The FFEM's action focuses on:

- ensuring the sustainability of ecologically effective protected areas;
- structuring value chains derived from biodiversity;
- identifying pilot areas with "high biodiversity ambitions".

RESILIENCE OF AQUATIC ECOSYSTEMS

The combined impact of human pressures and climate change on aquatic ecosystems is calling into question their capacity to regulate and adapt. The projects supported by the FFEM for marine and coastal ecosystems contribute to protecting international waters, preserving biodiversity and combating climate change and its effects. The FFEM's action in marine and coastal environments focuses on:

- preservation and governance of the high seas;
- resilience of coastal areas and small island territories.

Capitalising experience for wider sharing

The FFEM promotes innovative environmental protection and sustainable development in its areas of operation. It encourages innovative initiatives and pilot projects addressing global environmental issues, seeking environmental, social and financial benefits. The FFEM considers innovation in a broad sense, including innovative approaches, methods, tools and ways of working. The projects it supports thus test pioneering solutions, in order to learn from them and facilitate their sharing and deployment at larger scale, in other regions or sectors and/or by other actors. The reproducibility of actions that have proven effective is via the capitalisation of these innovative practices and experiences. This is the aim of this publication, which updates the previous capitalisation exercise of 2010 to include projects financed by the FFEM between 2010 and 2020, as well as reflect new perspectives central to current concerns.

Capitalisation: a systematic process of identifying specific knowledge and/or expertise developed through a project or programme, in order to analyse, explain and model the experience so it can be shared and developed by others.

The main themes of capitalisation

1.
Knowledge and monitoring for informed management:
management guidance (at the intersection between scientific understanding and local knowledge); ecological and socio-economic monitoring; storage, transfer and sharing of data.

2.
Creation and sustainable management of MPAs:
shared governance; management tools (management plan, business plan); the essential role of monitoring and assessing management effectiveness.

3.
Sustainable economic development and the blue economy:
combining conservation with socio-economic benefits for local communities: fishing (core activity in MPAs), tourism and other industries contributing to improving living conditions in the communities.

4.
Ecosystem resilience:
innovative planning tools and new ideas for more integrated management of the marine and coastal environments surrounding MPAs. Strengthening the resilience of ecosystems and their ability to adapt to changes, by using nature-based solutions to restore degraded ecosystems.

5.
Ways of sustaining the benefits of protection and MPAs:
capacity building for greater local autonomy (training, exchange and learning networks); public policies favourable to better conservation and co-management of the marine environment; sustainable finance for MPAs.

The study reviewed the 40 FFEM projects that have supported the creation and/or management of MPAs and the management of coastal areas. The study is largely based on the literature gathered on these projects, and on the authors' own knowledge of the MPAs and sites studied. This capitalisation highlights the wealth of FFEM experience, over a broad range of regions, themes developed, actors and partners involved. It demonstrates a clear paradigm shift (see figure opposite) towards a wider vision of the environment and more inclusive approaches that foster co-management, working more closely with users to better address the resilience of ecosystems and populations, particularly in the face of climate change, while the range of sustainable financing tools is growing. It charts the successes, but also the failures that have provided learning opportunities and fuelled progress.

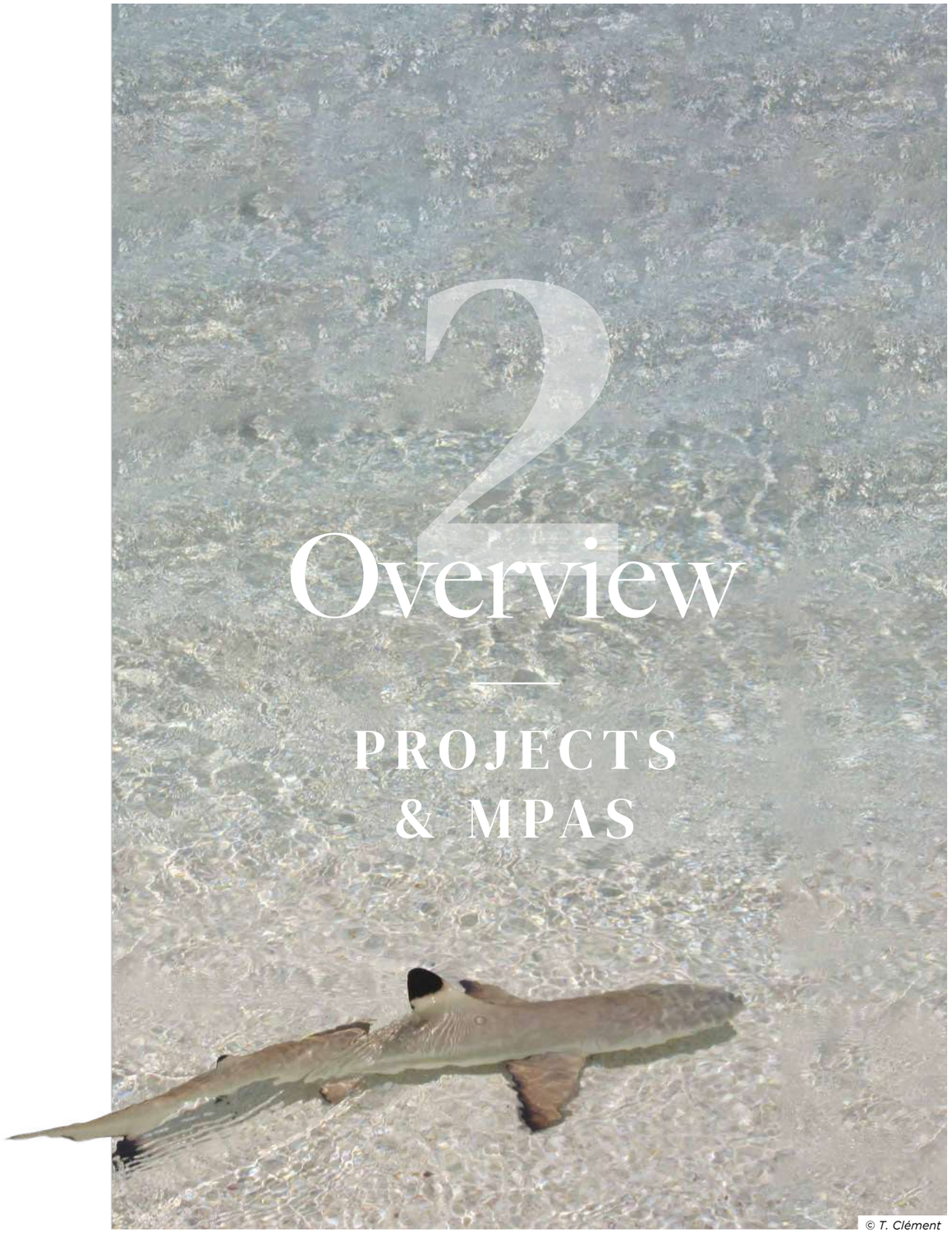
This round-up of experience shows the FFEM's extensive contribution to the body of knowledge. The improvement of fundamental knowledge - to which the FFEM contributes greatly - is crucial to the management of regions, to better recognising the importance of the high seas, as a foundation for informed decision-making, and for increased acceptance among communities. The FFEM also contributes to technological progress for scientific application.

In line with international recommendations, the review emphasises the FFEM's scope for progression, which includes refocusing projects on areas of high ecological and biological value and/or those of high "blue carbon" value; helping to establish highly-protected marine areas (HPMAs); forging closer links between MPAs and the management of fisheries both within and outside those; better integrating the relationship between land and sea in working with partners; strengthening the value chain approach; and pursuing nature-based solutions.

Lastly, this capitalisation highlights a clear need for the FFEM to continue its support in these areas, where there remains plenty of scope for innovation and development in pilot projects, vital steps in scaling-up.

Paradigm shifts

1990		2021
Preservation only, MPA "under glass"	→	Preservation and local development (greater involvement of communities and better standard of living), but the need for stronger protection
Only the MPA is considered	→	The MPA is part of a wider region and landscape: the need for an integrated regional approach from land to sea
Management imposed	→	Shared management, broad involvement of communities
Biodiversity	→	Climate change / resilience / nature-based solutions
Income-generating activities	→	Sectoral approaches: social economy value chains
Biodiversity studies **Strict MPA approach**	→	Functional studies Wider, regional and landscape approach
Coastal areas	→	High seas
Maritime economy	→	Blue economy
Academic training	→	Training through peer-to-peer experience-sharing in communities of practice Involving students from the South in research alongside academics from the North



2 Overview

PROJECTS & MPAS

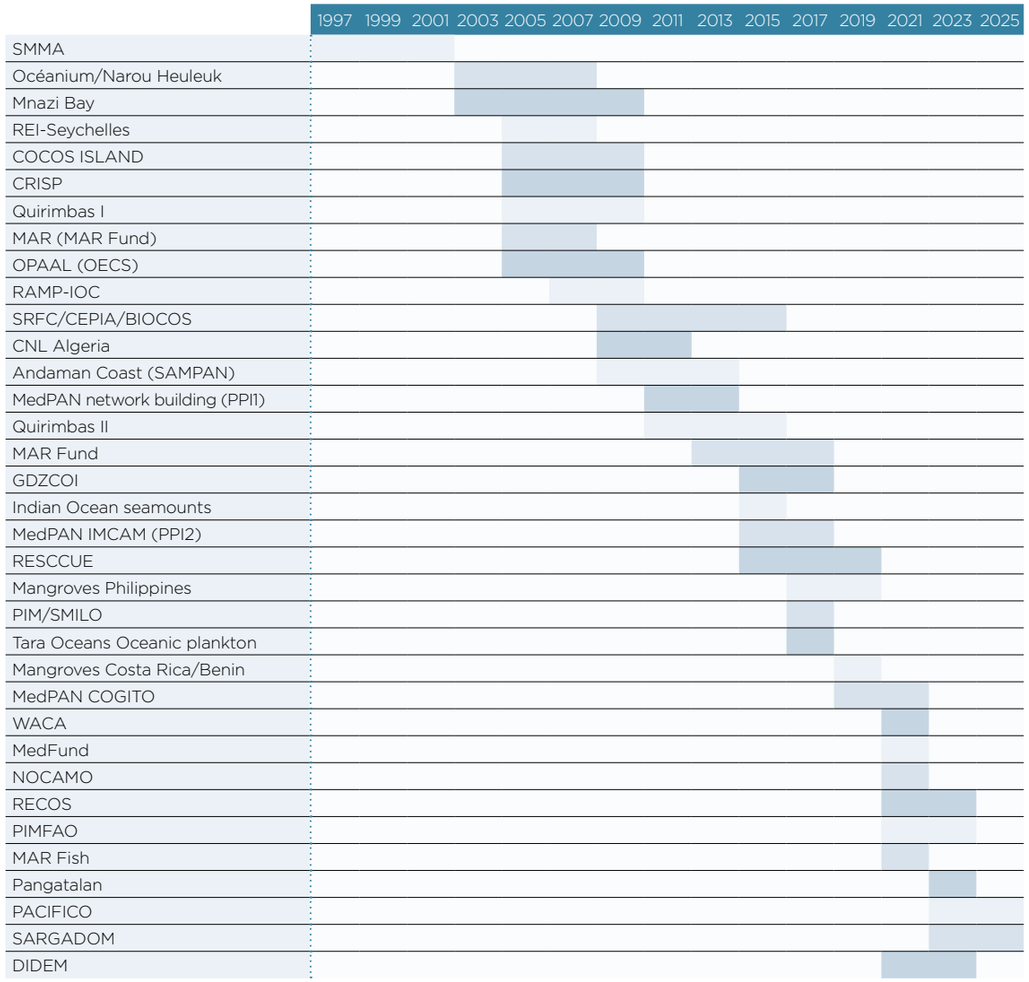
© T. Clément

For over 25 years, the FFEM has been working in the protection and management of marine and coastal environments, particularly through MPAs. Over this period, 39 projects have been financed in various parts of the globe (Africa, Central America, Mediterranean, Pacific, Indian Ocean, etc.) to the tune of total of almost EUR 50 million.

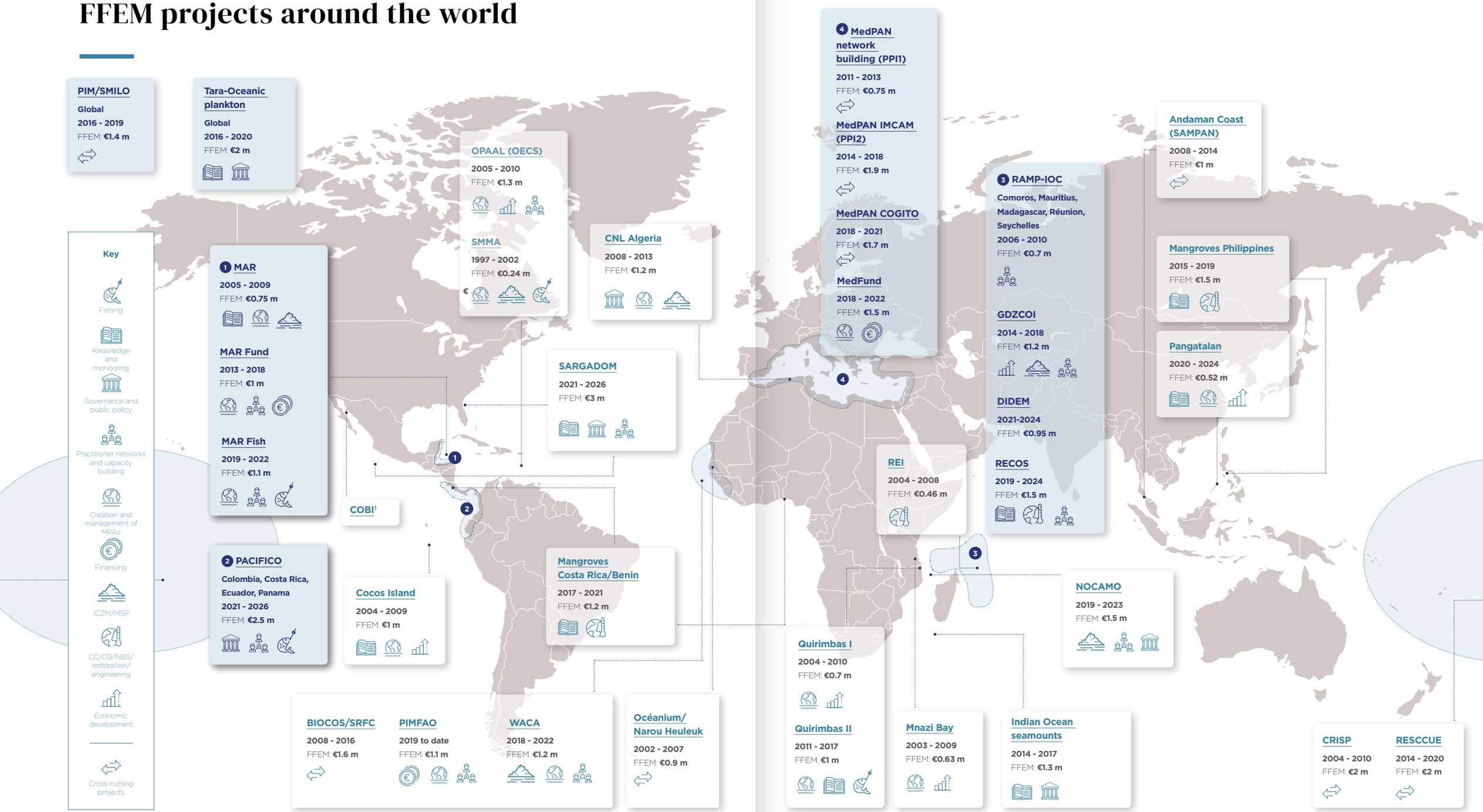
The two maps on the following pages show, respectively:

- **the main projects co-financed by the FFEM over this period.** For each, the map shows the abbreviated project name, when it ran, the FFEM contribution, and the key themes supported by the project;
- **the MPAs covered by this support.** To assist the reader, all the MPAs mentioned in the text are indicated on the map.

Start and finish dates for projects



FFEM projects around the world



1. *Under development*

MPAs supported by the FFEM[2]

Eastern Pacific

1. Cocos Island (Costa Rica)
2. **Cuajiniquil** (Costa Rica)
3. **Terraba Sierpe** (Costa Rica)

Mesoamerica

4. **Cayos Cochinos** (Honduras)
5. **Punta de Manabique** (Guatemala)
6. **Cuero y Salado** (Honduras)

Caribbean

7. **SMMA** (St Lucia)
8. **Tobago Cays** (St Vincent)

West Africa

9. **PNBA** (Mauritania)
10. **Bamboung** (Senegal)
11. **Niumi** (Gambia)
12. **Urok Islands** (Guinea-Bissau)
13. **Tristao Islands** (Guinea)
14. **Emerald Arc** (Gabon)

Mediterranean

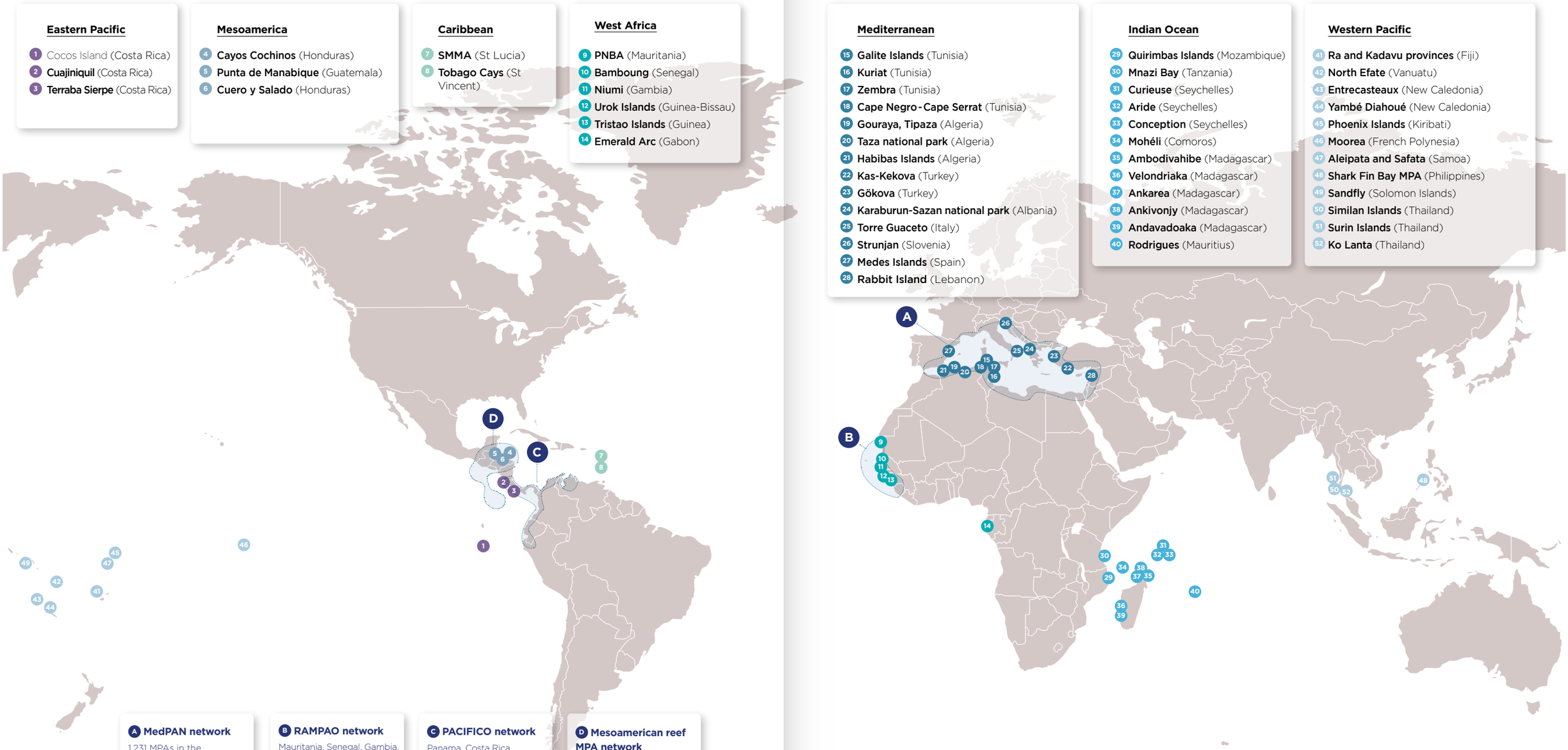
15. **Galite Islands** (Tunisia)
16. **Kuriat** (Tunisia)
17. **Zembra** (Tunisia)
18. **Cape Negro - Cape Serrat** (Tunisia)
19. **Gouraya, Tipaza** (Algeria)
20. **Taza national park** (Algeria)
21. **Habibas Islands** (Algeria)
22. **Kas-Kekova** (Turkey)
23. **Gökova** (Turkey)
24. **Karaburun-Sazan national park** (Albania)
25. **Torre Guaceto** (Italy)
26. **Strunjan** (Slovenia)
27. **Medes Islands** (Spain)
28. **Rabbit Island** (Lebanon)

Indian Ocean

29. **Quirimbas Islands** (Mozambique)
30. **Mnazi Bay** (Tanzania)
31. **Curieuse** (Seychelles)
32. **Aride** (Seychelles)
33. **Conception** (Seychelles)
34. **Mohéli** (Comoros)
35. **Ambodivahibe** (Madagascar)
36. **Velondriaka** (Madagascar)
37. **Ankarea** (Madagascar)
38. **Ankivonjy** (Madagascar)
39. **Andavadoaka** (Madagascar)
40. **Rodrigues** (Mauritius)

Western Pacific

41. **Ra and Kadavu provinces** (Fiji)
42. **North Efate** (Vanuatu)
43. **Entrecasteaux** (New Caledonia)
44. **Yambé Diahoué** (New Caledonia)
45. **Phoenix Islands** (Kiribati)
46. **Moorea** (French Polynesia)
47. **Aleipata and Safata** (Samoa)
48. **Shark Fin Bay MPA** (Philippines)
49. **Sandfly** (Solomon Islands)
50. **Similan Islands** (Thailand)
51. **Surin Islands** (Thailand)
52. **Ko Lanta** (Thailand)



A MedPAN network
1,231 MPAs in the Mediterranean

B RAMPAO network
Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone and Cabo Verde

C PACIFICO network
Panama, Costa Rica, Colombia, Ecuador

D Mesoamerican reef MPA network

2. *Referred to within this publication*

3 Capitalisation

KNOWLEDGE & MONITORING

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Thinking beyond conservation, how have our biodiversity-related projects and industries fostered the sustainable development of economic activities and improved the living conditions and resilience of local communities?

The basics

- Better understanding for better management
- Understanding the cultural context to tailor management solutions
- Preserving and sharing knowledge
- Making monitoring long-term

The challenge of capitalisation

To develop the level of knowledge and monitoring required for effective management, ensuring that they are available in the long term, particularly to inform global and domestic discussion in the context of the negotiation of international agreements.

Introduction

Obtaining good understanding of the environments and establishing baselines

The primary aims of an MPA are the protection of species and the conservation of habitats, ecosystems and landscapes. These aims should be clearly set-out and rooted in a proper understanding of the elements making up the marine area to be protected, so that informed decisions can be made on the perimeter and zoning of the MPA, and on the key directions of the management plan. This understanding, scientific in nature, is however complemented by local communities' knowledge of their environment. Preliminary studies thus enable characterisation of the species and habitats to be protected, better understanding of the socio-cultural contexts in which the MPAs are situated, and the establishing of baselines for subsequent ecological and socio-economic monitoring.

Posidonia meadow monitoring. Mediterranean Sea. © CENPACA

This preliminary research, assessment and establishing of baselines, facilitates the identification of key directions for managing and assessing the impacts on fishing, guides efforts to build resilience and restore ecosystems, and supports the assessment of the risks and impacts of climate change on ecosystems and coastal areas, to underpin adaptation and intervention strategies.

Beyond building knowledge of MPAs, and given that their role in climate regulation is recognised as vital, a number of current FFEM projects seek to improve our understanding of the oceans. These projects are primarily research oriented, requiring significant resources and multi-disciplinary scientific teams. Their ultimate objective is to promote the protection of these marine areas, which are of major biological and functional significance, and to contribute to international discussion of ocean management and governance.

OUR APPROACH

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As well as simply describing the natural and socio-economic characteristics of a protected area, our research strategies today take a more ecosystem approach and seek to study the dynamics of ecological systems subject to natural or human-made pressures. **#KNOWLEDGE**

Assessing trends and the effects of management through regular monitoring

To be able to assess progress and measure the impacts of protection efforts, it is important to establish baselines from the point of creation of an MPA. Once these have been established through preliminary assessment, regular monitoring over time plays a key role in the management of the MPA. It provides essential information on the evolution of the elements monitored, enabling management decisions to be adapted, impacts measured and progress towards planned management goals assessed. Acquiring and strengthening this baseline knowledge and developing monitoring for the areas are recurring objectives in MPA management plans. Monitoring also allows assessment of the effectiveness and impacts of FFEM projects involving the creation and management of MPAs.

Whether highly scientific or developed for the wider public – for example in the context of citizen science – several types of monitoring, addressing different objectives, are employed on MPA projects. These include:

- **biological and ecological monitoring,** which aims to measure changes in condition of the protected environments;
- **socio-economic monitoring,** which aims to gather information about communities living in and around the MPAs;
- **stock monitoring,** in particular for fishery resources (monitoring in no-take zones, sanctuaries and other areas);
- **economic activity monitoring**, of fishing in particular;
- **monitoring management effectiveness, and more.**

These various monitoring forms have different aims, but all seek to inform decision-making around management of the MPAs and assessing effectiveness.

Several of these monitoring activities, forming part of global networks, were at times undertaken in the MPAs before these projects (GCRMN, Reef Check, AGRRA, SocMon, etc.). Others were established as part of the projects themselves.

|LESSONS LEARNED: Monitoring can take many forms. In addition to strictly scientific monitoring, these days research tends toward methods that can be easily implemented by MPA managers, with the support of local populations. **#AUTONOMY**

Women monitoring shellfish populations. Urok MPA, Guinea-Bissau. © T. Clément

1 CHARACTERISING AND MONITORING ECOSYSTEMS AND THEIR FUNCTIONALITIES

Understanding the natural environment and establishing baselines

Ecological studies seek to inventory biodiversity, study habitats and their functionalities and species, assess the health of ecosystems, and so on.

Coral bed © IYORBank Jayne Jenkins

OUR APPROACH

Given that the FFEM is not a research financing body, the acquisition of knowledge is never an end in itself for projects. Research must always seek to deliver better knowledge, for better protection and more effective management.

CHARACTERISING COASTAL ECOSYSTEMS TO PROTECT AND MANAGE

Putting in place an MPA and corresponding management directions requires in-depth knowledge of these environments and resources. In addition, most MPA projects begin with an ecological study phase, building-up knowledge of the various sites within the boundaries of the MPA.

Research in coastal areas has yielded a wealth of benefits:

- Most of the MPAs either established or strengthened by projects – including Punta de Manabique, Cuero y Salado, Cayos Cochinos, Cabrits National Park, Mohéli or the Pacific Islands forming part of the CRISP programme – have been the focus of research work, on occasion finding species previously unknown to science.

- Some sites, such as the Mnazi Bay Marine Park (Tanzania) and Quirimbas National Park (Mozambique), have been the subject of particularly extensive scientific study, bolstering our knowledge of this region which is located in the 2nd greatest triangle of reef biodiversity in the world. These studies reaffirm the vitality of these reefs, which boast high levels of coral cover (up to 60%) and very high coral diversity (more than 250 species), highlighting the importance of these reefs for the Western Indian Ocean. The wealth of mangroves has also been highlighted, especially in the Ruvuma estuary at Mnazi Bay, where they are recognised as amongst the most beautiful in Tanzania. However, at Mnazi Bay, the project evaluation noted that the project at launch was overly focused on descriptive studies of the park and its environment, so delaying the implementation of activities to support local populations. This was to the detriment of promises that had been made to them and resulted in some discontent.

Soil and interstitial water analysis in the mangroves. Cuajiniquil, Costa Rica © C. Agraz

LESSONS LEARNED: This raises the issue of the balance at the start of the project between research, inventories and concrete action. The Mnazi Bay example underscores the importance of establishing the baseline at the start of the project, without losing sight of other challenges, particularly development. It's beneficial to involve local populations in this research (citizen science, etc.), so that they feel like project stakeholders from the outset of the project.

- The Shark Fin bay project, in the Philippines, is expected to create three community MPAs. In-depth work to characterise the environments and determine their ecological condition will be carried out in each MPA using modern and innovative techniques. The marine habitats will be mapped in detail and the health of the ecosystems, the fish populations and the level of pressure (impact of explosives, sedimentation, mangrove degradation, etc.) will be assessed at the very start of the project to provide baselines for later monitoring. For our coastal ecosystem restoration projects, the fundamental research allows us to tailor restoration by supporting management decisions (FFEM Mangroves Initiative project cluster). For more information, see the 2010 report Marine Protected Areas – Capitalising on experience gained in projects co-funded by FFEM (see Chapter 3.4: Ecosystem resilience).

OUR APPROACH

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Working with local communities to discover uncharted territory

Cayman Crown

The Cayman Crown site was discovered in 2013 with the help of local fishers from the Quetzalito community in Guatemala, who reported that there were large "rocks" in the area. The first exploratory dives at the site as part of the "Healthy Reefs For Healthy People" initiative revealed some of the most well developed reefs in Guatemala, with astonishing living coral coverage and an abundance of charismatic marine megafauna, including several threatened species, such as the critically endangered goliath grouper. As the characteristics and configuration of the site would lead us to expect, the studies conducted as part of the MARFISH project confirmed that the Jewel area is a spawning site for ocean triggerfish *(Canthidermis sufflamen)* and that the Cayman Crown is home to an exceptional diversity of life.

BETTER UNDERSTANDING OF THE HIGH SEAS' DYNAMIC ENVIRONMENTS

The ocean, the world's biggest climate regulator. © T. Vignaux

OUR APPROACH

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Protection of the high seas areas presents a new challenge that is both scientific and political in nature; these play a critical role in climate regulation through ocean-atmosphere exchange. These areas are extremely dynamic in terms of currents, and some certainly have high levels of biological productivity, supporting populations of fish, seabirds, arthropods and marine mammals, among others. In addition to acquiring knowledge of these environments, FFEM projects help to inform international discussions and frameworks relating to the protection, management and governance of these distinctive areas that fall outside national jurisdictions.

Planktonic hotspots: a ground-breaking global discovery

Tara: What the experts say about… the Tara Oceans research programme

"Tara: Describing ocean life and understanding its role in climate regulation"[3]

What discoveries has the Tara Ocean expedition made possible about marine biodiversity?

Over four years (2009–2013), the schooner Tara and its 25 partner laboratories sailed the world's oceans and collected 35,000 samples of virus, bacteria, algae and zooplankton. The Tara Oceans expedition allowed us to produce a complete biological description of planktonic organisms down to 1,000 m below the surface across the world's oceans. 150 million new genes have been analysed and sequenced and 130,000 new microscopic marine species discovered. To date this is the most extensive gene sequencing effort ever undertaken on marine organisms, covering the majority of species as well as well as previously unknown microbes. Almost 200,000 types of virus were encountered, i.e. 97% of those known.

What advances has this flagship programme – supported by the FFEM from 2016 to 2021 – made possible?

Since 2015, the Tara Oceans research programme has led, directly or indirectly, to almost 300 publications, including around 30 major articles in journals such as Nature, Science and Cell. The Tara Oceans data are open access to the international scientific community and provides a baseline for planktonic marine biodiversity. Young researchers working on the Tara teams and funded by the FFEM project were able to gain insight into the vulnerabilities of plankton and how these organisms adapt and acclimatise to change, allowing them to predict the consequences of disruptions to marine ecosystems. Other research will be used to determine the biological causes and consequences of oxygen minimum zones (OMZs) in the depths of the oceans (between 200 m and 1,000 m), which are expanding due to climate change. Further research again will help ensure that current models of fish stock move toward ecosystem models covering all organisms, including plankton, so permitting better management of fishery production.

What lessons have been learned in terms of tools and innovative approaches?

The scientific studies currently under way led by the Tara Foundation's partner laboratories aim to establish new criteria – based on the marine microbiome – and identify biologically significant ocean areas, so-called planktonic hotspots. This method, which will be used in a future programme, will improve how marine ecosystems are monitored, managed and protected.

Romy Hentinger, Tara Ocean Foundation, Project Manager, International Advocacy and Cooperation

Learn more: fondationtaraocean.org

Plankton mix © C.& N. Sardet, Plankton chronicles

3. oceans.taraexpeditions.org

Improving our understanding of remarkable ocean sites

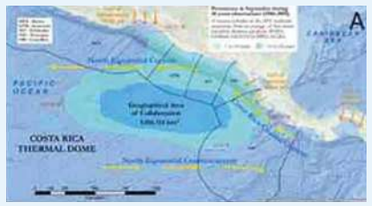
LESSONS LEARNED: the knowledge obtained about this one-of-a-kind site, shared with organisations working in the region and the sector, and presented in parallel to the negotiations on the conservation of biodiversity beyond national jurisdiction (BBJN), brings insight into these iconic seamount ecosystems.

© MNHN

Seamounts: the Walters Shoals example to the south of Madagascar, isolated and little-known

Discovered in 1962 the Walters Shoals undersea ridge, some 1,000 km off the coast of South Africa, is one of the rare structures in the Indian Ocean that extends up to less than 50 m below the surface and is located in international waters. Extremely remote, it remains little known. A multi-disciplinary oceanographic expedition, funded by the FFEM in 2017 and led by IUCN, extended knowledge of the area in which more than half of the fauna - despite its scarcity - is endemic or unknown to science.[4]. Remarkably untouched, the Walters Shoals is a biogeographic site unique in the Indian Ocean.

The Pacific's thermal dome: a unique tropical phenomenon



The Costa Rica Thermal Dome which runs along the west coast of Central America is an ever-shifting phenomenon formed by the interaction of trade winds and ocean currents drawing cold, nutrient-rich waters up from the depths at an average flow rate some 16 times greater than that of the Amazon. This causes the thermocline to rise in a dome shape up to 15 m from the surface. This dynamic tropical hotspot boasts extremely high productivity and the highest concentration of krill in the region. The concentration of zooplankton is 2.5 times higher in the surrounding waters and the thermal dome is one of the most efficient carbon sinks in the Eastern Tropical Pacific.

LESSONS LEARNED: this ongoing FFEM project aims to build knowledge of this phenomenon, in order to better understand its functioning and cycles, and its relationships with the region's coastal ecosystems. The objective is to lay the foundations for hybrid governance to protect and manage exceptional areas in the high seas.. More generally, if properly targeted, the reference data and knowledge acquired will permit the best possible understanding of the world, both at global and local scale.

4. All the data and photographs collected are available online at: expeditions.mnhn.fr/campaign/waltersshoal

INNOVATIVE TOOLS AND APPROACHES FOR GATHERING AND ANALYSING DATA

LESSONS LEARNED: Rapid technology development has disrupted how data are gathered on the ground, both in terms of tools and approaches. These allow work to be performed significantly faster in the field, yielding complementary and integrated data on the diversity and structural complexity of the environments. Technology cannot however totally replace the need for field studies, which enable better understanding to be acquired of the environments. While the high costs of these technologies mean they are not accessible to everyone, prices for some of these are falling fast which should in the medium term facilitate their wider use and adoption by managers. **#TOOLS**

The PANGATALAN project (Philippines) is a good example of the use of new tools and techniques for the study of the communities and habitats around coral reefs in future MPAs:

- drones are used to provide georeferenced aerial data that, combined with field data, facilitate the rapid mapping of habitats;
- surveys using side-scan sonar and single beam sounding provide information on the morphology, nature and relief of the seabed;
- as computational power increases, photogrammetry software can create detailed 3D submarine landscapes that can be particularly useful in establishing new ecological indicators for monitoring the site over time;
- bioacoustics determines the condition and abundance of an acoustic community through their biophony;
- genomic tools like metabar-coding[5], are used to assess the specific abundance of the marine environment.

State-of-the-art technology was used on the Tara expedition to explore marine life. Using methods to isolate and characterise individual cells, analysis of the plankton samples collected by the Tara expedition (2009-2013) from oceans across the world revealed the role genes play in a little-studied compartment widely found in plankton, the first link in a long food chain[6].

- The SARGADOM project (Costa Rica) will leverage the growing availability of open source big data in combination with other technologies offering significant amounts of new information that can be used to study human activities in the high seas, combining biophysical, usage and socio-economic data, among others. The provision of new solutions and synthesis of this data is an emerging field. Reviewing the current capabilities of these innovative technologies for monitoring and observing human activities will help to strengthen the governance of areas beyond national jurisdiction.

OUR APPROACH

Fundamental to the FFEM's approach is the combining of scientific knowledge in all its aspects with the expertise and experience of local communities.

5. Source: Andromède Océanologie in the Pangatalan Project Engagement Note *6. Cf. 2 articles in Nature Communications (22 and 25 January 2018).*

Ecological monitoring to inform decision-making

MONITORING BIODIVERSITY AND ECOSYSTEM HEALTH

MPA projects cover a wide range of coastal and marine ecosystems: coral reefs, seagrass beds, mangroves and seaweed, as well as a diverse range of species, of which the "iconic" species – such as birds, marine mammals and turtles, alongside fishery resources – are the most frequently monitored. By knowing the condition of these populations, management objectives can be calibrated as appropriate for maintenance, recovery or restoration.

Monitoring changes in reef health New Caledonia © S. Job

Monitoring ecosystem health: coral reefs

The methods used for monitoring coral reefs in MPAs are numerous, forming part of various networks: the GCRMN (Global Coral Reef Monitoring Network)[7] is the most frequently used, with many regional adaptations (Indian Ocean GCRMN, the AGGRA method in Mesoamerica, or CARICOMP in the Caribbean) and the Reef Check network, an international citizen science monitoring programme for reefs[8]. A number of GCRMN and/or Reef Check monitoring stations can be found in most of the reefs covered by MPA projects.

Reefs are in decline, with coral beds suffering change:

- **In the Indian Ocean,** the regional reef status report (2017), produced with FFEM support, identified a steady decline in live coral coverage of 25% compared against baseline levels observed in the 1990s and, at the same time, an increase in algal cover and major shifts in the structure of fish populations, with a decline in carnivores to the benefit of herbivores whose populations need to be maintained to regulate algal cover.

- **In Mesoamerica,** through its MAR Fund projects, FFEM supported the *Healthy Reefs For Healthy People* initiative[9] which operates a monitoring network spanning the Mesoamerican reefs. Data from the Healthy Reefs initiative show a slight improvement in the health of the reefs over 2003-2018, although they remain classified as "mediocre" according to the Reef Health Index.[10]

7. gcrmn.net 8. reefcheck.org 9. healthyreefs.org/cms/report-cards 10. Reef Health Index, RHI

Monitoring changes in species populations

Excluding fishery resources (e.g. BIOCOS and shellfish, MAR Fish and grouper spawning grounds, see Chapter 3.3.1 on fishing), the majority of species monitored are indigenous and iconic species[11] (turtles, marine mammals and seabirds, etc.).

Measuring green turtles in Entrecasteaux, North Caledonia © T. Clément

- **Seabirds (BIOCOS):** monitoring protocols have been established for four MPA in West Africa (Urok, Bamboung, Tristao and Niumi) and a methodological guide[12], produced for managers. Monitoring was in place throughout the project.

Whale shark © F. Mazeas

- **Large pelagic species:** the PACIFICO project conducts biological monitoring of these species in MPAs and adjoining areas via a standardised regional protocol with the provision of equipment and corresponding training, in order to assess the conservation status of the central and eastern tropical Pacific and improve regional management of marine resources.

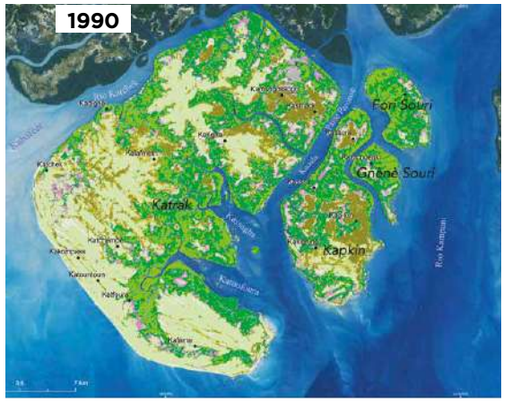
- **Mediterranean species** (limpets, groupers, turtles, monk seals, etc.) and habitats (Posidonia meadows, coralligenous) of special interest are monitored in the Mediterranean (MedPAN). To this end, a methodological guide on monitoring the marine environments of Mediterranean MPAs, while equipped with flippers, masks and snorkels, was produced by the Frioul Islands maritime park (France), together with video tutorials.

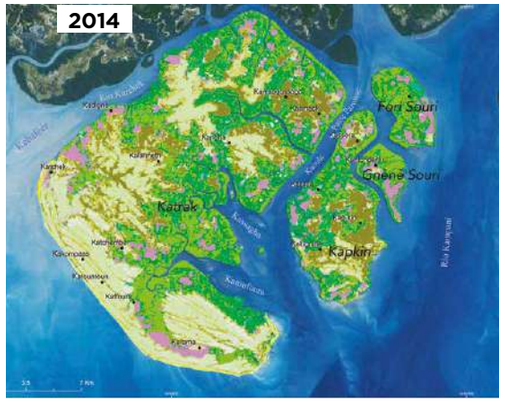
11. Wild species having cultural, religious or economic importance to people in a given region (source: MNHN) 12. rampao.org/IMG/pdf/maquetteguideoiseaux_bat.pdf

MONITORING CHANGING DYNAMICS

Monitoring spatio-temporal changes in habitats: mangroves

As part of the BIOCOS project an analysis of the monitoring of mangroves evolution in the Tristao islands managed nature reserve (Guinea) over the period 1990-2014 found little change in total mangrove cover over the period, but did find alternating dynamics between declining high-density mangroves, with (i) sparser mangroves before 2010 due to rice cultivation and clearing, and (ii) increased coverage, with transformation from sparse to high-density mangroves, in areas protected by the MPA - created in 2009 - which reduced the impact of clearing. These results can be followed in a "story map"[13].





Monitoring changes in coastline dynamics: West Africa

A major focus of the FFEM West Africa Coastal Areas project (WACA-FFEM) is to improve understanding of coastal risks and monitor coastline changes, in particular through comparison of a wide range of historical data such as aerial images and bathymetric data. Baseline data on countries' coastal structures is currently being collected. From the initial outlines available, it appears that the commonest structures on the West African coast, displacing the natural coastline, are port and shipping facilities and erosion-prevention structures. Indeed, an analysis of the results shows that 7% of Senegal's coastline comprises artificial structures (dams, seawalls, groins, etc.).

Coastal erosion. Senegal © T. Clément

13. A story map comprises an inspiring and immersive narrative resource combining text, interactive maps and other multimedia content.

REGIONAL MONITORING AND OBSERVATORIES

OUR APPROACH

The FFEM supports the development of various observation networks at regional scale, allowing a more comprehensive picture to be built-up of the phenomena studied. This approach also helps to strengthen networks of regional actors, helping them to:

- **adopt standardised protocols** employing a shared set of indicators
- **centralise information** in shared open access databases and information systems accessible to all.

Projects supporting MedPAN seek to strengthen and harmonise how habitats and species are monitored in the MPA network, helping to build the MAPAMED database which permits the regular assessment of the status of the Mediterranean MPA network.

The PACIFICO project will coordinate and improve the monitoring of large pelagic species in the five main MPAs of the central and eastern tropical Pacific (CETP)[14] and in the marine corridors targeted by the CMAR[15]. It will produce consolidated regional data on their status, in particular on apex species such as sharks, which are recognised as good indicators of overall ecosystem health, and on the impact of legal commercial fishing and IUU[16] in the region.

The WACA project supports the West African Coastal Observation Mission (WACOM) and strengthens the coastal observation mechanism in West Africa.

The GDZCOI project contributed to strengthening the Indian Ocean marine mammal network, IndoCet[17], while RECOS will seek to strengthen and enlarge the regional component of the turtle network.

In the Indian Ocean, **the Indian Ocean Commission (IOC) MPA network project**, and later **the GDZCOI project**, in partnership with other IOC projects (ISLAND, BIODIVERSITE), have supported the regional coral reef monitoring network.

14. The Cocos Island National Park (Costa Rica), the Cioba Island National Park (Panama) the Gorgona Island National Park (Colombia) the Malpelo Island Fauna and Flora Sanctuary (Colombia), and the Galapagos National Park and Marine Reserve (Ecuador). ***15.*** *The Pacific marine corridor is tropical.* ***16.*** *IUU: illegal, unreported and unregulated fishing* ***17.*** *The IndoCet consortium was created in November 2014 at the initiative of Globice to foster collaborative research programmes at basin scale.*

INTEGRATED TOOL KITS AND MONITORING PROTOCOLS: MAKING THE RIGHT CHOICES

MPA managers can often be overwhelmed by a multiplicity of monitoring techniques, protocols and indicators, and frequently struggle to use these data in their everyday management. Tool kits should be widely distributed to managers to provide them with easy access to methodological guides that can answer their questions, and help them develop appropriate responses.

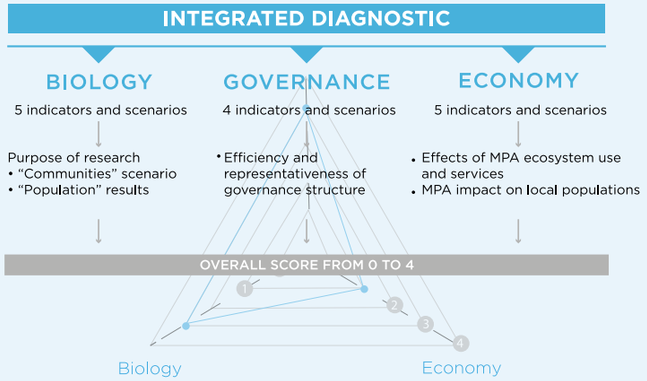
Two examples of co-constructed integrated tools

- In the Pacific, **the RESCCUE project** worked with Vanuatuan communities to co-construct a tool kit for monitoring marine resources, proposing monitoring techniques simple enough for communities to use themselves and technical enough to provide precise and robust data. Ideally, the surveys will monitor the same sites and compare "taboo" sites [18] with open sites. On completion of each module, a table allows the survey results to be quickly assessed and sets out appropriate measures to be taken (awareness raising, behaviour change, etc.).

The 6 monitoring modules in the RESSCUE toolbox for Vanuatu comprise:

1. Monitoring fish
2. Monitoring intertidal invertebrates
3. Monitoring changes in coral reef health
4. Monitoring mangroves
5. Monitoring seagrass beds
6. Monitoring crown-of-thorns starfish *(Acanthaster planci)*

- A real world application: **a collaboration between the SRFC/CEPIA project, the AMPHORE project (French National Research Institute for Sustainable Development), and a team of researchers and MPA managers,** proposed an integrated monitoring system covering three broad areas: bio-ecology, socio-economics, and governance (see Section 3.3.1 on fishing). These indicators are calculated automatically by the IPER software [19]. *"Aware of the disconnect often observed between the complexity of scientific community expertise and the pragmatism of stakeholders responsible for the day-to-day management of the MPAs, this project proposes a methodological approach of "co-construction", with a view to developing a simplified system for monitoring the effectiveness of the MPA for managing natural resources."* [20]



18. "taboo" = areas to which access is prohibited. 19. Translated from the French: Habasque et al., 2012 et, "Les aires marines protégées et la pêche: bioécologie, socio-économie et gouvernance" [Marine protected areas and fisheries: bio-ecology, socio-economy and governance], under the supervision of S. Garcia, J. Boncœur and D. Gascuel, 2013. 20. Source: Co-construction des systèmes de suivi: l'expérience de l'AMP de Tristao en Guinée [Co-construction of monitoring systems: the experience of Tristao MPA in Guinea].

2 PROFILING AND MONITORING THE SOCIO-ECONOMIC SYSTEM IN AN MPA

To ensure it is appropriate, management direction must be based on good understanding of the social, cultural and economic context. Subsequently, more regular monitoring, with a focus on the detection of changes and trends, should make possible the adaptation of these guidelines and the assessment of the direct and indirect impacts of the MPA on the local populations and economy.

To obtain buy-in from the local populations for the creation of an MPA and its regulation, it is important that the benefits for their resources and living conditions are made clear.

Socio-economic monitoring studies the social, cultural and economic situation of communities living near to the MPA and is a strong complement to biological monitoring. Socio-economic studies seek to understand how local people use, understand and interact with the MPA. They assess the extent to which the populations rely on the MPA's resources and how they view it. These studies are often participatory in nature, guiding management while enabling the impact of MPA implementation activities (resource management, development of economic sectors, etc.) on local populations to be assessed. Monitoring these aspects coupled with ecological monitoring provides managers with valuable information that can help to inform their decisions on managing pressures and developing populations, as well as measuring their impact.[21] Such monitoring allows managers to determine which stakeholders are decisive in resource management. It also helps to measure the benefits the MPA brings to local people. A long overlooked facet of MPA monitoring (which traditionally pays much more attention to ecological indicators), socio-economic monitoring is deserving of more systematic consideration.

Preparing shellfish in the Joal Fadiouth MPA, Senegal © T. Clément.

21. Fisheries monitoring is discussed at Chapter 3.3.1.

OUR APPROACH

While the primary aim of many MPAs is often to conserve biodiversity, FFEM-supported MPAs also seek to protect food security, bolster livelihoods and create economic opportunities for local communities.

Understanding the human environment and establishing baselines

UNDERSTANDING THE COMMUNITIES LIVING IN AND AROUND MPAS

Still all too rare, specific studies on the sociological, cultural and economic context of MPAs are indispensable for tailoring management decisions, regulating use of the site and strengthening the MPA's acceptability to local populations.

Socio-economic survey, Ankivonjy MPA, Madagascar © T. Clément.

LESSONS LEARNED: to document this topic, our most recent projects have engaged with local communities right from the consultation phase and the assessment is now highly participatory.

Setting up participatory planning processes and conservation mechanisms: The Mnazi Bay (Tanzania) project is a good example of an FFEM project that undertook a large number of studies at the outset of the project. These include: an in-depth study into the causes of biodiversity loss, a socio-economic assessment of means of sustainable livelihood in marine park communities, a study on the socio-economic structure of marine park communities, and more. However, although essential for MPA management, the prioritisation of these studies over the taking of concrete action drew criticism from local communities.

In New Caledonia, in the Diahot area (CRISP project), sociological and economic studies enabled local knowledge of marine biodiversity to be assessed, and improved our understanding of the broad outlines of customary social and regional organisations. This work demonstrated that while traditional management systems were well-known, they were no longer applied. These traditions are nonetheless favourable to modern management practices based in the acquired cultural foundations, particularly for the recovery of certain iconic species that now face uncontrolled hunting (turtles, dugongs).

Meeting with a group of women, Ankivonjy MPA, Madagascar © C. Gabrié

Assessing acceptability to local populations: as part of the GDZCOI project in the Indian Ocean, a GRET study (2018) enabled the socio-economic system of local fishing to be assessed, with a view to guiding management strategies, evaluating whether the social climate was compatible with implementing restrictions on fishing, and mapping socio-ecological vulnerability at an appropriate scale for decision-making. This study highlighted the socio-ecological predicament in which fishers found themselves, due to their high dependence on marine resources and the lack of economic alternatives. It pinpointed "socio-ecological hotspots", villages characterised by weak ability to adapt, with high dependence on fishing and high ecological vulnerability. The study recalled the importance of improving communities' capability to adapt, and their living standards, in order to address the complex root causes of degradation. Management measures having the highest social cost (for example no-take zones, in which fishing is prohibited) should be implemented in locations where they have the greatest chance of success.

To what extent do MPAs change social and ecological dynamics? In the Philippines, as part of the Shark Fin Bay project (PANGATALAN), thesis work is being conducted on this topic, aiming to guide initial management phases, encourage local communities to take ownership of the management rules, and to monitor how the measures affect local communities over time.

The SRFC/BIOCOS project paid particular attention to the question of monitoring, socio-economic indicators and governance in its extensive work collating state-of-the-art for fisheries management in MPAs (see Chapter 3.3.1 on Fishing). This remains a key reference in the field.

EVALUATING THE GOODS AND SERVICES PROVIDED BY ECOSYSTEMS

Projects increasingly seek to evaluate ecosystem services and their economic or monetary worth. Characterising the different services provided is often useful. However, the wide range of disparate methods used to assess the economic value of these services often reach very different conclusions and are the subject of controversy and expert debate. These academic exercises, which calculate the value of these services in million or billions of dollars or euros, in practice find little application in decision-making. FFEM projects, such as CRISP, RESCCUE, Bacomab, NOCAMO and Narou Heuleuk, have contributed to studies and research into these ecosystem service evaluations. While the objective value of the results remains open to debate, increasing interest from decision-makers in these evaluations does merit the reinforcement of those areas of research that could make them more robust.

To this end, the RESCCUE project proposes some interesting adaptations, focusing on the following key messages:

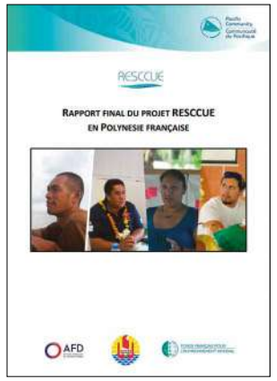
Economic analyses in general and ecosystem service evaluations (ESE) in particular, are often presented as effective tools that can enable decision-makers to work towards the Sustainable Development Goals. However, to date practice has been based on what economists have to offer, rather than on stakeholder needs, and the lack of application of the findings from economic analyses conducted is creating growing concern.

The social processes that drive decision-makers necessitate a pragmatic approach based on demand – rather than supply – if these economic analyses are to make a difference.

RESCCUE has therefore developed and implemented a demand-based approach in Fiji, French Polynesia, New Caledonia (North and South provinces) and in Vanuatu. A wide range of economic analyses have been deployed, such as ecosystem service evaluations, willingness-to-pay estimation, and cost-benefit and cost-effectiveness analyses. The Oceanian context highlighted specific challenges around the use of these analyses, finding it to be above all informative, rather than having technical or decision-making purpose.[22]

LESSONS LEARNED: the role and involvement of the end-users of economic analyses are at the heart of the demand-based approach. How the approach is envisaged influences its relevance and effectiveness.

To address the disparity of the different methods employed to value ecosystem goods and services in the Western Indian Ocean region, the FFEM NOCAMO project plans to develop a new valuation based on relevant tools, such as the Ocean Health Index (which has already been implemented in the region by the IOC) and Natural Capital Assessment, focusing in particular on areas impacted by fossil fuel exploration and operations in the region.[23]



22. resccue.spc.int/fr/sujet/analyse-economique 23. oceanhealthindex.org, https://naturalcapitalproject.stanford.edu/

Socio-economic monitoring for better management guidance

MONITORING AND EVALUATION "HOW TO" GUIDES

Various methods and guides have been developed to help managers undertake socio-economic monitoring. They offer data collection methods of greater or lesser complexity (focus groups, household surveys, semi-structured interviews with key informants, open discussion forums, promoting empirical knowledge sharing, etc.), which have a direct bearing on the costs of performing this information gathering. Given that not all MPAs have the same resources at their disposal, it is up to the manager to match what they would like to what is affordable. Simple, low-cost economic monitoring tools need to be developed, and existing tools where possible repurposed and leveraged.

- **The SOCMON guide, ground-breaking in the field, is already widely used.** Conceived in 2000 to allow ecological monitoring to be rounded-out with socio-economic monitoring of the usage and exploitation of reef resources, this manual[24] inspired the SOCMON monitoring method (2002) and its many regional forms (Caribbean, Indian Ocean, etc.), available on the ReefBase website.[25].

- **The CRISP guide**, designed to complement the SOCMON Pacific Guidelines, was developed as part of the CRISP framework to assess social vulnerability to climate change.[26]

OUR APPROACH

This type of monitoring has been used in several FFEM-funded projects, including: Mesoamerica, OPAAL and SMMA in the Caribbean, Quirimbas in Mozambique, Mnazi Bay in Tanzania, GDZCOI in the Indian Ocean, SAMPAN in Thailand, CRISP in the Pacific, BIOCOS in West Africa, etc.

Alternatives to the SOCMON approach:

- **The RAMPAO-BIOCOS guidelines:** The FFEM-cofinanced BIOCOS project undertaken in West Africa has produced a highly practical instructional guide, in French.[27] It provides an excellent springboard for managers wanting to implement such socio-economic monitoring.

- Like the SRFC project above, the RESCCUE project also produced a "Region-centred survey guide" to help with understanding the local area, local stakeholders and the local economy.[28]

24. iucn.org/es/content/socioeconomic-manual-coral-reef-management. 25. reefbase.org/resource_center/publication/default.aspx. 26. S. Wongbusarakum and C. Loper, Indicators to assess community-level social vulnerability to climate change: An addendum to SocMon and SEM-Pasifika regional socio- economic monitoring guidelines 27. rampao.org/IMG/pdf/guide_socioeco_vf.pdf. 28. resccue.spc.int/fr

ADAPTED METHODS: THE UTILITY OF PROXIES AND OPINION SURVEYS

Monitoring usually includes a well-substantiated initial study that need not always be repeated periodically, given that this work may represent significant cost and/or effort. Proxies can offer an effective, low-cost solution for estimating changes in the socio-economic parameters studied.

In addition, some projects (Hafafi/Kobaby in Madagascar, SRFC/BIOCOS) have used proxies to estimate development trends in the MPAs' area of influence, without having to conduct a full socio-economic survey (see box opposite). Once the initial survey has been completed, this method allows changes in a population's day-to-day quality of life to be measured more quickly and at a lower cost. It is then appropriate, before starting to monitor an MPA using "standard" methods, to consider the specific nature of the information required by the manager and to be willing to adapt these methods to the particular situation.

Generally speaking, populations regard the outcomes of the actions taken - in particular the abundance of catches - as positive (see Chapter 3.3.1 on Fishing).

- The Bamboung, Quirimbas, SMMA and some CRISP-funded Pacific MPAs have therefore added questions to their monitoring surveys to gather fishers' opinions on the "reserve" effect of the MPAs, adding qualitative opinion data to the quantitative data collected. These surveys revealed conflicting opinions. For example, in Bamboung (Senegal), 60% of fishers thought that the MPA had no effect while in SMMA (Saint Lucia), 55% of people asked thought that the MPA helped increase marine resources, and in Quirimbas (Mozambique), communities were globally satisfied with the effects of the MPA.
- A perceptions survey of villagers conducted as part of the CRISP Navukavu project in Fiji (Hubert, 2008) resulted in similar findings. It showed that villagers had been convinced of the benefits of the MPA and impressed by the abundance of catches in the protected area once it had been reopened to fishing, and that catches of fish and invertebrates outside the protected area were larger than before.

Changes in the use of motorised equipment is another way to estimate changes in local people's income. © T. Clément

Using proxies for better monitoring

Definition: In social and experimental sciences, notably statistical applications, a proxy or a proxy variable is a variable that is not significant in itself, but that stands-in for a useful variable that is itself not observable or measurable. For a variable to act as an effective proxy, it should have close, though not necessarily linear, correlation with the variable of interest. This correlation could be positive or negative.[29]

Examples of proxies:
- **Proxies for the Hafafi project:** ownership of a hut with a sheet metal roof, a boat, a motorbike, a radio, a mobile phone, etc.
- **Proxies for the SRFC/CEPIA project - Kawawana:** consumption of fish by households (number of times fish is eaten per month and the quality of the fish), number of fishers who emigrated in the family, ability to repay debts. Surveys with village shopkeepers.

In the same way, some projects collected information on how far from the representative's office the household was located to assess whether that plays a role in the level of information potential beneficiaries received.

DRAWING ON PRE-EXISTING DATA

Collecting socio-economic data is the day-to-day responsibility of a number of national and international institutions.

LESSONS LEARNED: Before launching surveys on the MPA, it is important to check what data are already available by visiting the website of the national institute of statistics of the country in question as well as any potential open data portals. If no data on the MPA are available, data collected outside the MPA by institutes of statistics or other projects should be identified, to allow the MPA to possibly be monitored using the same methods. This benchmarking against neighbouring areas can provide interesting information about the area around the MPA (the "inside-outside" approach), while MPA monitoring itself provides temporal (before-after) data on the MPA site.

Searchable databases

Most of the statistical databases listed below can be accessed free of charge, though for some access must be requested in advance and the purpose for which the data will be used, explained:

Multiple Indicator Cluster Survey (MICS)[30]: social, demographics, health
Demographic and Health Survey (DHS)[31]: social, demographics, health
Social and economic[32]: social, demographic, businesses
World Bank microdata[33]: businesses, financial services, misc.
Afrobarometer surveys[34]: governance, culture, society
Joint Monitoring Programme (JMP) records[35]: inventories of surveys in each country
IPUMS [36]: census data
Armed Conflict Location & Event Data (ACLED)[37]: local conflict database

29. Source: Wikipedia 30. mics.unicef.org/surveys 31. dhsprogram.com/data/available-datasets.cfm 32. catalog.ihsn.org 33. microdata.worldbank.org 34. https://afrobarometer.org/countries 35. washdata.org 36. international.ipums.org/international 37. acleddata.com

3 BASIC RESEARCH AND MONITORING: A TOOL FOR MANAGEMENT AND CONSERVATION?

Cayman Crown reef monitoring, Mesoamerica © A. Girò

OUR APPROACH

For 25 years, FFEM projects have been running on a wide range of topics in regions across the world: Mesoamerica, the Indian Ocean, Western Pacific, Eastern Tropical Pacific, the Caribbean, East Africa, West Africa. The contribution made by these projects to the wider knowledge of regions, frequently having high biodiversity and located in ecoregions with diverse biogeographical characteristics, is a remarkable contribution by the FFEM to our understanding of global biodiversity.

While it is vital to ask how and to what extent basic (or "pure") research and later monitoring are used to inform decision-making and guide management adaptation, and how much they actually contribute to conservation efforts, answering these questions is not often straightforward.

To illustrate:

- While many MPAs are well supported by basic studies to define or revise their objectives and management activities, for many the management plans were drawn up by external consultants for other projects, and are not actually relevant here. More rarely, some managers are not even aware that a management plan exists.
- When projects conduct basic research with research organisations, experience shows that researchers often struggle to move from basic to applied techniques and to propose concrete and pragmatic management or governance solutions that managers can put into practice.
- As regards monitoring, literature is overflowing with research on methods, protocols and indicators. However, the general observation is that it is difficult to evaluate project outcomes and impacts.

Optimising research and project monitoring

IMPROVING KNOWLEDGE ACQUISITION

Optimising research efforts and their contribution to management & conservation requires:

Effective participation by knowledge and management stakeholders
Whichever way you look at it, there are benefits in linking-up researchers, consultants, managers and local communities to work together, to help translate scientific data into useful management information, contribute to making the right decisions. and give managers appropriate tools based on sound scientific fact.

The right balance between research and action
Only if the project's situation is properly understood in terms of biodiversity, ecosystem dynamics, and human and natural pressures, can progress be evaluated. But research should not – particularly at the start of the project – take precedence over concrete actions on the ground, in particular if those will improve the project's acceptability amongst populations. Concrete action should in every case be initiated early on in the MPA creation process.

Optimised communication between scientists, managers and local communities
It must be ensured that any research conducted has practical application that directly supports the management of the MPA - or in a wider sense, conservation - and that it can be readily understood by non-scientists. A practical summary of the research findings, with actionable guidance for the manager, is essential. Traditional knowledge of local biodiversity, of how the ecosystems function, of the cycles and any other features should be studied and harnessed to inform management efforts wherever relevant.

Proportionate basic research for the size of the project
Given that many projects initiate or strengthen monitoring programmes, the acquisition of basic knowledge at the start of a project should be accompanied by proposals regarding the data and indicators that can be then be monitored regularly and that correctly report the baseline state of these indicators. Several robust, easy-to-monitor indicators that provide accurate information over time are more valuable than a battery of data that, while interesting, are not always useful for management.

Mobilise local human resources
In many developing countries MPAs are sorely lacking in resources, and universities in research sites for their students. MPAs make excellent field laboratories for these young researchers. It is therefore mutually beneficial for MPAs to offer placements to universities and engineering schools.

PROGRESSING PROJECT MONITORING

Monitoring can serve management and conservation efforts more effectively when it:
• answers specific questions on clear management objectives, aligned with the expectations of different stakeholders;
• uses robust baseline data;
• is based on SMART indicators (specific, measurable, achievable, realistic, time-limited);
• is simple, so managers can continue to use it beyond the end of the project;
• can be deployed over the long term, raising the question of sustainability.

Feedback: "Monitoring for managing Mediterranean MPAs[38]"

1. **Supporting managers to identify ecological and socio-economic monitoring activities** that align with the objectives and characteristics of their MPA.
2. **Encouraging monitoring activities that can be performed by managers in-house** and help them to implement them. This can be done by providing simple, scientifically valid protocols and methodologies that can be handled by managers, while remembering the importance of having a scientific resource to help interpret the results, and by supporting managers and their partners to implement them.
3. **Informing managers** about the technologies available for performing monitoring activities, identifying the technologies available and sharing feedback via a blog.
4. **Encouraging managers and researchers** to share their experience by incentivising MPAs to set up a scientific committee; proposing times for themed meetings on monitoring and/or creating an discussion forum for managers and experts, accessible online.
5. **Helping to find financing** for scientific projects that align with the topics of interest to managers.
6. **Promoting standardised monitoring approaches** by identifying shared cost-effective methodologies that are simple and scientifically proven, and sharing these; by prioritising a subregional and/or themed monitoring approach and developing protocols that are easier to standardise.

The sustainability of ecological monitoring networks essentially depends on several factors:
- Monitoring activities that form part of a global surveillance system, such as coral reef monitoring (supported at one time by the FFEM projects) are generally more sustainable.
- Long-standing monitoring networks run by reliable local or regional parties are also being maintained (such as the networks run by edPAN, the IndoCet and Kelonia networks in the Indian Ocean, and the Mesoamerican network, for example).
- Conversely, participatory networks run exclusively by local communities are more fragile, for example, the ecological monitoring developed as part of the BIOCOS project which was not continued beyond the end of the project: "The issue of the continuation of monitoring activities once a project ends remains unresolved and, since the start of 2016, it has been observed that monitoring has not been continued beyond the end of project financing."[39]
- Finally, the use of these monitoring efforts to inform management practice is hard to evaluate: "It cannot be confirmed that, at the end of the project, the MPAs have modified their management on the basis of the monitoring tools implemented."[40]

38. Regional experience-sharing workshop of the MedPAN network (Albania, 2014). 39. Translated from the French, MAVA Report, 2016 40. Translated from the French, C. Karibuhoye, MAVA

User testimony

At the Bamboung, Niumi and Urok sites, the right conditions were created and it was seen that the results were taken onboard well. Modifying the management rules requires discussion and interaction with local communities, and that takes time, and above all the abilities to analyse and interpret the results of the monitoring to translate them into concrete management measures. That remains the major challenge of implementing this participatory monitoring.

Charlotte Karibuhoye
Head of Strategic Alliances & Director,
West Africa, MAVA Foundation

Returning knowledge to local people is fundamental

It is essential that the findings of the scientific research and monitoring activities conducted in an area are shared with local stakeholders in an educational way and in language appropriate to them.

4 SHARING PROJECT ASSETS

To what extent are project assets - in terms of the scientific knowledge, protocols, methods and new tools generated and financed by these projects - distributed and shared in different circles (within and outside of the MPA, nationally and internationally)?

LESSONS LEARNED: Numerous project evaluations and experience show that the loss of knowledge and tools generated within projects is very significant.

Within a rationale of transfer and sharing, solutions are needed for:

- storing the data generated by projects to make them available to scientists;
- build searchable archives of many of the project assets (articles, reports, publications, etc.) of previous projects in the region, for use by similar projects elsewhere in the world;
- publishing and sharing global lessons learned from the project in different circles, within and outside of the MPA, at national and international scale;
- financing the storage of data and deliverables beyond the end of the project, identifying the necessary means to do so early on in the project.

STORING AND SHARING DATA, AND BUILDING KNOWLEDGE PLATFORMS

- **|LESSONS LEARNED: data, particularly scientific data, can present a complex challenge for projects.** Questions of the ownership of data, quality assurance, storage in accessible and durable databases, and the sharing of these data are often problematic, particularly when generated by research bodies. The authorisation of those providing the data and the conditions under which they are shared, and their entering into international databases (GBIF, Fishbase, etc.) should be clearly set-out in agreements, otherwise there is a risk, as has often happened, of MPAs being unable to use data generated within their own borders.

Longer & shorter-term project asset sharing solutions:

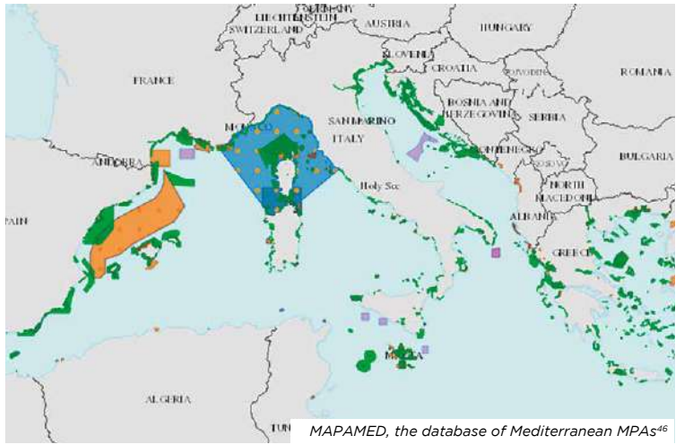
- The GDZCOI project supported the development of the IndoCet consortium database on marine mammals in the Indian Ocean. A successful initiative pursued independently of the project which provides a good example of how to ensure data are available in the long term.[41]

- Similarly, one of the aims of the MAR Fish project is that the regional spawning site monitoring network rest on a shared database, adopted regionally and accessible via the Health Reefs Initiative website.[42].

- As part of the SARGADOM project, innovative integrated approaches and dynamic monitoring of pressures, usage and ecosystems will be made available to managers and decision-makers via the platform produced by NASA's Coverage project or via the MGEL portal[43].

- For the PANGATALAN project, subcontractor Andromède has shared all its own data and beyond that, subject to the agreement of the various parties, all other data generated in the course of the project, via the Medtrix online mapping platform.[44]

- MedPAN, in cooperation with the Specially Protected Areas Regional Activity Centre (SPA/RAC), developed as part of the first FFEM project MAPAMED, a precious and ever-evolving database of Mediterranean MPAs[45].



MAPAMED, the database of Mediterranean MPAs[46]

41. indocet.org, globice.org 42. healthyreefs.org/cms 43. Duke University Marine Geospatial Ecology Lab 44. plateforme.medtrix.fr This platform, created by Andromède Océanologie in 2013, in partnership with the Rhone Mediterranean Corsica Water Agency, is accessible at no cost to all marine environment specialists (scientists, managers, engineers, etc.)
45. medpan.org/main_activities/mapamed/ 46. mapamed.org

SHARING "DELIVERABLES" AND PROMOTING KNOWLEDGE SHARING PLATFORMS

|LESSONS LEARNED: studies and projects activities generate a large number of documents ("deliverables"), which are precious sources of information. However, too few projects ensure proper long-term storage for all these deliverables. The difficulties encountered during capitalisation when seeking access to documents is a case in point. At the end of - and during - projects, it is advisable to build a bibliography of all studies and scientific publications, along with an overall summary of the scientific findings generated by the project. **#KNOWLEDGE**

The best example is RESCCUE, the assets of which are held on a dedicated website hosted by the Pacific Community (SPC).[47]

The CRISP programme ensured that its many programme assets (almost 6,000) were properly archived on a site hosted by the SPC which has now been transferred to the Institute for Pacific Coral Reefs (IRCP).[48]

Presenting the work done by the project on the mangrove ecosystem, the Terra Maris story map, created as part of the BIOCOS project is an educational and visual platform for the project, well worth preserving and replicating.

|LESSONS LEARNED: beyond ensuring the storage of deliverables during the project, proper selection of the hosting server is essential. The SPC, for example, a robust and resilient organisation, is hosting the RESCCUE site. That's also the case for MedPAN, MAR Fund and Tara. Where projects are handled by robust and resilient organisations, long-term document storage is usually arranged.

OUR APPROACH

As already suggested on several occasions, the FFEM/AFD should develop a dedicated platform to centralise all deliverables by project, theme and geographic area. Each project agreement should specify that the project sponsor must compile all project documents and other deliverables and deliver them to FFEM/AFD at the end of the project, or even develop its own document database.

47. resccue.spc.int/fr 48. www.ircp.pf/lecrisp

CAPITALISING PROJECT OUTPUTS

OUR APPROACH

In addition to the storage of deliverables, the question arises of how to capitalise on project results. Projects often end without a final report other than the evaluation. To make accessible to a range of audiences the valuable knowledge generated by the studies that the projects conducted, the project sponsor should systematically draw up a final implementation report. An essential element in the capitalisation of a project, this report should present the experience gained, the methodologies used and the (often innovative) tools developed, among other aspects. **#TOOLS**

Fish market. Kilwa, Tanzania © C. Gabrié

Few projects have capitalised on the assets generated:

- The CRISP programme produced a publication titled "Conservation, management, and development of coral reefs in the Pacific: capitalising on the results of six years of research, collaboration and education"[49], which presented a full report on the programme and its concrete outcomes on the ground.

- The RESCCUE project[50] also compiled all the outputs for the different countries and themes covered by the project to produce an ambitious resource that capitalises on the lessons learned and brings together contributions from all stakeholders and project partners.

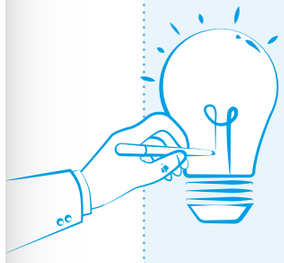
- MedPAN and its partners regularly publish documents on their websites presenting new knowledge and practices generated by the projects, such as the SEA-Med Technical Series[51] and the PISCO booklet, "The Science of Marine Protected Areas" on the Mediterranean, produced with the WWF, MedPAN and MPAs and scientists from the network.

As part of the BIOCOS project, work to return the findings of water bird monitoring to local monitoring teams made it possible to assess the adoption of protocols, to work with the data and to explain, where necessary, any outliers.

Evaluation of BIOCOS

This evaluation demonstrates the teams' passion for the work undertaken and their desire for it to be applied. They were happy to conduct monitoring and keen to continue this. Nevertheless, without the structure and framework put in place by the managers, it is likely that none of the teams would have taken the initiative to organise such a count themselves.

49. spc.int/resource-centre *50.* resccue.spc.int/fr *51.* mediterranean.panda.org/publications



Questions for the future
LET'S BRAINSTORM!

To make current and future projects as effective as possible, we must find ever more innovative solutions and learn from past mistakes and successes. Coming together to share our thoughts about the issues raised should help us find answers to the questions below.

• **What level of knowledge is required** to meet the objectives and the manager's expectations and how can this be tailored to the available resources?

• **How can studies be used more effectively** to improve management?

• **How can we ensure that the baselines established are sufficiently robust** to accurately measure progress against them and what **key indicators** should be measured as from the outset?

What are the actual needs of the MPA in terms of ecological and socio-economic monitoring, compared with the standard models found in the literature? What is the minimum required? What is superfluous? Where are there gaps?

How can we ensure relevant monitoring at least cost by using proxies, and what are the most pertinent measures?

How can we distinguish between the effects due to the MPA and those due to other factors (legislation, other projects, climate change, etc.)? This point, which is central to effective adaptive management, is rarely well documented.

How can we present the findings to stakeholders, to raise awareness and gather their comments and suggestions?

How can we ensure the tools and protocols developed continue to be used **beyond the end of the project?**

How can we engage waterside populations, especially fishers, in this monitoring so that they feel involved, and like stakeholders, from the start of the project?

Share your ideas, suggestions and experiences by writing to us at ffem@afd.fr.

Capitalisation

© T. Clément

CREATION AND MANAGEMENT OF MPAs

2

How and how far have projects helped expand and ensure the sustainability of ecologically efficient protected areas?

The basics

MPAs are created to last and proper management is therefore essential.

It is impossible to properly manage an MPA without engaging local people and local authorities.

While there are many types of MPA, the universally recognised base elements embody this management in the form of a management committee and management plan, if possible a business plan, and a monitoring and evaluation mechanism built on baseline data.

The challenge of capitalisation

MPAs have required management since their conception. Yet the wide variety of MPA models means that there is plenty of room for innovation when it comes to how to handle challenges, whether they are specific to the MPA or universal.

Introduction

Many countries and donors have focused their attention on the creation of MPAs, particularly in connection with international commitments like the Aichi Biodiversity Targets, which aim to conserve 10% of coastal and marine areas.

Creating an MPA means fulfilling a number of prerequisites, without which it will be nothing more than a "paper MPA" rather than a reality on the ground (and far too many of these "paper MPAs" already exist).

It also implies a process in perpetuity; once created, an MPA is intended to last, not to disappear. Once an MPA has been created, the challenge faced by promoters and managers is then to manage it long-term.

Lastly, MPAs have conservation and local development aims and progress towards these should be properly monitored. This is the goal of monitoring management effectiveness, which complements biological and socio-economic monitoring (see Chapter 3.1 Knowledge and monitoring), but is focused more on how well the MPA is working and whether it is achieving its aims.

1 CREATING AN MPA WITH LOCAL COMMUNITIES AND AS PART OF A NETWORK

The term Marine Protected Area covers a range of realities on the ground. Taking the definition used by the International Union for Conservation of Nature (IUCN) or the Food and Agriculture Organization (FAO)[52], the MPA's main purpose is to conserve nature based on a more or less strict protection status, from full reserves (where any activity is prohibited) to multi-use MPAs, which are only partially protected. The status of an MPA determines its management aims, its governance structures and how it is managed, whether by governments, communities or different forms of joint management mechanisms. Increasingly, MPAs are also proposed as mechanisms to manage fisheries (see Chapter 3.3.1 on Fishing).

52. The IUCN defines an MPA 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." (iucn.org). For the FAO, an MPA designates any geographical marine area that benefits from a greater level of protection than surrounding waters, with the objectives of conserving biodiversity and managing fisheries.

Local people from the Quirimbas MPA, Mozambique © Y. Macherez

OUR APPROACH

FFEM projects support all types of MPA, varying greatly in size, having a range of aims and statuses. The initial decision to create an MPA can be imposed (top down) or, conversely, can be a response to a need on the ground, which facilitates acceptance of the management rules. Our projects cover:

- **MPAs are most often created by governments or NGOs, having the primary aim of protecting biodiversity**, or on occasion archaeological, historical or other sites of interest. They are often delineated by scientists or naturalists who identify, for example on the basis of ecoregional analyses, zones that are biologically and functionally significant. The FFEM has supported a large number of these MPAs, including UNESCO World Heritage sites in New Caledonia, the Banc d'Arguin National Park in Mauritania, the île Alcatraz in Guinea, the Aldabra and Cosmoledo atolls in the Seychelles, the Galite Islands in Tunisia, the Cocos Island in Costa Rica, Mnazi Bay in Tanzania and the Quirimbas National Park in Mozambique, to name but a few.
- **MPAs created more recently in response to the overexploitation of natural resources or habitat degradation** (overfishing, mangrove clearing, destruction of reefs, etc.) or the exploitation of resources by outside communities (migrant or nomadic) where it is often local populations themselves who have initiated the process. No longer able to manage these pressures alone, they turn to government authorities to protect an area and improve its management, with the more or less explicit aim of reserving its use for themselves and excluding "outsiders".

The FFEM's portfolio includes many of this type of MPA. Among the oldest are the "taboo" areas in the Pacific, designated with the support of NGOs as locally managed marine areas (LMMAs), which have been created across the region, and replicated in Madagascar. Similar is the Bamboung MPA in Senegal which has started the process of creating community MPAs, the Urok MPA in Guinea-Bissau and Kawawana in Senegal, and more. These are often designed "community" MPAs.

There are a number that fall between these two categories, but the two processes differ greatly in their approach given that, in the first example, they can appear to be imposed from outside, while, in the second, they are created at the initiative of local communities, meaning that they are more readily accepted[53]. Today, in practice, MPAs are rarely imposed and those supported by the FFEM are all created with the agreement and support of local communities.

Going forward, MPAs are categorised more in relation to the level of protection they offer[54].

Entrecasteaux National Park, New Caledonia © T. Clément

STRONGER TOGETHER: IDENTIFYING PRIORITY CONSERVATION AREAS AND ECOLOGICAL MPA NETWORKS

LESSONS LEARNED: faced with rapid biodiversity loss and the ever-growing impact of global climate change, conservation efforts must focus on the most significant areas for biodiversity conservation, in order to protect essential ecological and functional ecosystem processes. International recommendations on the implementation of MPA networks representative of the diversity of the marine world have led major international NGOs to develop processes aimed at identifying coherent networks of MPAs within homogeneous ecoregions. FFEM has supported several such initiatives through the CRISP, MedPAN, RESCCUE, MAR Fund and MAR Fish (Mesoamerican reef), Bacomab and PACIFICO projects, among others.

OUR APPROACH

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Improving the development of protected area systems to ensure the coexistence in the same region of spaces having different protection statuses, together with networking these, so encouraging ecological connectivity and resilience to global changes.[55]

53. This is often but not always the case, as there may also be communities present in the region that are opposed to the MPA project or, more worryingly, to the rights attached to the region. *54. See the MPA Guide: https://mpa-guide.protectedplanet.net/ and Claudet et al., 2021*
55. Biologically or functionally significant elements not represented in a national or regional system of protected areas are identified by a gap analysis.

Several authors have shown that, despite a significant and sustained increase in protected areas globally, land and sea biodiversity has been declining rapidly, since the 1970s on land and since the 1990s in the oceans. These authors highlight the contrast between the many positive studies that demonstrate the benefits of MPAs and those that show these effects are not universal. While recognising the progress made, they suggest that MPAs, although important practical emergency measures if well managed, are not by themselves capable of halting biodiversity loss. New complementary approaches are required that more specifically address the known causes of this loss: overpopulation and excessive consumption of resources. These authors highlight the decades-long failure to properly assess the performance of MPAs and the limitations, also well known, of an MPA-based strategy: (i) too-slow expansion of MPA coverage; (ii) the inadequate size and connectivity of MPAs; (iii) the limited effectiveness of MPAs against some anthropic threats; (iv) insufficient funding; and (v) conflict with the needs of development.[56]

The FFEM thus supported an ecological gap analysis of the Mesoamerican MPA system, focused mainly on biologically significant areas for commercially-fished species. It also performed ecoregional analyses with a view to identifying priority conservation areas, for example in New Caledonia, where the analysis contributed to the declaration of the lagoon as a UNESCO World Heritage site, in French Polynesia, or again in the Indian Ocean, where it helped uncover the major significance of the Northern Mozambique Channel to the region.

MPA networks are likely to generate conservation and production benefits greater than individual MPAs (MedPAN, RESCCUE) can achieve, subject to the condition that the elements present in these networks are ecologically representative and are linked by functional relationship and connectivity (SRFC). However, some aspects of connectivity are difficult to identify as they depend on the species, their life history, currents and other variables.

- When assessing the condition of the MPAs (MedPAN), representativeness and connectivity analyses have shown that ecological coherence, which is better in the western basin, remains low across the Mediterranean as a whole. Particularly in the east, where the network is less dense, models indicate a low level of connectivity.

- In Mexico (COBI project), a network of fully protected reserves has been created and will benefit from FFEM support (see Chapter 3.3.1 on Fishing).

- Similarly, within the framework of the PACIFICO project, areas of countries' exclusive economic zones (EEZs) located between the MPAs are considered high-connectivity zones for species including sharks, sea turtles and fish. One significant finding suggests that the central and eastern tropical Pacific is, in fact, a single interconnected ecosystem, which reinforces the need to manage MPAs within the framework of a consolidated ecological system. The regional governments' initiative to create the Eastern Tropical Pacific Marine Corridor (CMAR) is notable.

- Finally, the RESCCUE project established a green and blue corridor in New Caledonia to profile and map ecological connectivity and continuity, enabling New Caledonia's South Province to implement by 2025 a more ecologically effective network of protected areas in the Great South (13 protected areas) and the Forgotten Coast.

56. Source: "Marine protected areas in fisheries management: Synthesis on the state of the art". Sub-Regional Fisheries Commission SRFC/AFD.

2 MPA MANAGEMENT IS BASED ON CONSIDERED CO-MANAGEMENT

MPA management committee meeting, Tristao, Guinea © T. Clément

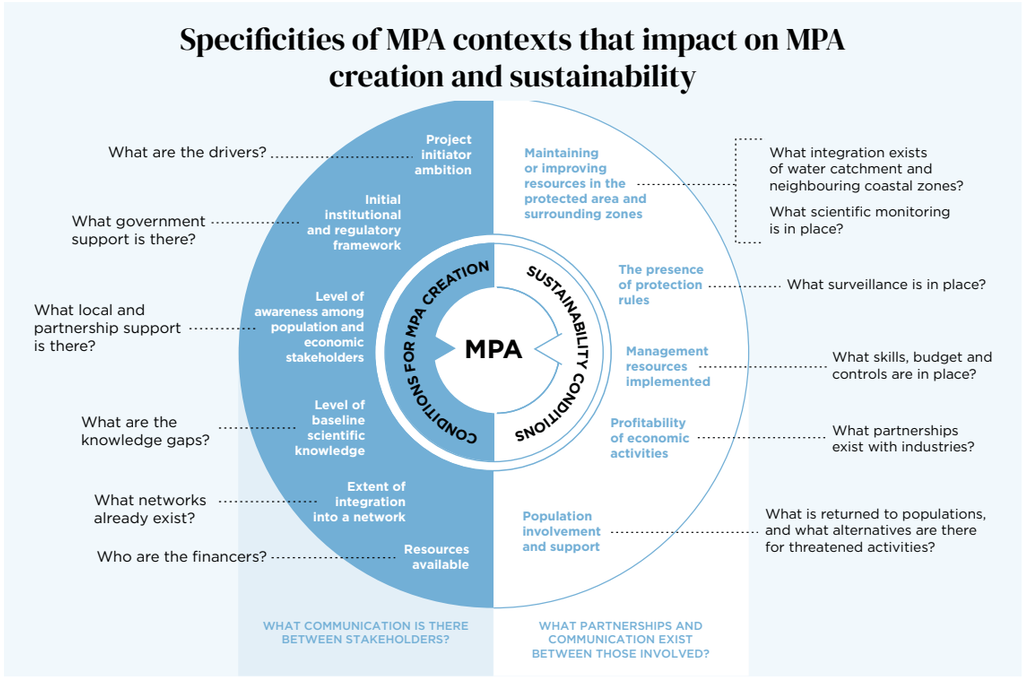
The success and sustainability of an MPA essentially depend, like any human endeavour, on its governance and management.

MANAGEMENT COMMITTEES AND CO-MANAGEMENT: A WIDE RANGE OF VOICES AROUND THE TABLE

No matter the type of MPA or its origin, it will be managed through the implementation of a management committee responsible for its governance. This body, usually composed of local stakeholders, is the political institution charged with making decisions on the MPA as from its creation (governance model, management rules, boundaries, zoning, monitoring committee, etc.) through to its day-to-day management activities, including monitoring. Setting this up is not always straightforward, since it comprises people and groups whose interests often diverge.

It is crucial that the utmost care is taken when establishing these committees and determining their operating and decision-making processes. The future of the MPA depends on it. Co-management, historically not always the preferred solution, is now the most common management model in FFEM-supported MPAs. This co-management should, as a minimum, bring together local communities and authorities, as well as the major local professional or institutional groups like fishers, and perhaps other groups such as those involved in tourism (e.g. Caribbean or New Caledonian MPAs) or communes (the Kobaby project in Madagascar). In some cases, the fishers themselves "sponsor" the MPA project. This was the case for some West African MPAs (BIOCOS project) where they played a decisive role in classifying the MPA, determining the management rules and monitoring (Kayar or Joal Fadiouth MPAs, Senegal); however, co-management with government authorities remains the most common governance.

PARTICIPATION AND INVOLVEMENT OF LOCAL PEOPLE: KEY TO SUCCESS



Local community participation at every stage of creation and management is key to the success of the MPA. It is however more important at some stages than others: when defining the principles for the creation of the MPA and its basic rules (prohibitions or regulations), boundaries and zoning of the MPA, and in the taking of decisions on cost and benefit-sharing rules, and on the composition of the management committee and - where one exists - of the monitoring committee. Local communities should be represented on the management committee and involved in the ecological and socio-economic monitoring activities that underpin adaptive management.

LESSONS LEARNED: Experience has shown that local communities' level of participation depends on the means deployed (technical, methodological, financial) to engage them and then keep them within the participatory process, but also depends on carefully identifying the relevant stakeholders at the outset. Conducting sociological and anthropological studies at the start of the project is essential (Hafafi/Kobaby project in Madagascar, RESCCUE project New Caledonia and Vanuatu, Mnazi Bay in Tanzania, Sainte-Marie in Martinique (GDZCOI), etc.) and should involve populations as early as possible.

Management committee meeting, Kayar, Senengal © T. Clément

Conflict management in Maromandia, Sainte-Marie, Madagascar © GRET-GDZCOI

Inclusion of all communities, including migrant communities

The particular case of migrant populations (whether recent or long-established) is in itself a major issue in many MPAs, where the original inhabitants often reject them. However, their exclusion from the process often causes more problems than including them, even if the path to this inclusion is not always simple and often needs to be adapted to each situation.

Examples of such complex cases are found in West Africa (MPAs in Gambia, Guinea, Guinea-Bissau and Senegal); in southern Thailand, with the Moken people known as the "Sea Gypsies"; in the Surin, Similan and Koh Lanta marine parks; or in Quirimbas and Madagascar. The challenge depends primarily on the number of these migrants and how sedentary they are. The fact that they are represented on the management committee (Tristao and Alcatraz MPAs in Guinea) is already a positive first step toward better MPA management.

Taking the time to earn stakeholders' trust

LESSONS LEARNED: While take-up of the MPA by local people is a perennial concern, the involvement of local populations should receive particular attention during the sensitive MPA creation phase. Broken promises can jeopardise the ongoing commitment of populations, and even lead to real hostility from some villages, so threatening the future of the MPA.

Examples of community opposition to a project, sometimes from neighbouring communities, affects several MPAs including Mnazi Bay in Tanzania, some MPAs under the Narou Heuleuk project in Senegal, Kobaby in Madagascar, OPAAL in the Caribbean and Emerald Arc in the Gabon. The Saint Lucia SMMA in Martinique, often cited as an example of a successful MPA, was the scene of violent conflict during its creation before things calmed down somewhat. However, conflict management remains a primary management objective for this MPA. In every case it is essential to maintain a long term presence on the ground (sometimes over several years) as part of the community, as in Yambé and Diahoué in New Caledonia, Urok in Guinea-Bissau, Nord Efaté in Vanuatu, and other locations.

Understanding the local context

LESSONS LEARNED: As a minimum, and not to be overlooked, are excellent contextual understanding and studies in the human sciences, intended to better understand the organisation and social functioning of populations and their interaction with their environment, in order to identify cultural aspects that could support or hinder engagement and participation (see Chapter 3.1 Knowledge and monitoring). These studies inform the development of the management plan by helping to identify management rules and models appropriate to the context. They are therefore generally indispensable. They should be allocated sufficient time and finances and should be conducted at an opportune time, if possible before the decision to create an MPA. If conducted after the MPA has been created, they can further our understanding of the context (Mohéli), but may fall short of alleviating any hostilities that have already arisen (Mnazi Bay in Tanzania, MPAs under the Hafafi/Kobaby projects in Madagascar). The mechanisms of land and access rights enjoyed by local communities must be properly understood before a project is launched (for example, the ownership of reefs in some Pacific countries). Local "leaders" can also play a decisive role. It is important at the outset to identify them and mobilise their influence (for example, the creation of fishers' MPAs in Senegal, Quirimbas and Bamboung, and community MPAs in New Caledonia and Mexico).

Similarly, where it may be necessary for effective management, the creation of new community groups should be considered carefully in light of the existing social context to maintain social cohesion.

Thus in Mohéli in the Comoros, recently created village associations, often of young people, were seen to have been given responsibility and power (via the financing granted) to the detriment of traditional authorities composed of older generations, which were then seen as having been undermined.

Identifying potential losers and compensating losses

The consultation phase, before the creation of the MPA, and the "compensation" phase which often includes the management plan, must absolutely take into account those people or groups negatively impacted by the project, at least in the short term. It is important to identify such groups within the MPA's sphere of influence early on; they usually include fishers, to whom solutions should be proposed (see Chapter 3.3.1 on Fishing).

Building a problem tree. Sandfly MPA, Soloman Islands © T. Clément

A cinema debate session, Saloum Delta MPA, Senegal © NGO Nébéday

Using the right tools and approaches

Information and communication methods used to facilitate participation should be tailored to the context. It cannot always be taken for granted that efforts to consult local communities have reached all stakeholders and that the decisions taken respect the rules of procedure within, and in particular between, local communities. This is particularly the case where the structure of these communities, and how power is shared between them, are complex, as in the South Pacific and Madagascar. Inadequate or poorly adapted consultation efforts can lead to failure of the MPA (see the example of migrants and nomadic peoples above, or of the Hafafi/Kobaby MPAs in Madagascar, where the full complexity of relationships between groups within the MPA was only revealed by a governance study performed after MPA creation).

In terms of communication, some methods, like the cinema debates run by Océanium in Senegal or the theatre sessions in Urok in Guinea-Bissau, have proven highly effective and of unquestionable interest. Participatory workshops, the method most frequently used, and today role playing, allow different actors to meet and build together. It is important to ensure, however, that the representatives chosen are seen as legitimate and to effectively represent the views of the group, then to also ensure that they properly feedback information to this group, which might not always be the case (some Mangrove MPAs or the Emerald Arc project)[57].

Exchange visits have also been an excellent means of sharing experience for many projects in order to convince sceptical communities (MedPAN, CRISP, Kobaby, GDZCOI, PACIFICO, NOCAMO, etc). Exchange participants have been unanimous in their interest, often maintaining contact after the visits. Networks help to scale successful experiences, because applying solutions that have already been tested elsewhere is easier than pioneering one (see Chapter 3.5: Sustainability of MPAs).

57. een.cirad.fr/competences-et-produits/modeles-de-simulation-jeux-de-roles

Keeping participation going

This can be the most difficult part. Once the initial enthusiasm and momentum of the MPA have passed, maintaining participation over the long term remains the biggest challenge for MPAs. The mobilisation of communities and actors should, therefore, form a recurring element of MPA management activities for several years (or decades). The question of "reward" and other "compensation" for volunteers should be considered, in particular for those community monitors (Mangrove MPA projects in Senegal, Kobaby in Madagascar, etc.).

LESSONS LEARNED: To maintain engagement, several elements should therefore be considered:

- The need to pay close attention to human aspects, to all those volunteering for or contributing to the MPA, and showing that they are appreciated;
- The need to maintain momentum within communities by holding regular meetings (one or two per year to present the year's results and the activities planned for the next year);
- The need to offer incentives (moral or financial of some form or another).

#AUTONOMY

The manager should also periodically and systematically feed back to the management committee and local people on the knowledge acquired, changes in resources, the results of monitoring, and the ecological and economic impacts of the MPA, amongst other things.

Exchange visit, GIZC platform, Sainte-Marie, Martinique © GRET

Traditional management models: A good foundation for appropriate management

Traditional management models continue to play a vital role in the Pacific, home to the FFEM CRISP and RESCCUE programmes, and it is here where studies and activities leading to the creation of the MPAs sought to integrate these aspects (New Caledonia, Salomon, Samoa, Vanuatu, Fiji, Cook, Wallis and Futuna, etc.). This is also the case in Senegal, in the Mangroves MPA project, and in Guinea-Bissau in the Urok MPA, for example. For several of these projects, traditional practices comprise the foundation of community MPAs, often being recognised by the authorities. Studies in New Caledonia showed that preparatory work with the communities could also help to regain ancient traditional knowledge and customary usages and to reconnect with tradition (See Chapter 3.3.1 on Fishing). See the RESCCUE guidance on the management of taboo sites.[58]

58. https://resccue.spc.int/fr/sujet/aires-protegees

SUPPORTING THE MANAGEMENT COMMITTEE TO IMPROVE MANAGEMENT CAPABILITY

For FFEM projects, management of MPAs is of course led by the management committees within a co-management context, but very frequently with the support of an external body or committee member as the management capability and availability of members are often very limited. This support could come from:

- **Government services** under the ministry responsible for MPAs (Mnazi Bay in Tanzania, Quirimbas in Mozambique, MPAs in Mauritania, Guinea-Bissau or Cabo Verde);
- **Independent bodies** comprising various stakeholders, including economic operators (Saint Lucia SMMA, Tobago Cays to Saint Vincent) and NGOs (Mesoamerican MPA, Océanium in Senegal, Kobaby MPA project in Madagascar).
- **Sub-regional organisations** (Organisation of Eastern Caribbean States (OECS), SRFC in West Africa) or MPA networks (MAR Fund in Mesoamerica, RAMPAO-PIMFAO project in West Africa, small projects, MedPAN).
- **Communities,** with the support of NGOs or projects, such as the community MPAs managed by fishers in Senegal (Kayar, Joal, etc.) or the Pacific LMMAs, or an intermediary between any or all of these.

Our portfolio also includes sites old enough that the preliminary phase was undertaken by NGOs, the subsequent stages being taken up by government authorities (Bamboung in Senegal, Urok in Guinea-Bissau, Quirimbas in Mozambique, etc.).

Ranger, Port-Cros National Park, France © C. Gerardin

LESSONS LEARNED: Government bodies have the benefit of legitimacy. However, they rarely have the resources to ensure effective management or, more importantly, to ensure the necessary consultations. Moreover, their management can be hindered by disconnection from the concerns of local populations (the Mangrove or Emerald Arc MPA projects). The flexibility of NGO management (particularly local ones) and their sensitivity to population needs means they are often better placed to lead projects, but national authority ownership remains the default approach. Partnership between the two often yields a good compromise, given the shortfall in government resources (Vanuatu MPA, Urok MPA in Guinea-Bissau, some MPAs in Cabo Verde, new protected areas in Madagascar, etc.).

Direct management by communities alone doesn't exist in reality

They are always supported by an NGO or authority, even if only light-touch. Where this can be done, it's only at small scale and requires strong leadership to ensure the rules are followed. But sooner or later, communities will turn to the authorities to help them enforce the law against offenders, to enable legal proceedings (fishers MPA in Kayar, Joal, etc. in Senegal) and perhaps to benefit from regulation that enshrines customary rights in modern law (Pacific LMMA). In more developed countries, where revenue from the MPA is possible (such as the Saint Lucia SMMA or other MPAs in the Caribbean arc and some in the Mediterranean, where tourism helps to fund well-organised MPAs), the transition to an independent body that is run as a public-private partnership, and has financial and decision-making autonomy, is often simpler and more effective.

THE BOUNDARIES OF THE MPA: TAKING ALL PARAMETERS INTO ACCOUNT

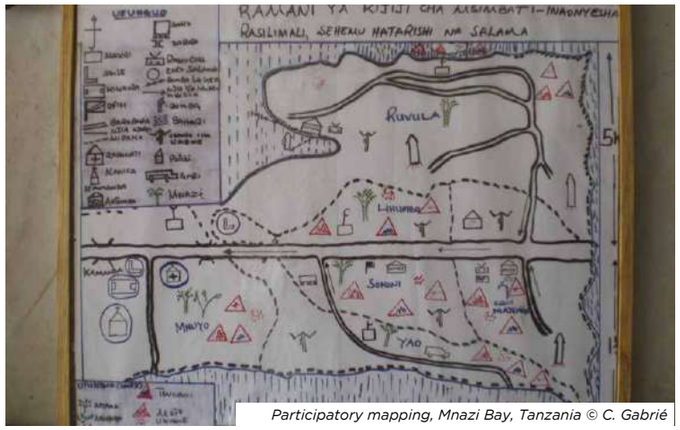
Port-Cros National Park, France © N. Gerardin

LESSONS LEARNED: The selection of an MPA's perimeter will most often depend on biological criteria. Yet, these criteria alone are not always enough. Social data (links between villages) and data on usage (understanding usages, the users, where they come from and their rights) and administrative arrangements are all also important and should be assessed before finalising the MPA's boundaries. Moreover, a comprehensive understanding of the geography of the MPA and its relationship between land and sea is essential, especially in island environments (see Chapter 3.4: Ecosystem resilience). However, few MPAs include watersheds - which pose a threat to the MPA - although exceptions do exist (Mohéli Park in Comoros, Moorea PGEM in French Polynesia). Effective management of an MPA can therefore be compromised by terrigenous pollutants leached from soil inland or other contaminants in used water (SMMA, Hafafi MPA, Mediterranean MPA, etc.). Work performed as part of the Mesoamerican project on agriculture in the watersheds offers in this regard an example of good practice, as do the agro-environmental measures implemented in Moorea in French Polynesia under the RESCCUE project.

ZONING, ESSENTIAL FOR CONSERVATION AND MANAGEMENT: USING SCIENTIFIC EVIDENCE IN SHARED WAYS

The majority of MPA projects incorporate zoning in order to separate sectors of the MPA that are subject to different regulations, depending on their purpose. This zoning varies in complexity within FFEM MPA projects (from two to ten zones, depending on the MPA) and plays several roles:

- **Protecting the habitats vital to species' life cycles** (breeding sites, spawning aggregations, nurseries and migration routes), together with fishing zones;
- **Managing conflicts over usage.** Zoning has proven effective in, for example, the SMMA where it has helped to resolve recurring difficulties between fishers and tourism operators, or for increasing resources in non-fishing zones.



Participatory mapping, Mnazi Bay, Tanzania © C. Gabrié

LESSONS LEARNED: Over and above the importance of location for zones, zoning is also more effective where decisions are made in a participative way (Kayar or Joal Fadiouth MPA in Senegal, Mohéli in Comoros) and, where relevant, that the zones identified correspond with long-established traditional management zones (such as the taboo zones found in many Pacific MPAs, as well as some MPAs in Senegal: Sangomar and Niamone Kalounayes). Participatory mapping (Tanzania, Quirimbas or New Caledonia) is also a good tool for engaging local communities in defining the zoning and developing the management plan. **#TOOLS**

Should insufficient resources be available to conduct basic studies, interim zoning for the purpose of demonstrating the principle, and raising awareness of the populations, may be proposed. This should then be reviewed in light of the scientific knowledge ultimately gained.

For example, the zoning of the Quirimbas MPAs, and the selection of the Comoros' Mohéli marine park reserves, were both performed without preliminary studies and later had to revised to better embody the conservation objectives for fisheries zones.

In Senegal, several MPAs created on the initiative of fishers along the extensive sandy coastlines have adopted a very simple zoning system prohibiting any fishing within the first nautical mile, then allowing line fishing only at 1 to 5 nautical miles, normal fishing regulations applying beyond that. This highly pragmatic system allows zoning to be implemented quickly based solely on fishing issues, making it easy to understand, implement and monitor. The findings of recent scientific work on the effectiveness of MPAs as a function of the zoning regulations in place have been mixed (see Chapter 3.3 on fishing).

3 MPA MANAGEMENT DEPENDS ON ITS MANAGEMENT PLAN

Once an MPA has been created and its governance and management bodies established, the real management activities can begin. If not already performed, as part of these activities initial state studies are conducted to provide baseline data on the MPA (or for a project supporting the MPA), so that the impacts can be measured. In every case the management plan is one of the essential tools, serving to define, guide and programme activities.

THE MANAGEMENT PLAN: AN INDISPENSABLE AND ADAPTABLE TOOL THAT IS OFTEN UNDERUTILISED

A management plan is recognised as indispensable to the management of an MPA and almost all MPAs define their management plan soon after their creation. There are several types of management plan, from the most sophisticated (generally for those MPAs in developed countries) to more rudimentary plans covering just a few pages of key points (Pacific LMMAs).

Generally speaking, a management plan sets out the current situation, a set of long-term objectives, zoning, MPA management rules for each zone and a multi-year programme of activities, often organised by theme (research and monitoring, education, surveillance, etc.). A key aspect of a management plan is that it sets out clear objectives, accompanied by relevant indicators that make it possible to verify how far management objectives have been met. However, management objectives are often vague, along the lines of "protect biodiversity" or "reduce pressures", etc.


Working meeting, Sandfly MPA, Soloman Island © T. Clément

How well the management plan was implemented in the MPAs studied varied greatly. In the best examples, it acts as an effective guide setting out a yearly work plan. While the first management plan is always more or less realised, its renewal and financing remain difficult areas (See Chapter 3.5 Sustainability of MPAs). Renewal is often a critical phase because the energy that drove creation of the MPA and its foundations can sometimes have diminished, particularly without supporting projects to take the load. As a result, many MPAs still have management plans that have expired and are in need of updating, which can hinder their effective management (Kobaby project in Madagascar).

OUR APPROACH

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The FFEM supported the development of guides for the preparation of management plans as part of the BIOCOS project. available online via the RAMPAO site[59]. The provision of management tools is also a precious resource for managers, available to them through their networks: MedPAN and RAMPAO.[60]

BUSINESS PLANS ARE LITTLE BY LITTLE TAKING THEIR PLACE IN MPA MANAGEMENT

The benefits of planning how an MPA will continue to operate and run its activities once its support project has ended are obvious. Yet few MPAs currently have a business plan, even a basic one. In fact, all MPAs really need to be quantifying precisely what they need to achieve their aims, and working out what resources they can access (business taxes, trust funds, etc.) to identify sustainable funding sources. The technical and regulatory conditions for accessing such funds should be set out in detail in this plan, specifying, for example, whether the MPA can itself levy licence fees or apply fines directly, without the funds having to pass through the Ministry of Finance or relevant official body.

59. rampao.org/-Guides-methodologiques-.html?lang=en 60. toolkit: rampao.org/-Presentation-.html?lang=en

Meeting at the Banc d'Arguin National Park © M. Bernardon

LESSONS LEARNED: Finding a sustainable way to finance an MPA's operations is highly dependent on local development opportunities and the activities carried out in the MPA. It is easiest to finance those MPAs with a significant tourism offering to draw on (Caribbean Arc MPA, some Mediterranean MPAs, etc.). For those that pose a greater financing challenge (especially those where there is little tourism), more ad hoc projects need to be developed. Given that managers tend not to be well versed in economic development, this may require calling on the expertise of relevant sector specialists, such as conservation NGOs, associations or the government services responsible for managing the MPAs (see Chapter 3.3: Sustainable development and the blue economy). Whatever the approach taken, it is vital that studies and consultations on these financing activities are started early, as setting-up this type of project can be a lengthy process.

OUR APPROACH

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The FFEM supported the development of guides for the preparation of business plans as part of the BIOCOS project. available online via the RAMPAO site[61]. One has also been produced by the MedPAN network. The FFEM also contributed, as part of its support for the MAR Fund project, to the development of the MARFIN5 tool for the Mesoamerican reef network and, in the context of its support for the MedFund, to an MPA funding needs assessment tool (see Chapter 3.5 Sustainability of MPAs).

SURVEILLANCE: A KEY TO MPA SUCCESS

Surveillance is a real challenge and few projects are currently able to conduct adequate surveillance due to the size of the marine areas, the time required to reach the different sectors and a lack of resources (boats and fuel), as well as issues around the legitimacy of the surveillance teams, particularly for community MPAs. Indeed, poaching and the violation of the rules governing fishing remain significant challenges in the majority of the MPAs studied.

Surveillance mission, Akanda National Park, Emerald Arc MPA, Gabon © L. G. d'Escrienne

61. rampao.org/-Guides-methodologiques-.html?lang=en-. The specific aims of MARFIN are to: gather field information to determine the current and future management costs for each category of marine and coastal area; provide present and future scenarios for the management of marine protected areas at regional and local level; develop a strategy to secure the funds required to establish a functional network of MPAs in the MAR region.

Park boat, Comoros, 2015
© C. Gabrié

In Mohéli, in the Comoros, the surveillance strategy remains ineffective against the spike in turtle poaching during Ramadan, given the very high selling price of green turtles (around 100 Euro per turtle), with the remains of butchered turtles being often found on the beaches.

Human resources:

Depending on the institutional arrangements of the management body and the resources available, surveillance might be handled by local authorities (coast guard, police or fisheries, forest or environmental rangers, for example), on the condition that they are law enforcement officers. Local people and fishers can help, but given that they have no legal authority they cannot take enforcement action themselves, without the support of the authorities. They do however play an important role in relation to providing information and raising awareness of the rules of the MPA. To ensure the continued commitment of these volunteers, they need to be trained in the same way as rangers, and need their work to be recognised and appreciated, and even paid (BIOCOS project, Narou Heuleuk, Mangroves MPA, etc.). If they are to be paid, funding for this needs to be secured (see Chapter 3.5 Sustainability of MPAs). Finally, support from the national navy for MPA surveillance teams has been found very effective, (Cocos Islands, Quirimbas, Guinea-Bissau) and should be considered whenever an MPA is particularly large or extends to the high seas.

In Costa Rica, where industrial-scale illegal fishing is widespread, an entire project was dedicated to strengthening surveillance: procurement of surveillance vessels, capacity-building for different surveillance actors (training workshops), reinforcing patrols and partnerships (strategic alliances) with both surveillance actors and fishers. The Banc d'Arguin National park in Mauritania is another good example of surveillance on the high seas.

Equipment

Surveillance cannot be conducted effectively without equipment. Rangers need to be able to take action quickly and so must be able to get out onto the water, which may on occasion demand a large budget, both for purchasing or building boats, and for operating them - fuel costs for large vessels can be very high. The maintenance and replacement of these logistic resources is also a challenge where they were provided to the MPA by a project, which is usually the case. The human and financial resources required for surveillance should therefore be considered early in the MPA management process, and included in the business plan.

Many MPAs have been helped to acquire vessels by projects (BIOCOS, OPAAL, Emerald Arc), meaning that often being of Western design they are expensive both to buy and maintain, and need spare parts that are impossible to find locally. Instead of using sophisticated models, simpler, locally constructed boats would be preferable. Some projects are already taking this pragmatic approach, reaping the benefits of lower cost, simpler repair, and supporting local economies (Mangrove MPAs, fishers' MPAs in Senegal, Kobaby).

The PACIFICO project

To improve the regional control and surveillance of protected areas, this project will strengthen existing capability in five main MPAs, providing equipment, internet connection, access to advanced satellite data and analysis capabilities to develop a shared standardised regional protocol. To this end, the project pans to partner with the International Monitoring, Control and Surveillance (IMCS) Network, Global Fishing Watch and/or other suitable platforms, such as Skylight (from Vulcan), OceanMind or Collecte Localisation Satellites (CLS). These activities are high cost, matching the challenges they address, and the FFEM cannot support these operations alone (see Chapter 3.3.1 on Fishing).

User testimony

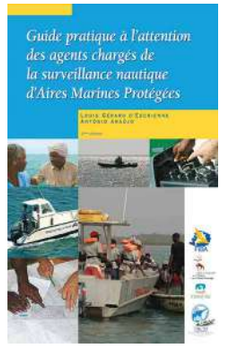
Louis-Gérard d'Escrienne, Deputy Director of the Occitania Region, French Biodiversity Agency (OFB), specialising in nautical training

"Logically and by definition, resources are more abundant within an MPA than outside it, and that attracts the attention of unscrupulous fishers/poachers and risks undoing all the efforts of an entire community and souring good will. We cannot, therefore, create a marine protect area without surveillance. But surveillance is not something you can improvise, it needs to be learned! Training should, of course, cover the challenges of surveillance and enforcing the law, but also, most critically, the security of the personnel responsible for undertaking this. MPAs often have only very basic equipment and their personnel are often not trained on the most basic principles. These key principles for the security of personnel at sea, which impact the effectiveness of surveillance missions on the water, are however fundamental and are less complex to implement than they may appear. Training personnel in security and undertaking surveillance missions on the water is an indispensable prerequisite for organising any MPA surveillance effort."

BECOMING A RANGER: A LEARNING CURVE!

Training MPA rangers (who are usually unarmed and not law enforcement officers) is important in many respects. Identifying an offence and apprehending the offenders at sea are not simple tasks, and ensuring the safety of personnel is a prerequisite for any mission.

LESSONS LEARNED: At least two projects (BIOCOS and Emerald Arc) trained their rangers with the support of specialists. This training proved very useful, both in relation to examining vessels and the equipment on board and in terms of expertise and knowing how to act. Building on the training provided under the BIOCOS project, RAMPAO set up a sub-regional task force to provide more cost-effective training for the teams going forward. A guide to support this training is available online on the RAMPAO website.



AWARENESS: PREREQUISITE FOR SURVEILLANCE

Surveillance should be accompanied by awareness-raising efforts because when people understand the issues, they are more likely to respect the rules.

LESSONS LEARNED: One of the best ways to raise awareness is to present the results of scientific research to fishers, or actually show them the effects of closing off an area. Training leaders in the fisheries sectors[62] (fishers, fishmongers and processors) has been shown to be very effective, as they are very well placed to persuade their peers to adopt good practices, whether at sea (fishers) or along the supply chain (fishmongers and processors). One example is stopping the buying of juvenile fish (ADEPA-CCFD project in West Africa) (see Chapter 3.5 Sustainability of MPAs).

Beyond the issue of surveillance, prosecuting offenders is also a recurring problem for MPAs. More often than not, judicial authorities will fail to pursue cases (Mohéli, Madagascar). Awareness-raising among judicial authorities by some projects has been somewhat effective (Mangroves MPAs, Kobaby, etc.), but needs to be frequently refreshed due to regular staff turnover.

Training on the use of GPS equipment, Emerald Arc © L. G. d'Escrienne

OTHER MPA ACTIVITIES: HABITATS AND SPECIES MANAGEMENT AND RELATIONSHIPS WITH ACTORS ON THE GROUND

The management plan is organised into key focus areas, usually articulated around the following topics: (1) research and monitoring; (2) surveillance and control; (3) habitat and species management and activities; (4) awareness-raising, education and training; (5) development of economic activities in and around the MPA; and (6) communication and relationships with actors on the ground.

The management of species and habitats also falls to the manager: protecting a biologically significant habitat, protecting its species (caring for turtles, etc.), combating exotic or harmful invasive species (eradication of rats, etc.), restoring degraded environments taking care of various other tasks maintaining sites (pathways, pontoons, etc.), installing information boards, maintaining cultural heritage, installing mooring buoys, artificial reefs, signage, cleaning beaches, raising public awareness, promoting economic activities, overseeing administration and good governance of the MPA. Managers have to perform a wide range of activities on top of their administrative responsibilities.

It is moreover important for managers to maintain relationships with local communities and other local actors and to report back to them regularly.

62. *AFD-ADEPA-CCFD project, Terre Solidaire training for 45 leaders in the fisheries sector in West Africa.*

4 MONITORING MPA MANAGEMENT EFFECTIVENESS: CHOOSING THE RIGHT MEASUREMENT TOOLS

Once an MPA has been set up and is operational, the question of effective management soon comes into play. Management effectiveness is usually assessed as part of MPA supporting projects based on management objectives, ecological and economic baselines and regular monitoring (see Chapter 3.1: Knowledge and monitoring). While the majority of projects handle these activities in whole or in part, once the projects end, monitoring of management effectiveness becomes more sporadic, or disappears entirely.

Children in Bamboung, Senegal © T. Clément

LESSONS LEARNED: Whether an MPA can be considered effective depends on attaining its objectives: improving biodiversity, increasing resources - especially those under threat - and improving the living standards of populations. Several stages are needed to obtain these results. Many tools are available online to help managers measure effectiveness, including: the compass card, RAPPAM (Rapid Assessment and Prioritisation of Protected Area Management), the Integrated Management Effectiveness Tool (IMET), Scorecard, the methodologies developed by MedFund, and many others. **#TOOLS**

OUR APPROACH

Following the observation that several of the existing tools were cumbersome and/or that results analysis was reserved for a few specialists, in 2007 the FFEM funded the development of a much simpler tool christened the "compass card". Using simple software (Excel), which all managers with a computer possess, the tool produces a highly-visual output that's readily-understood by non-specialists, thanks to the clear way it presents the evolution over time of some specific parameters. It has been gradually improved and adopted by a large number of MPAs and projects (Narou Heuleuk, CRISP, BIOCOS, RESCCUE, Emerald Arc, Kobaby, etc.), donors (FFEM, AFD, FIBA/MAVA) and networks (RAMPAO, New Caledonian MPAs).

The "compass card" represents the MPA's performance and evaluates its management effectiveness.

The tool allows an MPA to be depicted at a particular point in time t, then monitored over time, comparing the results by superimposing the two graphs. It is also possible to create averaged compass cards, for example to represent a group of MPAs benefiting from the same support (e.g. Mangrove MPA project, BIOCOS MPA). These can all be created simply from a pre-programmed Excel spreadsheet. The tool shows at a glance where weaknesses need to be addressed, identifiable as "troughs" on the compass card. This can then serve as the basis for designing a roadmap to improve the management of the MPA and make the process more robust (see Annex 4).

The MedFund method: Evaluating the impact of financing on management effectiveness and efficiency

Created in 2015, the MedFund provides long-term financing for the Mediterranean MPAs, including their operation (see Chapter 3.5: Sustainability of MPAs, paragraph on financing). The MedFund has developed a dedicated tool to measure the performance of its biodiversity conservation financing, evaluated against the management objectives set out in the management plan. For this reason objectives need to be clearly defined. Using the tool developed[63], we can identify three priority conservation targets (species or habitats) the evolution of which can show whether management activities are positive or not. The targets mirror the site's issues, and their monitoring will be supported by MedFund. Since the baseline condition is not always know, the MedFund finances scientific protocols to allow these to be established.

The tool was designed on this basis, and is organised around three main aspects:

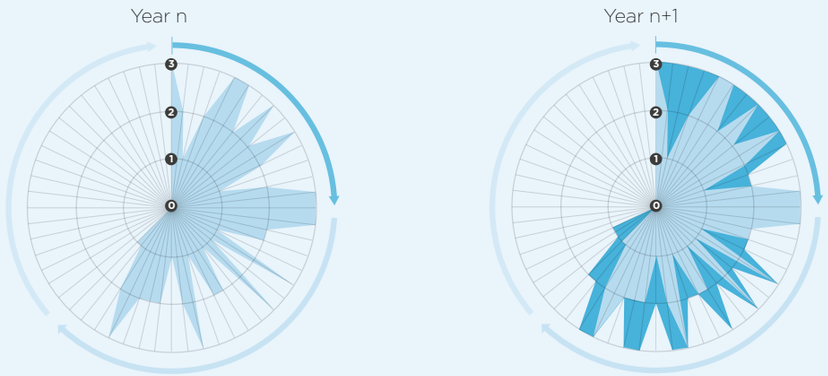
- **The management context:** Indicators of whether the context is more or less favourable to effective and efficient management: legislation and policies on the MPAs, existence of a management plan, type of governance, level of human resources, competences and financial means available.
- **The effectiveness of management: Indicators on the performance of management activities:** surveillance, habitat or population conservation activities, activity management for fishing, tourism etc., combating pressures, ecosystem restoration, research, monitoring, awareness raising, education.
- **The efficiency of management: Outcome and impact indicators:** Evolution of conservation targets, fisheries resources, fishing behaviours, socio-economic benefits for local populations, strengthening governance, and acceptability level.
- **Sustainability:** Assessed on the basis of financial resources available, the quality of governance and the level of buy-in to the MPA by local communities.

Each of these sections covers a topic broken down into basic sub-questions, scored from 1 to 5, allowing a percentage achievement for each topic to be calculated with the results obtained being presented as a radar chart.

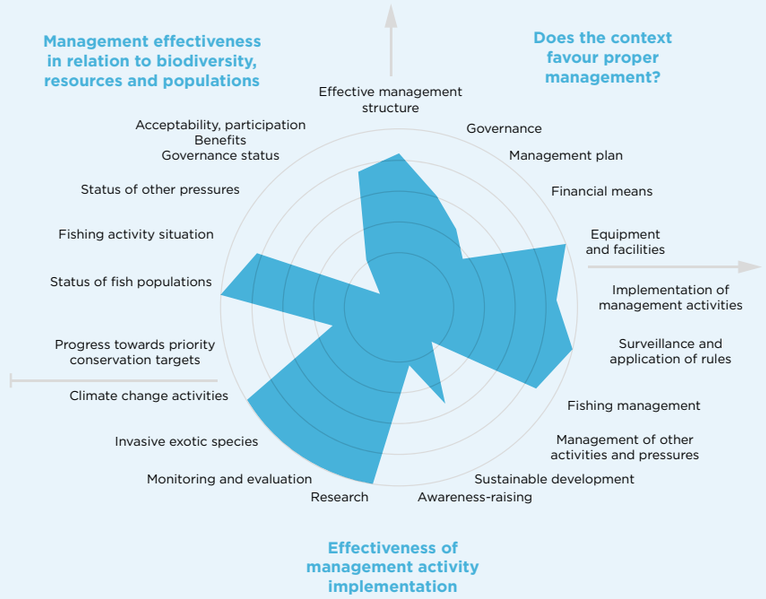
Effectiveness is evaluated annually, while efficiency is evaluated every five years (the duration of MedFund agreements). Cross-cutting indicators are monitored, such as activities related to climate change and gender approach.

All MedFund beneficiaries are trained and supported in the use of this tool, which is essential for effective and long term use.

Example of a compass card illustrating the progression of an MPA over time



Summary of the results of MPA management efficiency analysis (MedFund, 2020)



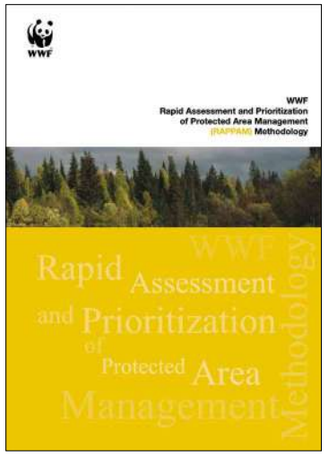
63. It is based on a pre-existing tool developed for the Mediterranean MPAs by IUCN and WWF. https://www.iucn.org/content/guide-quick-evaluation-management-mediterranean-mpas

The ground-breaking RAPPAM tool

The RAPPAM methodology is based on the principle of participatory self-assessment, conducted with all stakeholders involved in the management of the MPAs evaluated.

It has five steps;

1. Determining the scope of the assessment (MPA under evaluation);
2. Assessing existing information on each MPA;
3. Administering the rapid assessment questionnaire;
4. Analysing the findings;
5. Identifying next steps and recommendations. The data analysis uses simple scores that aggregate several pieces of data into a single figure.[64]



The IMET 7 tool, for large MPAs (IUCN-BIOPAMA)

This programme, which developed the IMET tool in partnership with the EU Joint Research Centre, provides operational support to managers of protected areas to facilitate the planning, monitoring and evaluation of protected areas with a view to improving their management and ensuring that they achieve their conservation objectives. This is a comprehensive tool, well suited to large MPAs that have significant long-term resources, including IT facilities. It is undoubtedly too elaborate and cumbersome for smaller MPAs, in particular community MPAs many of which have no internet connection or even electricity supply.[65]

Many other tools are available and each manager should use that best suited to their area and situation.

These include:
• *Score Card to Assess Progress in Achieving Management Effectiveness Goals for Marine Protected Areas, 2004*[66]

• *Guide for quick evaluation of management in Mediterranean MPAs*[67]

See also "Towards assessing management effectiveness of Mediterranean MPAs", published with the support of the FFEM in a special edition of the MedPAN scientific newsletter "Science for MPA management".[68]

Ouvéa, New Caledonia © T. Clément

64. wwfeu.awsassets.panda.org/downloads/rappam.pdf 65. rris.biopama.org/fr/node/18795 52. Kersting D.K., Ducarme F., Gallon S., 2021. Towards assessing management effectiveness of Mediterranean MPAs, MedPAN. Marseille, France: researchgate.net/publication/351686926_Towards_assessing_management_effectiveness_of_Mediterranean_MPAs 66. reefresilience.org/pdf/MPA_tool.pdf 67. https://portals.iucn.org/library/sites/library/files/documents/2013-018.pdf 68. Kersting D.K., Ducarme F., Gallon S., 2021, "Towards assessing management effectiveness of Mediterranean MPAs", MedPAN. Marseille, France. See: researchgate.net/publication/351686926_Towards_assessing_management_effectiveness_of_Mediterranean_MPAs

Questions for the future
LET'S BRAINSTORM!

To make current and future projects as effective and efficient as possible, we must find ever more innovative solutions and learn from past mistakes and successes. Coming together to share our thoughts on the issues raised should help us find the best answers to the questions below.

• **How can we convince stakeholders of the value** of the (often Western) concepts used to manage MPAs and their resources?

• **How can government and communities work together?**

• When the majority of the world's MPAs are suffering from a chronic lack of resources, **how can we determine the essential elements to focus on** to retain the benefits of the MPA?

• **How can we resist the too-sophisticated and too-costly** (vehicles, speedboats, surveillance equipment) when supporting MPA, keeping in mind post-project sustainability? And, generally speaking, how can we better anticipate/manage the end-of-project transition for MPAs receiving such support?

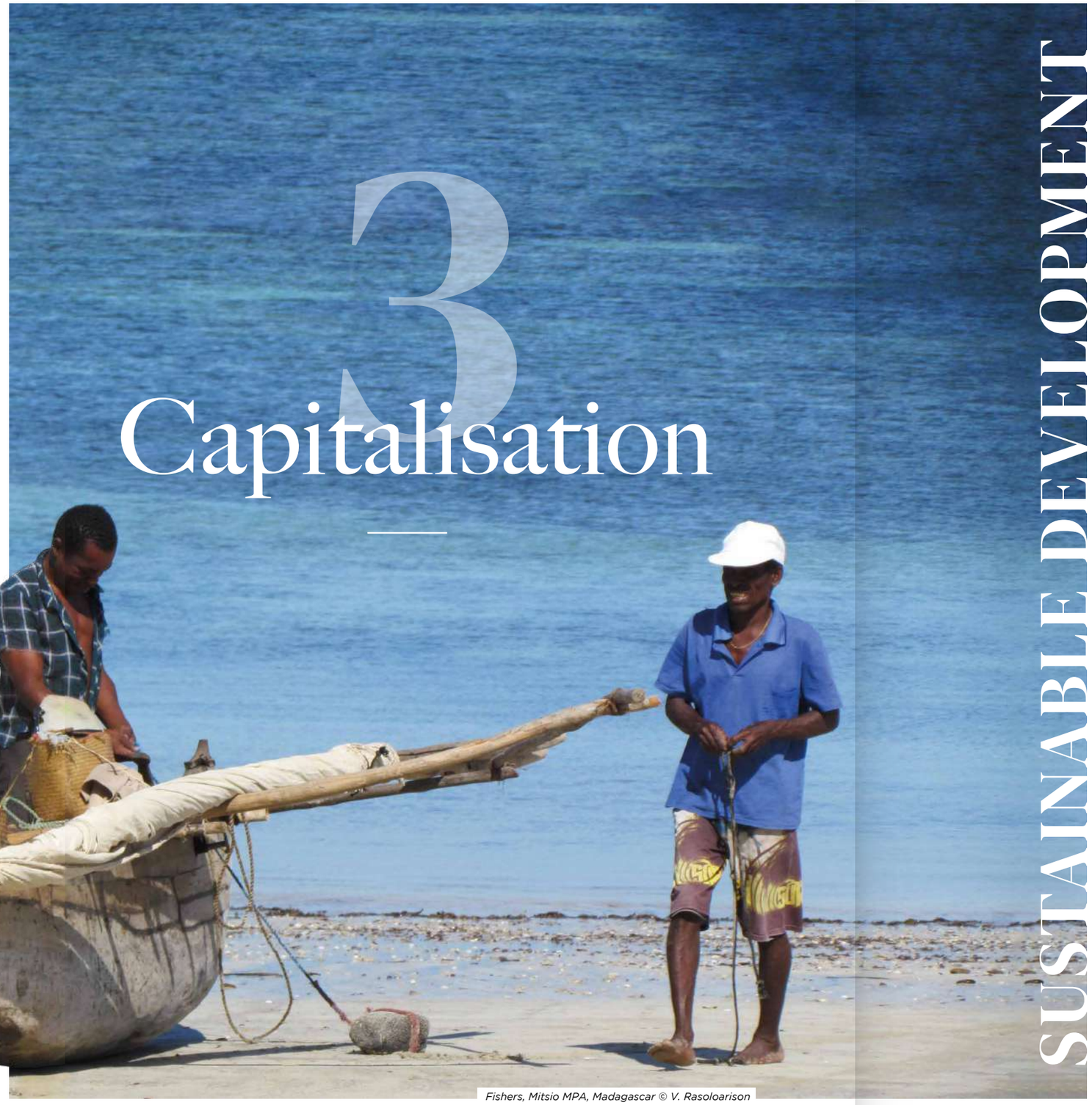
• **How can we ensure MPA funding is sustainable?**

• **How can we identify those robust MPAs that are temporarily struggling,** and just need a boost to get them back on the right track?

• **How should we address the issue of migrants or nomads** in the MPA (fishing or on land)?

• **How should we prioritise which MPA to create and support in the long term?**

• **How can we convince donors to extend their project durations** (since it takes at least 5 to 10 years to properly embed an operational MPA)?



3 Capitalisation

Fishers, Mitsio MPA, Madagascar © V. Rasoloarison

3 SUSTAINABLE DEVELOPMENT AND THE BLUE ECONOMY

How have our biodiversity-related projects and industries fostered the sustainable development of economic activities, and improved the living conditions and resilience of communities?

The basics

To conserve natural resources, populations, and above all fishers, must play a role in management.

Populations need to find an MPA's existence beneficial, and profit from it: the blue economy should leave no one behind.

Economic development derives from robust industries covering production, collection, processing and, above all, ensuring profitable outcomes.

Product certifications (e.g. Marine Stewardship Council, forest stewardship council, fair trade, organic and so on) offer significant benefits in terms of sustainable resource use and accessing profitable markets.

The challenge of capitalisation

To identify and scale up catalysts of economic development, including the resources required to build robust value chains, to improve the living standards and resilience of local communities and encourage them to accept the MPA.

Introduction

With very rare exceptions, MPAs and the surrounding areas are occupied by populations that, to greater or lesser extent, are affected by the protected area classification. Restrictions on the use of resources and practices are often one main cause of opposition to the creation of an MPA. It is therefore important, going beyond conservation, to further the social and economic development of the areas around MPAs.

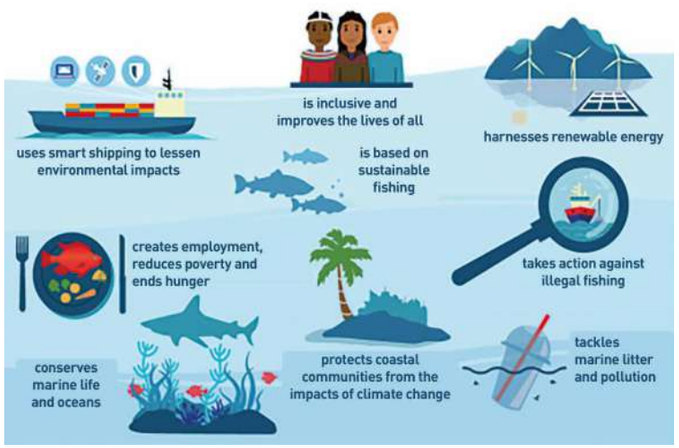
> The evaluation team noted a move over time away from a rationale of conservation-oriented projects and toward one more oriented on socio-economic development.
> ***AFD Evaluation, Quesne* et al., 2018**

Change doesn't happen overnight: The rationale underpinning more recent projects holds that unless the economic development of communities living in and around the MPA is properly taken into account, it is unrealistic to expect meaningful results in terms of conservation. With this in mind, almost all projects now combine conservation with economic development to a greater extent than before (something also observed in AFD projects, see AFD Evaluation opposite).

Today we talk about the blue economy. According to the World Bank, the blue economy is "sustainable use of ocean resources for economic growth, improved livelihoods and jobs, while preserving the health of marine and coastal ecosystems." The concept covers a wide array of activities: extraction of living resources (e.g. fish, aquaculture and algaculture) and non-living resources (e.g. oil and gas), tourism, maritime (such as port activities and maritime transport) and research, as well as emerging sectors such as offshore renewable energies, deep seabed mining, marine biotechnology and bioprospecting. Other ecosystem services that are provided by the ocean, such as carbon sequestration, coastal protection and even the presence of biodiversity, for which markets remain underdeveloped, also make a significant contribution to economic and social activity and form part of the blue economy.

The blue economy in MPAs should leave no one behind.

Sustainable Blue Economy Conference, Nairobi, Kenya, 2018.



In similar vein, Blue BioTrade is defined, according to UNCTAD, as ecologically sustainable business and economically equitable investment in coastal and marine biodiversity and ecosystems. This concept includes four complementary approaches: ecosystem management, the value chain approach, adaptive management and the development of means for sustainable livelihoods. (Schematic below: UNCTAD, 2007).[69]

Ecolodge, in the Punta de Manabique MPA, Guatemala, Mesoamerica © C. Gabrié

Principles of BioTrade	Approaches
P1. Conservation of Biodiversity	• Value chain
P2. Sustainable use of biodiversity	• Adaptive management
P3. Fair and equitable benefit sharing	• Ecosystem approach
P4. Socio-economic viability	• Means for sustainable livelihoods
P5. Legal compliance	
P6. Respect for the' rights of those involved	
P7. Right to use and access natural resources	

Fishing, and to a lesser extent tourism, almost always plays a central role in the MPA, but other value chains (particularly agriculture, forestry and aquaculture) should also be considered as avenues of local economic development able to support conservation.

69. *UNCTAD, 2018, Blue BioTrade: Harnessing Marine Trade to Support Ecological Sustainability and Economic Equity.*

1 FISHING WITHIN AND AROUND MPAS: MANAGING AN ESSENTIAL ACTIVITY

Whether the purpose of a marine protected area is biodiversity conservation or fisheries preservation, fishing almost always has a central role.[70]. Fishing is often the sole means of subsistence for very poor local communities. Because of the local population's high level of dependence on fish stocks, fishing is the one activity that must be fully taken into account when setting-up and managing an MPA.

Because the areas in which the FFEM is involved are located in developing and emerging countries, with most MPAs lying near the coast, the main activity is usually artisanal fishing using traditional methods, even where fishing is a significant activity such as in Senegal. It is usually small-scale, subsistence fishing in inshore areas within the range of these small artisanal vessels, not all of which are even powered. Fishing has been practised in these areas forever, with techniques that have barely changed and gear that is often very basic. Various techniques are used such as line fishing, nets, traps and fishing from the beach, with some areas still employing destructive techniques, even quite widely, among them dynamite - currently used in the Philippines - poison, mosquito nets, trawl nets, monofilaments etc.

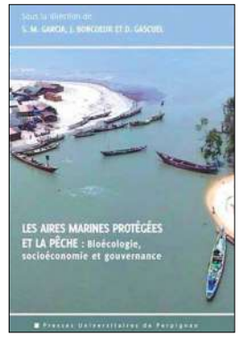
Fishing activity is often difficult to manage in these areas for a number of reasons: it does not target particular species, takes many forms, uses a variety of fishing gear, and uses widely dispersed landing places and fishing methods (from the beach, by boat, by local residents and migrant or nomadic fishers). An ecosystem approach is therefore required.

Whatever the type of fishing, the feature common to all projects is that the resource is overexploited - even where this charge is not backed-up by the numbers. Fishers will frequently under-report their catch, or claim that its make-up has changed, or that the fish are smaller, meaning they have to travel further for the fishing. In the Mesoamerican reef area, for example, the biomass of commercial fish has fallen by 23% in 10 years in the areas monitored by the Healthy Reefs Initiative.

Mediterranean catch © C. Gabrié

70. According to some environmental actors, only areas that are managed for the purpose of protecting the ecosystem should be termed MPAs. These are usually mandated by environmental policy with the goal of preserving biodiversity. On the other hand, areas managed for the conservation of commercially fished species, as part of fisheries management policy, should not be considered to be MPAs. There is ongoing debate on this issue. The SRFC/CEPIA project used the term MPA "reserve" for areas where no or very little take was allowed, the term "multi-use" MPA for areas having different usage zones where only one part is a completely protected reserve, and the term "spatio-temporally restricted" fishing for those areas where the objective is the protection of fish stocks and the improvement of fisheries.

Sources of information about the management of fishing in MPAs



Following-on from the many observations made in the first FFEM report on the capitalisation of MPAs (2010), several further major pieces of work, some funded by the FFEM and the AFD, have corroborated and endorsed the value of that experience.

The most current knowledge of the role and impact of MPAs in the management of fishing comprises two documents by MedPAN: "MPAs as sustainable fishery tools"[71], and "The involvement of fishers in Mediterranean MPAs", plus a significant document on the state of the art "Marine protected areas in fisheries management", an analysis of 72 MPAs around the world, produced by a group of research organisations under the framework of the SRFC/CEPIA[72] project. Management is, on the one hand, a matter of integrating MPA "reserves" into fishing management and, on the other, a matter of integrating fishing management into the management of multi-use MPAs with a more conservation focus. This work was also the subject of an academic paper "Protected marine areas and fishing: bio-ecology, socio-economy and governance"[73].

Also cited, from outside the FFEM, is work by the FAO, "Fisheries Management. 4. Marine Protected Areas and Fishing" [74]. **#TOOLS**

These base documents are very valuable resources, for those involved both in establishing marine protected areas, and for those managing fishing activity within and around MPAs. Most of the elements of this chapter are described in more detail in these books, which can be usefully consulted.

71. Rodríguez-Rodríguez, D. 2016. MPAs as sustainable fishery tools. MedPAN. Marseille, France. https:// https://www.researchgate.net/publication/350176759_MPAs_as_sustainable_fisheries_tools *72. Garcia et al., 2013. Marine protected areas in fishing management. Work undertaken by SRFC, IUCN and IRD in cooperation with several projects (AFD's MPA Co-management, RECARGAO, GP-SIRENES and AMPHORE).*
73. Led by S. Garcia, J. Boncœur & D. Gascuel (2013).74. Fisheries Management. 4. Marine protected areas and fisheries. FAO Technical Guidelines for Responsible Fisheries. N. 4, Suppl.4, Rome, FAO. 2012. 206 pp.

Known effects of reserves: benefits are many, and may be rapid

The many benefits are described in the international bibliography (Roberts et al., 2000, 2001; Polunin, 2002; Wickel, 2008)[75] , recently backed-up by MedPAN's work (2016) and the SRFC/CEPIA project (2013, 2014)[76] :

- **Increase in species richness, overall abundance, and average size of individuals:** these effects are marked in the case of species subject to intense fishing pressure (outside the reserve) and for species at the top of the food chain (predators).
- **Re-balancing age and size structures**;
- **The trophic cascade effect:** the increase in the numbers of large predators results, due to increased predation, in a decrease in the abundance of certain - mainly mid-sized - species, so leading to increased numbers of their own, smaller prey species.
- **Higher reproductive output[77]:** increased abundance of reproductive adults, rebalancing of the gender ratio and increased spawning and larval recruitment numbers (although the effect of this increase on recruitment and the overall abundance of juveniles is not clear and depends on the recruitment processes).
- **Catch-size maintenance or improvement in adjacent fishing areas from any spillover** of adults and juveniles. However, the biomass export is limited and diminishes rapidly with distance. Any noticeable effect on fishing occurs only within a short distance of the reserve: a few hundred metres for coral reefs or small MPAs such as Bamboung, and between 500 metres and a few kilometres for large MPAs such as the Banc d'Arguin. This is further limited if pressure from fishing is intense. The transport effect of fish larvae, which varies greatly depending on the species and its behaviour (breeding capability, spawning ground etc.) could help limit the risk of stock collapse and improve catch in some fisheries.
- **Reduction in the variability and unpredictability of the catch**;
- **Improved biodiversity:** MPAs have a role in genetic and ecological conservation. Some species can now only be found in MPAs, and have disappeared elsewhere - an example is the sawfish in the Bijagós Biosphere Reserve. This increase in biological diversity at different levels of the food chain helps make it more robust, improving population resilience and ecosystem stability.

Direct effects within an MPA can be seen, on average, after a period of 5 to 7 years while the indirect effects (interactions between species) are detectable after 11 to 15 years. The benefits of an MPA therefore generally only become apparent after a long period - between 10 and 40 years.
Research has however shown that if the reserve is not maintained, these positive results can be reversed very quickly - under a year - whatever the age of the reserve (5 - 10 years or even more). Therefore, reserve management techniques need both to be effective (monitoring), and to be maintained over the long-term[78].

75. Roberts C.M. and Hawkins J.P., 2000. Fully-protected marine reserves: A guide. WWF. Roberts C.M. et al., 2001. Effects of marine reserves on adjacent fisheries. Science 294 (5548): 1920-3. Wickel J., 2008. The effect of reserves on the tropical marine environment – Ifrecor report. Polunin, 2002, in Handbook of fish biology and fisheries. Polunin et al., 1996. reef fisheries. Fish and Fisheries series. Springer 76. The effect of MPAs on ecosystems depends on the level of protection and regulation of activity within the MPA (Zupan et al, 2018, Claudet J, et al., 2020) 77. Larger individuals, which are more abundant in MPA "reserves", are more fecund and have a longer spawning period. 78. The time frames indicated here for the effect of reserves on fish species and the top of the food chain reflect those in the latest literature. However, note that, according to the work of Yunne-Jai Shin (2017), the restoration of ecosystem biophysicochemical mechanisms is quicker, within 3 to 5 years. Using meta-modelling, the research aimed to provide the answers needed by decision-makers and fishers: which biodiversity indicators best resist the pressures from fishing? Are these indicators more sensitive to pressures from fishing than to the effects of climate change? What is the average response time of all of the biodiversity indicators to a climatic or fishing event? Meta-modelling has already answered this last question: 3.6 years, which is a much shorter time than one would think. 79. See also: The ecological benefits of no-fishing zones in FFEM projects in Marine Protected Areas - Capitalising on experience gained in projects co-funded by FFEM, p. 58

Sorting the catch in French Polynesia © M.-L. Licari

LESSONS LEARNED: MPA "reserves" and no-fishing areas (reserves, sanctuaries etc.) and the stringent protection of habitats significant to fish stock replenishment (spawning aggregation and nursery sites) have already demonstrated their impact on the conservation of fishing resources and its resulting socio-economic benefits.

While setting-up MPA "reserves" within large multi-use MPAs may improve the impact of an MPA on fishing, the development of networks of small MPAs remains the most realistic solution in a context of highly-constrained coastline areas, provided that this is justified by functional relationships and connectivity (so dependent on the environment, local currents and species)[79].

Fishers need to be at the heart of the process

VERY EARLY ENGAGEMENT WITH FISHERS IN MPA MANAGEMENT: KEY TO SUCCESS

Fishers are often the first to lose out during creation of an MPA, after regulations forbidding or restricting fishing are put in place but before these measures produce any tangible benefits, often several years later.

LESSONS LEARNED: It is thus essential to encourage their buy-in, through informing early on about the restrictions and the benefits that protecting the resources they exploit will bring, by helping them to organise so that their voice is heard in management, and encouraging them to play an active part in that management (surveillance, monitoring etc.).

It is important, or even critical, to the success of the MPA that they are supported. To help them move away from destructive fishing techniques, the project manager should support their adoption of other techniques (as long as this does not transfer the overfishing problem to other stocks). This was the case for the SMMA, Mnazi Bay and Mohéli projects which offered viable alternatives (FAD and more selective nets). Supporting the change to the new methods is important, if the risk of potentially fierce opposition is to be avoided (Mnazi Bay & SMMA projects). A peer learning network and exchange visits between fishers are both very useful (see Chapter 3.5: Sustainability of MPAs)

In the most critical cases, fishers who are most affected and disadvantaged, and cannot easily switch to alternatives, may be directly compensated or granted non-transferable specific fishing authorisations (SMMA project).

BASE CO-MANAGEMENT ON FISHER GROUPS AND RELY ON THEIR LEADERS

The co-management of fishing within and around an MPA should involve representative fisher groups respected within the fishing community (natural leaders). If these fisher groups do not exist, it often falls to the project itself to set-up a trade structure - something not always easy to do. It can additionally be very complicated where migrant fishers are involved, and in the not infrequent situations where the gear is owned by someone other than the fishers themselves. This necessitates a consultation phase - which can be substantial depending on the existing structure - and good knowledge of the split between owners and crew, and of the distribution of income between them, in order to correctly define the role of each in decision-making. Training for the newly-formed groups, if required, is an important part of supporting them. Meetings between the fisher groups proved themselves very helpful on several projects (see Chapter 3.5: Sustainability of MPAs)

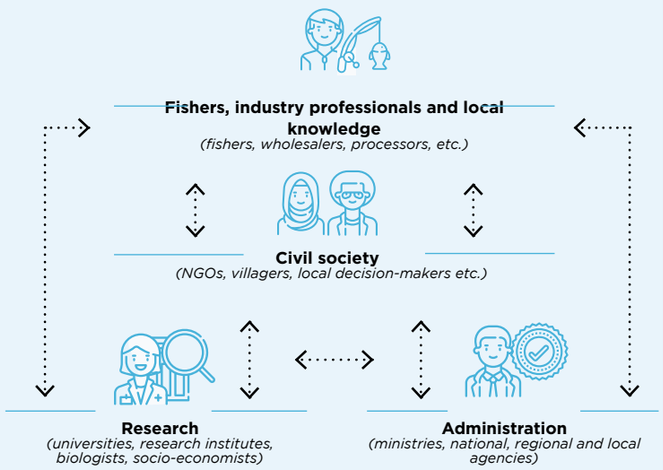
80. Wiegel J-Y., de Monbrison D., Giron Y., Fossi A., Diop H. THE STATE OF THE ART ON FISHERIES CO-MANAGEMENT: GLOBAL SUMMARY, EXPERIENCE, LEARNINGS. Atelier SRFC, Apr 2014, Dakar, Senegal. 30 pp.

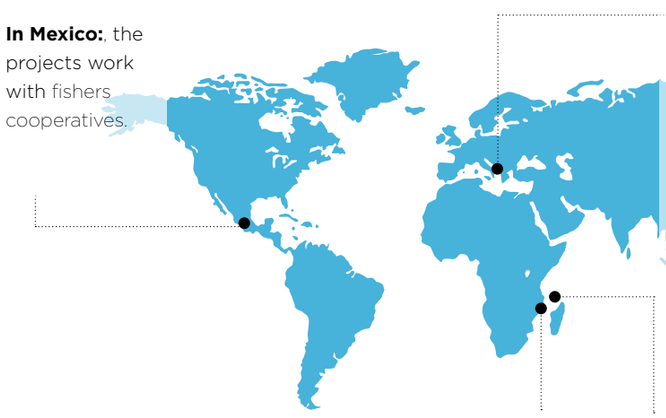
Fisheries co-management

As part of the SRFC project funded by the AFD, a report was produced on the state of the art of fisheries co-management.[80]. It contains a review of the international literature on the subject, based on experience in more than 30 countries. This extensive report explains co-management and its different forms, presents the key factors which contribute to a successful co-management process, details how to scope, develop and then implement a co-management plan or project and presents the technical measures for fisheries management applicable to co-management.

Principal partners and key actors in fisheries co-management

Alexis Fossi (SRFC workshop, 2013), based on Staples and Funge-Smith, 2009





In Mexico:, the projects work with fishers cooperatives.

MedPAN PPI: this sustainable traditional fishery monitoring project in the Italian Torre Guaceto MPA has produced significant indirect results. An intensive measurement campaign strengthened dialogue and collaboration between the project manager and the fishers from the area, who then formed an artisanal fishers association which became the sole contact point for the manager.

In the Quirimbas islands off Mozambique, the park works with **Community Fisheries Councils (CCP),** a local, informal organisation of around a dozen fishers that sets-out, applies, and monitors compliance with, local fishing rules. In particular, the Councils monitor the fishing gear used and respect for sanctuaries. Fishing authorities involve them in monitoring catches and issuing fishing licences to resident fishers. It's also the Councils who grant fishing authorisations to migrant and nomad fishers. Their role is seen as exemplary, with very positive results.

At Mohéli, in the Comoros, the fishers associations showed great interest in re-structuring into cooperatives, with the economic benefit of collective equipment and working practices. Eleven fisher cooperatives were set up.

Relying on local leadership: a winning gamble for the fishing sector


© A. Rosenfeld

The ADEPA-CCFD-TS project, financed by the AFD in 7 West African countries,over a period of around 4 years trained 45 local leaders (fishers, wholesalers, processors) from the fishing industry . The basic concept was that every link in the industry must be properly made for the industry to be as it should be, and that only those from within the industry themselves could convince their peers to convert to sustainable fishing practices. The project therefore chose to gamble on young leaders co-opted by their peers to lead this transition. This approach has proved itself effective. (See Chapter 3.5 Sustainability/sub-section Peer Training)

The COBI project, in Mexico, aims to scale up the community leadership programme developed between 2013 and 2016. The *Community Leaders Program* is based on identifying leaders from within the coastal communities possessing the knowledge and technical skills for marine conservation and sustainable fishing, and then building upon their capabilities as proactive change agents and models for their communities. The program is based on a process of coaching participants in eight human dimensions - ethics, thought, communication, ecology, economics, empathy, culture and spirituality - through individual and group sessions and the development of a community project.

THE BENEFITS OF PARTNERSHIPS BETWEEN FISHERS, SCIENTISTS, ADMINISTRATORS AND LOCAL GROUPS

- As part of the SRFC/CEPIA project and the France-IUCN framework agreement a fishing task force was set up. This task force, made up of fishing sector experts from many disciplines, responds to requests from RAMPAO MPA members, providing help to managers and others involved with practical questions on monitoring fishing resources, fishing activity, inter-sector consultation, governance and systems for managing the relationship between MPAs and the fishing sector. This support, which assisted several MPAs (Bamboung, Urok etc) was greatly appreciated. Unfortunately, it is no longer active and its return would be most welcome.
- On the Mesoamerican coast (MAR Fish project), local community acceptance of spawning zone protection has been built on strengthening the relationships between scientists, fishers, environmentalists, policy decision-makers and citizens to support a regional movement to improve understanding of the role of spawning sites in fisheries management, the importance of protecting them and to encourage sustainable co-management.

Relying on ecological and socio-economic studies and monitoring for ecosystem-based management


Reef fish inventory work in New Caledonia © S. Job

Basing upon robust scientific research is essential for the development of fisheries management planning and for ensuring appropriate tools are put in place for managing fishing within and around an MPA. Fishers possess extensive knowledge of the resources, their behaviour and habitats etc. which makes them invaluable allies. Fish population studies enable assessment of the pressures on stocks, the exploitable biomass, the identification of functional areas to protect to maintain and renew stocks etc. It is not always possible to conduct such robust scientific study, particularly on little known species and/or fisheries for which there is little data. The FAO has provided tools and guidelines for setting the total permissible catch based on conservative principles.

Socio-economic studies of fishing activity, including opinion surveys, enable the proposed measures to be balanced against feasible management methods appropriate to the cultural context, and to improve local buy-in to the proposed regulations. Finally, they help identify fishers who will be affected by implementing the MPA, with whom alternative measures can be addressed as a matter of priority. This research also records the baseline status of the indicators which will be monitored to assess the ecological and socio-economic benefits over time. This ecosystem approach is essential in coastal areas where contributing factors are often complex.

- **As part of the GDZCOI project** research into "local ecological knowledge, socio-ecological dynamics and their implications for marine resource management on Sainte Marie" was able to inform management strategies, with the result that they were more readily accepted by the fishers (see Chapter 3.1: Knowledge and monitoring).

Spatialising data on resources (habitats, distribution and volume of resources, nursery areas, reproduction areas) and fishing activity (type of activity, actors, fishing areas etc), on which ecosystem management is based, is crucial to decisions on fishing areas, the choice of management type, allocation of fishing rights etc. (SRFC/CEPIA).

Regular and robust monitoring is essential to adapting management. This is even more effective where baseline data is available. In addition to this basic research, regular monitoring of fishing is essential to measure long-term changes in activity within the MPA and

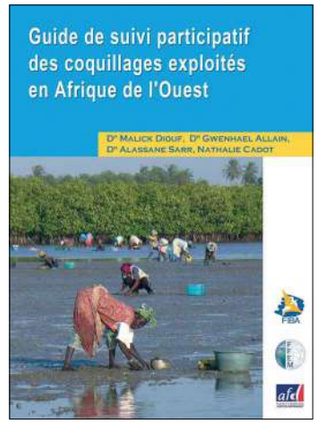
the impact of the MPA (changes in catches, economic benefits for fishers, exploitation levels of stocks). Interesting monitoring programmes have been developed by some projects (Quirimbas, Mesoamerica, SRFC, BIOCOS, MedPAN) along with the corresponding data bases. Involving local communities (citizen science [81]) in monitoring is an effective way of improving acceptance (BIOCOS, COBI etc.), but does not always guarantee long-term success (BIOCOS), unless there is ongoing support (Mesoamerica, Mexico). (see Chapter 3.1: Knowledge and monitoring)

The monitoring must be calibrated to be effective long-term. The resources required to develop this can be significant and should be quantified at the start of the project, to avoid monitoring ceasing at project end due to lack of resources, as is often the case. It is therefore necessary to calibrate this monitoring with a view to the long term, subject to the human and financial means available, and it is preferable that this be done in collaboration with local fishers and scientific organisations. Sharing the studies' results with fishers and others in the fishing industry (wholesalers, administrators etc.), while often neglected, is essential.

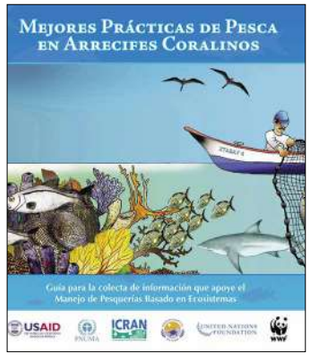
On-site development and testing of methods for monitoring and assessing the effectiveness of an MPA on fishing was one of the main goals of the CRSP/ CEPIA/BIOCOS project. Given the acknowledgement that "researchers develop universal indicators (scientific method) but these are little understood outside the scientific sphere"[82], the approach was to develop indicators that were simple and robust, yet pertinent and rigorous. These indicators had to be relevant to all involved in the fishing sector, take account of the real local conditions, be easy to learn for users and based on their representation of the environment and practices, and finally encourage long-term monitoring, at a scale appropriate to the ecological processes in play (see table below and Chapter 3.1: Knowledge and monitoring).

- **At Bamboung in Senegal:** one of the main successes of a series of projects (Narou Heuleuk, CEPIA/ AMPHORE, BIOCOS) was the ongoing monitoring of fishing resources by the IRD and the CRODT projects for almost ten years, a rare achievement. This monitoring has provided a relatively long series of data, enough to contribute to our understanding of the impact of MPAs (see understanding the reserve effect, p.3) The results have been published but resulted in few proposed changes to actual management plans (periodic opening or not, changes to the area of the MPA, management measures outside the MPA etc.)

- **At Bamboung, Urok, Niumi and Tristao, in West Africa:** the BIOCOS project set-up a joint edible shellfish monitoring programme (Arca & Solecurtus species), involving over a hundred women in total. This programme, first designed for this region, has been adopted in each country. The programme and parameters monitored allow shellfish size at sexual maturity, species recruitment time, and population density which can be used to adapt harvesting. The results were shared with communities. At the end of the project, a certain amount of monitoring was still happening in 3 MPAs (Urok, Bamboung and Niumi) but subsequent assessments showed that, without support, monitoring had been partly abandoned. Several guides were produced.[83]



- **In Mesoamerica:** ecosystem monitoring was based on the methodology of "Best fishing practices in reef environments - Guide for the gathering of information to assist in fisheries management"[84], developed by WWF and ICRAN in 2006.



- **In the Mohéli Marine Park, Comoros,** the AFD project in collaboration with the SWIOFish programme, set up a catch monitoring programme directly involving the park: 3 rangers monitored samples of the catches of 2 or 3 fishers (using the SWIOFish protocol).

The domains to be covered by monitoring (SRFC/CEPIA)

DOMAINS	BRIEF DESCRIPTION
The MPA's effect on fishing	Fishing effort, catches, employment and income
Income-generating activity development (AIGA)	Employment and income by type of activity
MPA's impact on spatial management of use	Conflicts over use (frequency and severity according to those involved)
Financial viability and autonomy of the MPA	Recurrent resources as a proportion of MPA's operating costs, and the share of own resources in the recurrent resources
Economic and social context	Relevant information that can be routinely obtained from previously existing data sources (demographic, health, living conditions etc.

81. See: The 10 principles of citizen science, published by the European Science Foundation. 82. " What are the indicators to assess the role of MPAs in fisheries management? ". P. Tous, R. Bailleux, A. Sidibé and L. Tito de Morais

Bringing back the catch, Tanzania © C. Gabrié

83. WWF Mexico/Centroamérica, 2006. Best practices for coral reef fisheries, A guide to collecting information to support ecosystem-based fisheries management., 82 pp. http://pdf.usaid.gov/pdf_docs/PNAD1184.pdf 84. General guide: rampao.org/IMG/pdf/guidesuivicoquillage_franaais_oct2013.pdf. Saloum Delta local guide: rampao.org/IMG/pdf/guide_de_suivi_bioecologique_des_coquillages_exploites_dans_les_iles_de_niodior_dionewar_falia_et_de_fadiouth.pdf

How to turn a problem into a success story?

In the Gulf of Gökova MPA (Turkey, MedPAN small projects), fishing activity is confronted by new problems following the arrival in 2008 of invasive species via the Lessepsian migration from the Red Sea, which today form part of the haul (25 to 30% of all hauls taken by the Akyaka fishery cooperative). These species are unfamiliar to consumers, demand for them is very limited and the selling price low, presenting a potential loss of income for fishers. However, these species are very edible, especially *Siganus rivulatus*. The creative idea to emerge from this project was that of holding a food festival of invasive species to introduce people to these fish: with over 400 people taking part, 120 kgs of fish was prepared by restaurateurs and distributed to the public. The results were very conclusive (see Box). In the same spirit, supported by the PPI MAR Fund, the *Belize Fisheries Department* organised a competition for the best ceviche of lionfish, an invasive but delicious species from the Caribbean.

Rabbitfish recipe Gökova, Turquie
© C. Gabrié

Some outstanding results from the Gökova project (MedPAN):

- customer demand for invasive species has grown by 400%
- the price of invasive species has increased by at least 20%
- thanks to the introduction of no-fish areas, control of illegal fishing by rangers and the commercialisation of invasive species, the per-boat income of the fishers' cooperative almost tripled between 2010 and 2015
- in response to growing demand for invasive species, more and more fishers have starting using equipment that targets these fish.

Fishers in the Mediterranean © L.-M. Préau

Developing a specific fisheries management plan

Few MPAs (Mesoamerica, Kobaby project) have a specific plan for fishing (see Box) based on science and consultation with fishers. This tool, which complements the MPA management plan, is essential to the controlling of fishing activity. Such a plan need not be implemented at once, because it will be all the easier to develop once the fishers have begun to see the benefits from other management measures.

Start with a simple agreement between fishers: a useful first step can be the adoption by fishers of a charter of good practices (Gouraya MPA in Algeria, the Strunjan Nature Reserve in Slovenia, MedPAN PPI2). Eventually, "it's a good idea to clearly spell-out MPA management regulations with other regulatory measures on access to fishing areas, and to develop legal expertise to encourage a coordinated approach across all regulatory frameworks" (SRFC).[85].

Management regulations based on traditional practices, as long as they adapted appropriately, are more easily accepted.

Several traditional management systems exist (especially in the Pacific) which are well recognised even if not currently used. These include fishing following the species' life cycle, species catch and fishing areas aligned to fishers' customs, and areas or species classified as *taboo* in Melanesia (forbidden) and as *rahui* in French Polynesia (temporary prohibition of exploitation of a resource), as well as certain forms of customary territoriality. In South Pacific MPAs (CRISP), taking into account these traditional systems in modern-day laws and management practices has facilitated acceptance by local communities.

• In Madagascar, the *dina* a traditional community law, is increasingly used in MPAs. In the Ambodivahibe MPA, part of the GDZCOI project, a *dina* regulates which fishing gear and equipments are prohibited, the location and extent of fishing reserves, protective measures for threatened species, prohibited practices, penalties and responsibilities under this *dina*. At Velondriake, a *dina* is used to manage octopus fishing.

MPAs alone are not enough to guarantee protection of a resource. To maintain a sustainable industry, management systems must be integrated and operate not only within reserves but also outside them.

Fisheries management tools

- No-take areas, especially within an MPA, or areas where fishing is restricted either temporarily, seasonally or permanently.
- Size limitation on catch and limitation by quotas.
- Regulation of fishing effort, control of access by allocating exclusive fishing rights to waterside populations.
- Prohibition or reduction of the use of destructive or insufficiently-selective techniques.
- Using structures to diversify habitats, such as artificial reefs or FADs (Fish Aggregating Devices).

85. We should also flag up, for information, the case of shared stocks (see SRFC project Appui à la Gestion de la Pêche Artisanale Transfrontalière (PARTAGE) [Support for the Management of Cross-Border Artisanal Fisheries] and, as example, the Improvement Plan for the jewfish fishery in Mauritania, March 2013).

ZONING AND CLOSURE OF FISHERIES AS TOOLS FOR FISHERIES MANAGEMENT

Proven benefits

No-fishing zones within MPAs (reserves, sanctuaries, *no take zones* etc.) have already shown their importance in resource and biodiversity conservation around the world (widely documented in international publications - see Box on page 82) and their socio-economic benefits (less well documented). No-fishing zones within an MPA are increasingly seen as a useful tool in fisheries management. These are often zones within the larger MPA area and are either subject to a ban on all activity or to one on harvesting. They can be permanent or temporary, or more rarely recurring. Research has shown the importance of increasing the number and area of these strongly protected zones, which then reinforces the effectiveness of less strongly protected adjacent zones (Zupan *et al.*, 2018).

Proper selection of no-fishing zones

To ensure the zones are beneficial effect to fishing resources, the choice of location for these is essential. In these projects, this choice will sometimes depend on scientific knowledge of the MPA (the richest zones and those of general functional interest). The choice may also often made by the local community themselves, which can help raise awareness and buy-in but will not always be very effective in restoring stocks if the location of the zone is inappropriate (sandy areas for example, as in the creation of the Mohéli MPA).

The size of the no-fishing zone must be sufficient

Research shows that the best results are obtained where the protected area is between at least around 10 to 35% of the fishing zone (Gell and Roberts,2002). Some studies suggest a range of between 15% and 25% of the total area of the MPA. These percentages however vary depending on the species to protect.

Fishing must also be managed in the area around the reserve, and within the range of its influence, to ensure the protected area is the most effective.

• **In the Mexican Gulf of California (forthcoming COBI project),** the choice was made to increase the number of very small no-take zones (NTZ). The network consists of 74 sites of average area 5.6 km² and separated on average by around 5.4 km. The planned positioning of the NTZ took into account connectivity (based on larval transport models) between existing and proposed protected sites, together with the probable effects of global warming using a scenario of a 3°C temperature rise in sea temperature. The COBI association, which will be supported by the FFEM, produced a large volume of geospatial data to support the proposed NTZs and to document the expected changes depending on the different climate change scenarios.

Positive results from the no-fishing zones at Bamboung (Senegal).

After just 3 years the effect of these can already be seen within the MPA, primarily in the composition of fish populations, the food chain (with a 3- or even 4-fold increase in predator numbers) and individual fish size (larger on average); on the other hand however, species diversity and biomass are less noticeable. No monitoring was undertaken outside the MPA. 52% of fishers felt there were more fish around the MPA ,while 79% of park staff, who are more involved, reported a positive effect. The increase in catchable biomass for fishers around the MPA is of the order of 16 tonnes per year. Current technology cannot however measure the effect of spill-over on the distribution of larvae and juveniles.

• **In Mesoamerica**, no take zones are called “Fish Stock Recovery Areas” (FSRA), a term that should help to encourage acceptance from fishers. Workshops were organised, at which were presented the economic and ecological importance and benefits of such zones. The MAR Fund supported several of these initiatives (setting up of FSRAs, legislation, monitoring and/or control, surveillance).

• **In Madagascar** (Sainte Luce), management by the villages of the lobster fishery was initiated with the support of the GDZCOI project in collaboration with buyers, local authorities and the fisheries management authorities. This takes into account the lobster breeding season, the size of the lobster and the needs of communities during agricultural shortages.[86]. Following positive results from three years of voluntary closures, the pilot site was progressively extended at the request of two neighbouring villages.

Protection of areas vital to fish resources

The importance of protecting those habitats essential to the life cycle of commercial species, such as clusters of spawning grounds, nurseries and migration routes, in order to minimise juvenile mortality, is now largely recognised. That should result in projects beginning to identify as soon as possible - and to protect - those habitats vital to the life cycles of the most important species in the area, especially those of commercial importance. These protections may be temporary (for example, during the recruitment period).

• **On the Mesoamerican reef**, from Honduras to Mexico - the length of the Caribbean coast, so virtually all of the grouper spawning sites - the MAR Fish project will contribute to the better understanding and protection of these by supporting an observation network of monitoring locations.

Zoning employed by some MPA fishers on the Senegalese coast

In Senegal, a number of MPAs were created at fishers' request on the long, sandy coastlines, where a very simple zoning system prohibits any fishing within one nautical mile of the MPA, line fishing only between 1 and 5 nautical miles, with normal fishing regulations applying beyond that. This very practical system offers rapid implementation and zoning that is easy to understand and monitor.

Fishers, Tristan da Cunha MPA, Maritime Guinea © T. Clément

86. The period when stocks are largely exhausted and the new harvests not yet ready

TEMPORARY CLOSURES: A REAL SUCCESS STORY FOR REBUILDING STOCKS OF SOME SPECIES

Octopus fishing in the Comoros © J. Wickel

> Spatio-temporal restrictions (STRs), ad hoc and seasonal (being established to protect recruitment) are effective for fishing if they are correctly placed (appropriate location and opening/closure dates). However, they are doomed to fail long-term if fishing capacity is not controlled/effectively limited.
> ***SRFC/CEPIA State of the art report***

Octopus fishing in Madagascar: largely transferred success

For octopus, first tried in South West Madagascar in 2004 by the Blue Ventures NGO, the temporary closure model for fisheries has been a success (see Box). This system, recognised as scalable good practice as part of the GDZCOI project, has been widely adopted throughout the Indian Ocean and was promoted on projects supported by the FFEM and the AFD in Rodrigues and Mohéli. Monitoring of the octopus catch (number and weight) in Madagascar showed an 8-fold increase from zones closed for the breeding season, compared with other zones.

Community reserve management

Temporary reserve closures and the imposition of sanctions for breaking the agreed rules, codified in the *dina* , led to a significant increase in catch after re-opening of the reserves, an increase in fishers' income, and a reduction in the social and economic vulnerability of local communities. During closure periods, alternative economic activities such as livestock rearing and small local industries were developed to improve and diversify community sources of income (experience drawn from Conservation International in Madagascar, and identified as a good practice to diffuse as part of the GDZCOI project).

Octopus reserves in Madagascar

The system imposes temporary closure of part of the octopus gathering sites on the reefs that are accessible on foot. Up to a quarter of the community's fishing area can be closed over some three months. As a result of this system, significant increases in the size of the octopuses and in the fishers' income have been recorded after reopening of the closed zones to fishing. Management of these zones is collaborative, the rules (opening and closing, monitoring, fines etc.) are decided at village meetings, then codified in the *dina* (A local law specific to Madagascar).

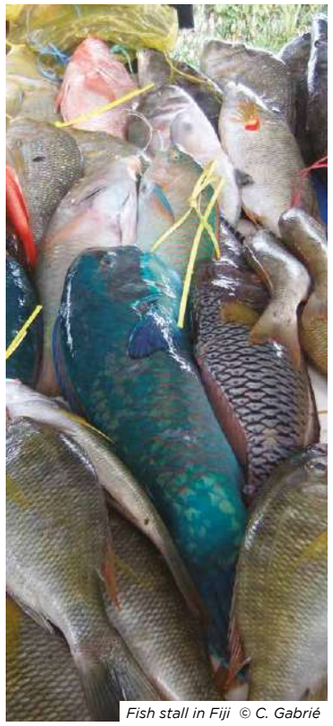
No-fishing zones in the Gökova MPA, Turkey © C. Gabrié

The integrated management zones in Mexico (COBI project) are an innovative approach to the management and restoration of bivalve species. It consists of designating an ocean area which users divide into three zones: 1) no take, 2) harvest, and 3) culture.

EXCLUSIVE ACCESS RIGHTS TO RESOURCES OR FISHING ZONES TO COMBAT POACHING

Recognised as important in reducing the damaging effect of uncontrolled access to communal fisheries, exclusive rights to marine zones are being increasingly used, often based on existing traditional territories (examples in the South Pacific and West Africa). This entails having a system to record fishers and to register the fishing boats. While implementing exclusive access can be a good solution for limiting pressure on an MPA and for managing conflicts, it is important to properly study the limit of these rights and to include everyone who has traditionally worked the zone, or alternatively grant them fishing rights in other areas. In fact, the support of a local community for an MPA is often linked to their interest in excluding others. In the case of at least two projects, the perimeter of the MPA excluded significant fishing communities who had habitually fished in the area (neighbouring communities or migrant/nomadic fishers), with no alternative solutions being proposed. The situation of these migrant fishers must be taken into consideration by management, in order to avoid their becoming poachers.

- In the Urok conservation area, no commercial take is allowed; fish and shellfish may be taken only as food for residents' consumption, or for ceremonial purposes. Fishing must be done on foot or from canoes propelled by paddle or sail.
- In the Arguin National Park, only the Imraguen people are permitted to fish.
- In the Quirimbas Islands, only park residents are allowed to fish. Migrant and nomadic fishers need to obtain an authorisation in order to be permitted to fish. The management plan states that the total number of migrant fishers within the park is contingent, and may be varied, dependent on the evolution of the fish stocks. Authorisations to fish are granted by fishing committees.



Fish stall in Fiji © C. Gabrié

SETTING PARK MANAGEMENT OBJECTIVES TO PRESERVE ECOSYSTEM INTEGRITY

The latest research on the reefs in Quirimbas National Park (PNQ, McClanahan et al., 2015) shows that a third of the Park's reefs have a level of exploitable biomass below the level recommended to maintain proper functioning of the ecosystem (see Box). The recommendation is then to set management objectives based on a target of 500kg/hectare of exploitable biomass. This requires better regulation of fishing, including restricting the use of destructive techniques, better implementation of the regulations intended to limit entry to the MPA to those with authorisation, restricting migrant fishers' access, management of fishing gear by such means as encouraging the use of modified traps which reduce by-catch and improve catch quality, enforcement of areas of no take etc.

Previous research in the Western Indian Ocean (WIO) region has shown the relationship between the reef fish biomass-based maximum multispecies sustainable yield (BMMSY) and the risks of reef ecosystem degradation (in McClanahan et al., 2015): below 300 kg/ha, the risk of reef ecosystem degradation is high; between 300 and 600 kg/ha the risks are reduced and the ecosystem maintains some resilience, while a BMMSY above 600 kg/ha ensures good maintenance of ecological integrity and potential resilience to climate change.

Crab growing cages. Mnazi Bay, Tanzania © C. Gabrié

SUPPORTING THE DEVELOPMENT OF MORE SUSTAINABLE FISHING METHODS AND ACTIVITIES

GDZCOI good practice; Sometimes simple approaches can make a big difference to fishery sustainability. In Madagascar, where mangrove crabs play an important role in the food security of coastal populations, a good practice developed by Blue Ventures was introduced within the framework of the GDZCOI project: the use of the crab scale, otherwise known as the lombo, belaroa or garigary, a technique almost unknown in Madagascar fishing. The crab scale has already proven effective, improving crab selectivity and reducing post-catch losses in the crab industry *Scylla serrata*.

© Blue Ventures

BAD PRACTICES

In some regions fishing is still performed using methods dangerous to fishers and damaging to the environment

- Compressor diving
- Fishing with explosives
- Seine nets
- Nets of too small a mesh, and monofilaments
- Poison

SOLUTIONS ADOPTED

Some projects not only introduced bans on unsuitable gear, but also offered other tools and methods in exchange

- Large mesh nets (Tanzania)
- Fish Aggregating Devices FAD (Sainte-Luce (Caribbean), Cayos Cochinos (Honduras))
- Artificial reefs (Cayos Cochinos (Honduras), Senegal)
- Distribution of fishing gear (Strunjan Nature Reserve (Slovenia) under a MedPAN PPI)
- Distribution of encircling nets (Mananara (Madagascar))

These projects aim to limit the impact of physical destruction and of the taking of juveniles as well as allowing coastal fishers to access to less exploited fisheries (pelagic species such as tuna) by moving the fishing activity away from the coast (and overfished reef areas) towards the open sea. They also work to improve fishers' safety (COBI, Mexico, SMMA)

It can take some time for new techniques to be accepted and converting to these techniques requires - as well as fisher education - several preliminary phases:

- provision of boats suitable for the open sea, which requires significant financing (projects in Tanzania and SMMA)
- prior consideration of management structures and financing for gear and equipments provided during the project (micro-credits in Sainte-Luce) and after its completion (co-management of FADs was proposed by the SRFC on Cape Verde)
- in some cases, evaluation of fish stocks;
- evaluation of the new methods to ensure their success, or identify issues.

Lessons learned from the adoption of FADs on Sainte-Luce (SMMA) are transferable to other projects and other fishing methods. These include:

- the importance of taking the time to develop technical solutions in consultation with the fishers, involving them from the outset in selections (of gear, FAD type, deployment sites) and in delivery (involvement in setting-up, choice of sites, positioning);
- the importance of fishers taking "personal ownership" of FADs or artificial reefs, to obtain buy-in and avoid conflict (one FAD per fishing community or per village) and to impose access regulations on other fishers;
- the importance of signing agreements with the fishers who have received, or will receive, the new gear.

Among recent, and substantial, developments has been West African fishers' growing awareness of the destructive effect of nylon nets (termed monofilaments) which continue to entrap fish for many years after they are abandoned on the ocean floor. While banned for decades by every country in the region, it was only once the fishers themselves understood the harmful effects that nylon nets have begun to be eliminated. Pilot MPAs, such as Kayar in Senegal, took the first step. Today, many fishing communities in the sub-region are considering following this example - a significant step forward in which this MPA played a key role. The Mangroves Project in Senegal is drawing on that experience in its efforts to rid MPAs of monofilaments, although their removal from all of the fishing zones remains too complex to currently achieve due to a social factors.

How do MPAs benefit the fishers themselves?

The SRFC/CEPIA state of the art report states that the socio-economic effects of MPAs on fishing are more difficult to measure, most potential benefits occurring outside the protected area (little studied). The lack of information, including baseline and other data on the effect of larval dispersal on recruitment etc makes evaluating these benefits difficult. Except for a few small atolls, most studies show that spillover effects are rarely enough to compensate for catch losses resulting directly from the closure of fishing areas. This justifies the effort put into providing compensation measures. Projects supported by the FFEM confirm this.

On several projects however (Quirimbas, SMMA etc.) some fishers have very quickly gained the impression - whether reflecting reality or not - that catches had improved around the protected zones. Surveys indicate that the more people are involved in the setting-up and management of an MPA, the greater their perception of its positive effects. However, surveys in the Bamboung, Quirimbas, SMMA and some CRISP-funded Pacific MPAs revealed contrasting perceptions. For example, in Bamboung, Senegal, 60% of fishers thought that the MPA had no effect, while in Sainte-Luce 55% of those asked judged that the MPA helped increase marine resources.

Aquaculture in the Ankivonjy MPA, Madagascar © T. Clément

User testimony

Mar Mbaye,
Fishers' President and President of the Kayar MPA in Senegal

Fishers are the most active people in any MPA and, if they are involved, they then become the guarantors that the rules decided upon are followed. Here in the Kayar, we actively participated in the creation of the MPA ,and then took over its presidency. We set strict rules, in particular a total ban on nylon monofilament nets - unfortunately the only such ban in West Africa - and we apply this rule, together with all the other rules in the fishing code. This is the only way in which we can leave our children a permanently sustainable resource.

In the Quirimbas, the final project assessment showed that the improvement in local socio-economic conditions resulting from conservation of the PNQ's natural resources was seen as encouraging by most involved, although the improvement was relatively limited and not always tangible. There thus seems to be a consensus between those directly involved, and most fishers, on the positive effects of the PNQ with regard to fishing resources.

Alternative activities for fishers: added value fish products

Compensation for a fishing ban is often via the implementation of tailored alternatives such as new gear or - more rarely - cash compensation, or by the creation of revenue. These alternatives must be carefully weighed and adapted if they are to ensure the desired results. Such compensations must not lead to the transfer of fishing pressure onto sensitive areas, and alternative income generating activities (AIGA) must been tailored to the situation. A number of the AIGA set up for fishers by various projects did not succeed (see Chapter 3.3.2 on tourism and 3.3.3 on other industries below). It is recommended that projects focus on adding value to fishing and other products already exploited in the MPA and the surrounding area (for example, oysters at Bamboung and in the Quirimbas, smoking of fish in Madagascar, and poutargue (salted dried fish eggs) in the Banc d'Arguin etc.).

Supporting communities to develop industries: good practice aquaculture, as showcased within the GDZCOI project

In collaboration with the Institute of Marine Science, University of Toliara, the local ocean product exporter Copefrito and the aquaculture business Indian Ocean Trepang (IOT), Blue Ventures is connecting remote coastal communities to the international algae and sea cucumber markets so that they can develop their own aquaculture businesses. Aquaculture specialists trained more than 700 people in the production of sea cucumber (*Holothuria scabra*) and red algae (*Kappaphycus alvarezii*).

SURVEILLANCE IS EVERYONE'S JOB: PUTTING IN PLACE STRATEGIC ALLIANCES AND CERTIFICATION GUARANTEE EFFECTIVENESS

Surveillance is critical to ensuring fishing methods and zone closures are effectively controlled, and must be made permanent (see Chapter 3.2: Creation and management of MPAs).

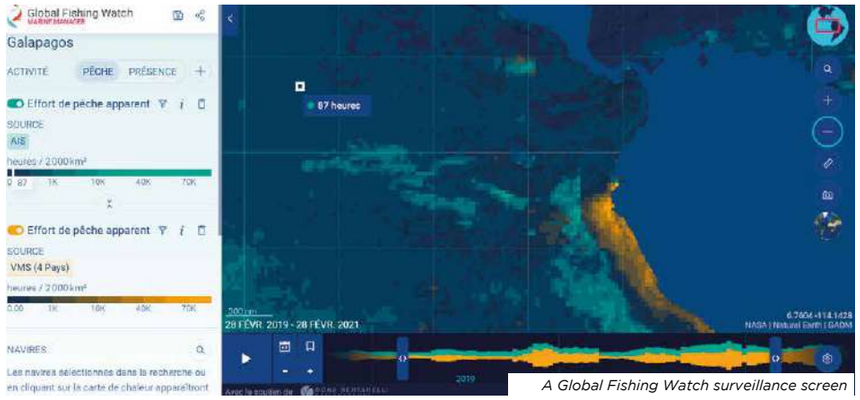
Strategic alliances for the protection and surveillance of remote MPAs and combating illegal fishing

In the industrial fishing sector the setting-up of management rules and the surveillance of compliance are even more difficult than for artisanal fishing, and only two FFEM projects have tackled this.

- The Mesoamerican project in the lobster fishing sector, and the Cocos Island project in Costa Rica in semi-industrial longline fishing. The creation of strategic alliances between the various parties (administrators, fishers' committees, surveillance providers and consumers) is one of the effective approaches used by these projects to encourage all parties to play their part in protection efforts and commit to good practice rules. Alliances with the industrial sector can take a long time to achieve, as the sector is firstly hesitant to report results, and secondly may be less than keen to impose such constraints on its activities.

In the same spirit, based on a standardised protocol the PACIFICO project is developing control and surveillance tools for IUU (illegal, unreported and unregulated) fishing in the 5 main MPAs in the project area, using sophisticated techniques in partnership with the International Monitoring, Control and Surveillance Network (*IMCS Network*), *Global Fishing Watch* and/or other suitable platforms such as *Skylight* (by Vulcan), OceanMind or CLS. These groups use satellite data, artificial intelligence and data processing software to provide useful and targeted information specific to the fight against IUU fishing.

- At Mohéli, in collaboration with the fisheries training school at Anjouan, FADs were introduced and fishers trained in the new sustainable fishing techniques made possible by FADs (dragnets). These improve access to pelagic resources, in particular bonito which today is an important part of the catch.



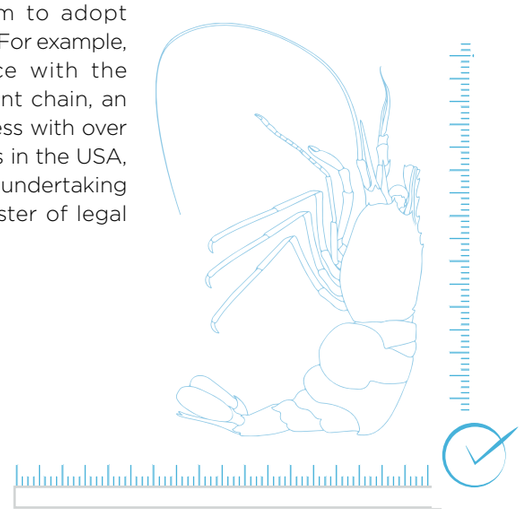
A Global Fishing Watch surveillance screen

Eco-certification of fisheries entails the meeting of stringent conditions, and feasibility should be considered before assembling the project.

It often takes a long time, and where the required conditions are not all in place (knowledge of the resources, existing links with fishers, applications for support) eco-certification is difficult to achieve within the time frame of these projects. The guidelines most often used for an application are those published by the *Marine Stewardship Council*[87].

Encouraging consumers at all levels, international or local, to buy products of a size and catch method that respect environmental and legal circumstances is also an effective strategy that puts pressure on all fishers - whether artisanal or industrial-scale - to adopt responsible fishing methods.

- In Mesoamerica, alliances formed with local restaurants encourage them to adopt better practices. For example, such an alliance with the Darden restaurant chain, an American business with over 1,700 restaurants in the USA, resulted in their undertaking to buy only lobster of legal size.
- Projects in Turkey and Honduras are working with restaurants to encourage them to buy only product that has been caught sustainably; in these instances fish for Turkey, and lobsters for Honduras



Fishing and Covid: Information from COBI

The project identification note for the COBI NGO project in Mexico is the only one to date which has provided useful information on the impact of Covid-19 on small coastal communities. Based on regular consultation with fishing communities at national scale, the report mentions in particular the following:

1. **Reduced fishing activity:** with the closure of international markets, 48% of interviewees had given up fishing temporarily, 41% had continued fishing but at a level 30-80% lower, while 11% fished only for their own consumption, etc. Prices have fallen by 30-60%.
2. **Action in response:** 52% have taken measures to adapt (for example through changing product presentation, selling door-to-door) while 48% did not know what action they should take. Adapting depends more on the ability to organise than on innovation.
3. **Gender:** 50% of men and 39% of women have some sort of healthcare provision. In 73% of households, the principal earner had changed and 45% of women are engaged in an alternative economic activity.

87. msc.org

2 TOURISM WITHIN AND AROUND MPAS: A DELICATE BALANCE OF RISKS AND BENEFITS

Tourism is often considered to be one of the most obvious ways of financing and developing MPAs, and is frequently put forward as a means of generating income. While tourism can be a key activity for some MPAs, provided that the region itself is attractive to tourists, for other MPAs it is often a poor fit - for example, for security/safety reasons - and is rarely sufficient to generate the revenues needed to provide financial autonomy for the MPA.

In fact, tourism can be a double-edged sword; positive in that it can drive local development, bring financing into the MPA, assist in landscape conservation, and help raise tourist awareness, but can also be negative because of pressure on resources, pollution, and cultural impact, especially on indigenous communities. Tourism can only then be developed in an MPA after first assessing its impacts, then implementing any necessary corrective measures to counter the adverse effects (see also Chapter 3.4 Ecosystem Resilience).

Numerous environmental problems are rooted in tourism. These are particularly associated with the "blending-in" of hotels to their surroundings and resulting loss of distinctive landscapes, with land use, and with property development pressures, with an additional risk being that the MPA itself will increase coastal land value, and so property speculation with all its negative impacts. They are also associated with the artificialisation of the coastline, with environmental damage during infrastructure building (deforestation, erosion and sedimentation) and during tourism operations (water management, waste) along with its associated activities (coral damage from walking or diving on the reef, collecting plants and creatures, uncontrolled water activities etc.). Tourism greatly increases consumption of drinking water, in areas where this is often a very limited resource. It also considerably increases the quantity of used water and other wastes, and the consumption of natural resources and energy (according to a study by the Accor group, on average a main residence in France consumes 190 kWh per person, while a guest in an international hotel consumes twice that amount - 380 kWh). Global issues are also important - particularly the environmental costs of air transport, and social problems such as drug abuse, alcohol consumption, prostitution, loss of respect for the elderly etc.).

Furthermore, the fragility of the industry has been demonstrated by the terrorist attacks in the Quirimbas, or by the COVID pandemic which emptied all visitors from the tourist sites in northern Madagascar's Kobaby MPAs and many others.

Tourist accommodation. Ankarea, Madagascar © T. Clément

MPA TOURISM COVERS A WIDE RANGE OF CONTEXTS AND OBJECTIVES

The circumstances of MPAs vary enormously, from those in Thailand, Moorea, the Caribbean etc. which receive over 100,000 tourists a year, to those receiving a few thousand, such as the Quirimbas, Cocos Island, Orango, Bamboung, Mnazi and the Mesoamerican MPAs, down to those receiving very few indeed, such as the Mohéli MPA in the Comoros.

Tourism takes several forms:

Luxury and high-end tourism *(Moorea, Seychelles, some sites in the Caribbean)*	Few tourists, moderate use of natural resources so mitigated environmental impacts, but often employing few locals due to lack of skills, so little economic benefit flows to the local community with most profit leaving the area.
Mid-range and budget tourism *(Thailand, most of the Caribbean, cruise destinations in the Mediterranean, CETP)*	Positive socio-economic impact in terms of employment, but not in terms of social well-being (eg. prostitution); often financially beneficial for the MPA because this generates most tax-related financing, but has severe environmental impact which brings into question the MPA's conservation role.
Responsible, socially inclusive or community eco- tourism *(Guludo and Quirimbas, in Mozambique, Bamboung in Senegal, Ankarea in Madagascar, Mesoamerica)*	Direct and long-term employment (not just for hotel construction), in most cases less environmental impact, flow-down benefits to neighbouring communities, and indirect benefits (from associated development projects).
Scientific tourism *(Mesoamerica, Madagascar, Curieuse Island in the Seychelles)*	Minimal impact with evident benefit in terms of support for the MPA, in particular in the financing and undertaking of environmental work.

The SAMPAN project in Thailand is the only example in the FFEM's project portfolio. This project is aimed almost exclusively at developing sustainable tourism , in a country with large-scale tourism, developing novel activities (dedicated funds, accreditations, awareness-raising) in the context of post-tsumani recovery.

Luxury hotel. Moorea, French Polynesia © C. Gabrié

Different objectives for different projects

Some projects have a direct role in encouraging tourism development (sustainable as far as possible) with management organisations the main driver: SAMPAN (direct financial support for operators) and Quirimbas (creation of a "favourable environment for investment and promotion of the park"). The manager may even have a direct role as an operator themselves, such as Bamboung or Cayos Cochinos[88].

Others support tourism developers in order to anticipate and reduce the risks and impacts for the environment by helping with impact studies, developing good practice (whale watching charter in Madagascar), providing information and awareness-raising for tourists (Fijian MPA), capacity studies, or conflict resolution between those involved, most often between fishing and tourism (SMMA)[89].

OUR APPROACH

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For many FFEM projects in areas with medium-to-high tourism potential, such as SAMPAN, BIOCOS, SMMA, RESCCUE, MedPAN, Mesoamerica, CRISP, Hahafi/Kobaby, Quirimbas I and II etc., tourism development is expected - often over the longer term - to cover part of the operating cost of the MPA and generate flow-on benefits for the local community. Many of these attempts however have an uncertain future. For example, the final review of the MedPAN IMCAM project noted that few initiatives seemed to be viable because they were income-earning projects managed by a local NGO or by a group or cooperative lacking the skills to handle these economic activities. More promising are those projects having their own investment and more sustainable business models (home stays, nature walks etc.). Without long-term, micro-business type support, however, these initiatives remain very dependent on external funding, at least for marketing. Few private initiatives are supported by the projects or by long-term national agencies (tourism), limiting their development. The local private sector is usually badly lacking in resources, so necessitating specific support targeted at this type of operator. A call for proposals in this sector has however seen some good results (MedPAN small projects, Kobaby fund).

88. cayoscochinos.hn/index.php/investigacion/turismo-educativo 89. facebook.com/SMMAInc

A LACK OF PLANNING AND MONITORING

© C. Bourbeillon

While tourism development is often touted as of great importance, few projects develop the knowledge and monitoring bases necessary for its development:

- **Few MPAs have produced a tourism development plan**, although the Quirimbas and Mnazi Bay are exceptions with plans identifying the sites, activities, tourist capacity, regulations, potential tax revenue etc. together with a business plan. That's also the case in the Mediterranean, in the TAZA National Park in Algeria, where the road map for sustainable tourism for the coastal part of the Park was approved by the three municipalities of the Park, and similarly the Kas-Kekova MPA in Turkey where the sustainable tourism management plan was produced through a participatory process and integrated into the management plan. Tourist capacity (assessment of visitor numbers that the site can support) is only very rarely assessed (although work is being done on the capacity of the diving sites on Cocos Island).
- **Studies on the impact of tourism, and monitoring of visitor numbers, are very rare:** the Cocos Island project developed a marine tourism monitoring plan, the SMMA project studied some impacts (diving), some tourism impact studies were undertaken in the Quirimbas, whereas some Mediterranean MPAs do monitor visitor numbers.

However, many types of impact need to be managed (for diving for example these include removal or disturbance of species, damage to coral from being walked upon etc.), which directly affect the MPA's conservation role.[90]

COMMUNITY TOURISM WITHOUT ADEQUATE SUPPORT

Community tourism experience from projects, even if these are only partially successful, provides a number of learning points. At smaller scales, communities must be well trained and supported to attain the necessary levels of service, language skills etc. which may take many years. Where a project aims to develop this type of tourism, it must expect to be reliant on specialist support in order to be able to work across the industry, reaching out to tour operators and local tourism ministry networks. Small projects do not have the means to market internationally, and some MPAs have experienced total or partial failure and been left with abandoned or deteriorating community tourism camping-style accommodation (Bamboung and the Casamance MPA in Senegal, Orango in Guinea-Bissau, Mohéli in the Comoros etc.). It is also necessary to source separate funds for financing the infrastructure and support. This for example is the case in Madagascar, where the PIC project, financed by the World Bank jointly with the Kobaby project, has a dedicated element to finance construction support. This enables the effects of the Kobaby project to be extended without using its own resources. **#ACTORS**

90. facebook.com/SMMAInc

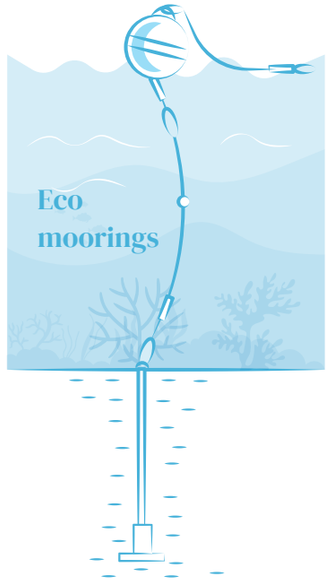
GOOD PRACTICES AT ALL LEVELS NEED TO BE DEVELOPED AND SHARED

Good practices needs to be developed at all levels of the tourism industry: in relationships with local communities, in the choice of tourist sites, and in the management of construction, in which local materials and labour and non-polluting techniques must be prioritised. The same is true in the operational phase (control of water consumption, waste management etc.) and in the matter of tourist activities themselves (water sports, diving, wildlife watching etc.) to minimise negative impacts on the environment. The development of some activities must be done very carefully - for example recreational and sport fishing, both activities which often place extra pressure on local fisheries.

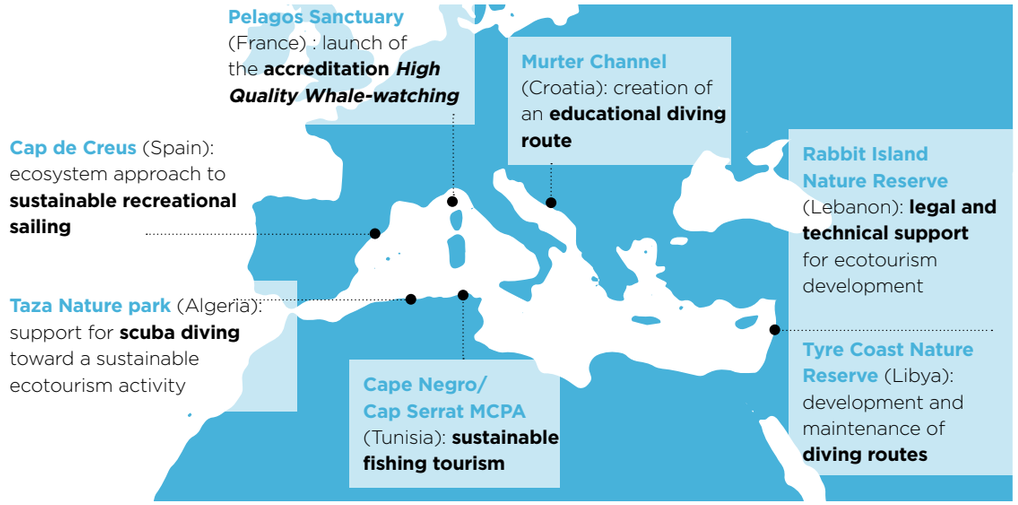
Good practice guides for certain activities have been produced by some projects: Cocos Island, Mesoamerica, CRISP Programme and RESCCUE in the Pacific. Innovative approaches also should be highlighted - for example, some Fiji hotels have developed the concept of offering tourists opportunities to assist, physically or financially, with environmental restoration; or again the *Guludo Beach Lodge*, in the Quirimbas, which produced a guide for hoteliers for the responsible buying of sea food; or the sustainable tourism charter created at Nosy Be in Madagascar. Even though much remains to be done, these initiatives are showing the way.

GDZCOI Good practice: eco-moorings *(Seychelles National Parks Authority)*

Every year, the use of anchors to moor commercial and recreational vessels costs millions of dollars in damage to the sea floor around the world. Now however anchorages are increasingly providing eco-moorings which vessels mooring within the zone - both fishing vessels and tourist boats - can (or must) use. The use of the same buoys by one or other can be managed according to the time of day, or by having different buoys for each use. These moorings can be a source of income for the MPA (many MPAs worldwide charge by the night for mooring). This does imply however that managers must maintain these moorings perfectly, because the reluctance of users to utilise these often stems from the risk incurred should they fail.



MedPAN small projects - examples of eco-tourism[91]



Under the MedPAN small projects framework, Cap Boating introduced a sustainable ecosystem approach for recreational boating in the Cap de Creus Natural Park. Éco-union published the report "Managing the environmental sustainability of nautical tourism in Mediterranean Marine Protected Areas".

The sustainable fishing tourism industry (*pesca tourismo*) is very well established in the Mediterranean, as is whale watching at Sainte-Marie in Madagascar and other islands in the Indian Ocean. Several projects are trying to establish options where tourists can join fishers on their boats but often encounter issues with safety while at sea.

The PACIFICO Project aims to establish pilot blue economy initiatives, such as at Uvita in Costa Rica where a fishing village has been transformed into a whale-watching tourist destination, and at Bahia Santa Elena, also in Costa Rica where *Costa Rica Por Siempre* offers homestay accommodation to tourists.

Countering bad practice

An example of good practice in recreational fishing is the small MedPAN project at Cap de Creus in Spain. The project developed a code of good practice which identifies vulnerable species (recommending a catch limit of 1 fish from these species per trip per fisher), reminds the reader of the damage caused by fishing gear and provides alternatives to lead sinkers (such as stone, steel and lead-free alloys). It also provides information about the risks related to using exotic baits etc. As part of the MAR Fish project, the University of Murcia studied the biological, ecological and socio-economic impacts of recreational fishing.

Kas-Kekova (Turkey, IMCAM)

The launch of the accreditation *"Nature Friendly Tourism Accreditation"* by the Kas tourism promotion association, in collaboration with WWF, led to 67 businesses immediately electing to join the scheme for the adoption of environmentally friendly good practice.

91. MedPAN_Rapport_Capitalisation_APP_2017_FR_web.pdf

RAISING THE AWARENESS OF TOURISTS AND OPERATORS IS ESSENTIAL

There are numerous examples of tourist-facing awareness raising in MPAs financed by the FFEM, such as the SAMPAN project, the Cocos Island and SMMA projects, Fijian hotels (brochures, videos, underwater guides, diving routes etc.), the MedPAN MPA network, and so on. These are a valuable contribution to raising of awareness.

When it comes to raising awareness amongst tourism operators, most efforts have made in Thailand as part of the SAMPAN project (of which this aspect forms one of the main objectives), in the Quirimbas, and under the CRISP programmes (Fiji, Vanuatu, Soloman Islands), for example through partnering reef restoration sites with hotels.[92].

At Pangatalan in the Philippines, various tools have been deployed for educating children (but that work equally well for adults!), including for example an observation platform on stilts above the reef, and digital modelling that offers virtual reality tours of the reef using special glasses (and the Andromède Océanologie app to display photogrammetric visualisations). [93].

Many of the tools created by these projects would be easily transferable between MPAs, but are often forgotten at the end of a project so have to be reinvented in later ones. These tools need to be centrally accessible so that they can be shared.

ENCOURAGING THE PARTICIPATION OF TOURISM OPERATORS

Community involvement in luxury tourism at Guludo, Quirimbas © C. Gabrié

The Princesse Bora Lodge & Spa at Sainte-Marie in Madagascar, committed to whale conservation, is a good example of this. As well as the whale-watching commitment, the hotel has also purchased and restored a 9 hectare watershed of degraded and highly eroded terrain in order to create an ecological education garden, at Ankarena, intended to raise awareness of agro-environmental good practice and reforestation. Since then 1,800 trees of 30 different species have been re-planted. Plants from the nursery have been distributed to the island's population for community reforestation campaigns.

Hotel eco-certification was planned in the CRISP and RESCCUE programmes, but failed to take off. The SAMPAN project did however introduce this successfully. That experience would be worth building upon in future projects.

92. Fiji: reefresilience.org/case-studies/fiji-ecological-restoration 93. sulubaai-foundation.com/fr/accueil

CONCEIVING AND IMPLEMENTING APPROPRIATE TRAINING FOR THOSE INVOLVED IN THE TOURIST INDUSTRY

Tourism development has only recently begun in some of our projects' countries, meaning there is a significant need for training. The role of these project in this building of workforce capability remains to be defined and partnerships are a very useful solution (supported by existing training institutions, links with any regional hospitality schools where these exist etc.). Higher-qualified roles such as those of guides, boat operators etc. also require training, and often "homologation", such as for the Kobaby project in Madagascar and some in the Caribbean.

Tourism offers an excellent opportunity to create outlets for local products, as long as there is rigorous control of quality and professional support for local operators to provide products which meet expectations and the required standards (crafts, food products in the Saloum MPAs in Senegal, oyster sauce in the Quirimbas, market garden produce sold to hotels in the Kobaby project in Madagascar, etc.). There is wide scope to establish many such income-earning, short-supply-chain activities as long as they are supported by good training so that market standards can be met and as long as they do not result in over-exploitation of resources.

Diving tourism in the Seychelles © T. Clément

MANAGING AND CO-MANAGING FOR THE LONG TERM THE KEY ROLE OF TOURISM PROFESSIONALS

Serious thought needs to be given to the place of MPA managers in tourism. It could in fact be asked whether the MPA manager's role is really to develop tourism, as in Bamboung. It seems preferable to rely on tourism professionals from the outset (SAMPAN, SMMA, Tobago Cays and Quirimbas projects). The Bamboung example in effect showed that, even if some tourism initiatives may be initiated by MPA managers, it may be very difficult for them to succeed in the long term. The baton really then needs to be passed on to tourism professionals, both to "sell the product" to operators in international and specialised markets, and to manage the activity.

The approach taken in the Quirimbas of establishing a relationship framework between communities and operators that is formalised in the management plan, will be retained for future projects. This entails the signing of contracts between the operators and local communities concerned, detailing the conditions for funding access, management rules, distribution of incomes etc.

For MPA projects supported by the FFEM, revenues generated by tourism fall into two main types:

- **MPA Admission fees**, from which income is highly variable (see examples below);
- **Concession fees and taxes on activities** such as moorings, diving, recreational boating, snorkelling and marriage ceremonies, fees and taxes for which are common in the Caribbean, in the Quirimbas, at Mnazi Bay etc.[94]

Entry fees to MPAs funded by the FFEM in 2021

	ENTRY FEE	NUMBER OF TOURISTS/YEAR
Cayos Cochinos	USD 10	approx. 200
SMMA	USD 1 + tax on activities	No recent data but around 500,000
Bamboung	Free	< 1,000
Tobago Cays	Free but tax on activities	No recent data but around 150,000
Moorea	Free	Open access site
Cocos Island	USD 25	approx. 3,000
Mnazi Bay	USD 23.60	approx. 1,000
Quirimbas	USD 12	3,300
Thailand	USD 4	265,000 max. per park

94. See Tobago Cays for an example: tobagocays.org/regulations-fees

Fair distribution of tourism revenue must be planned for in projects and the resulting benefits monitored as far as possible. Tax revenue must benefit local communities to the same extent as it provides a source of funding for MPAs. Several FFEM projects expect to generate benefits for the populations, such as at Cayos Cochinos where tax income finances community projects, or in the Quirimbas where 20% of tourism tax income goes back into community funds and 30% of community tourism income is also put back into one of these funds. However, governance of this type of fund can lead to tensions and the probity of managers must be irreproachable.

Scientific tourism, which welcomes scientists who pay for their stay coming to conduct research in the MPA, is at an early stage of development for projects (Cayos Cochinos in Honduras, Andavadoaka in Madagascar, Curieuse Island in the Seychelles). It is worthwhile both in terms of income and in supplementing the number of scientists available to conduct research and monitoring. It does however require some investment, the level of which depends on the type of research and the level of the researchers involved. For example, the Cayos Cochinos project set up a research station in partnership with American universities. *Blue Ventures* have done the same in Madagascar, although facilities there are more modest. It is undoubtedly an interesting opportunity for MPAs which projects should consider.

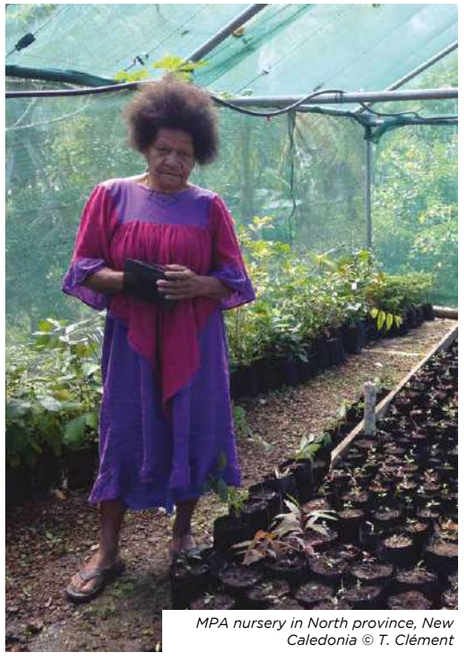
Good practice (GDZCOI)

Supporting community management of marine zones (Madagascar, Conservation International). These community-managed zones were set up as part of partnerships with international research centres. This takes the form of University research centres making payments for environmental services, helping to finance specific zones where they conduct research to the benefit of local populations.

3 MPAS AND OTHER ECONOMIC DEVELOPMENT SECTORS: BOOSTING AND BUILDING EXISTING ACTIVITIES

The prohibition of certain activities, zones or practices that cause environmental degradation and/or put pressure on resources can result in loss of income for all or part of a population, at least in the short term. Projects are therefore committed to developing income-generating economic activities, with varied and often complementary aims.

- **Sustainable development: reducing pressures on natural resources by encouraging communities to move towards new, sustainable activities.**
- **Compensation for losses: providing communities negatively-impacted by the MPA with alternatives to those previous activities that are now banned or restricted, in the form of alternative income-generating activities (AIGAs).**
- **Improving the living conditions of communities affected, increasing acceptance of the MPA.**



MPA nursery in North province, New Caledonia © T. Clément

Disappointingly, the 2010 edition of this report (Marine Protected Areas[95]) revealed that small-scale AIGAs rarely satisfy needs and often find themselves discontinued at the end of the project, for a number of reasons:

- The activities do not always meet the expectations of the communities.
- The industries set-up rarely have a solid footing based on market agreements (e.g. Narou Heuleuk project, Hafafi, OPAAL).
- The communities do not receive sufficient support with these new activities.
- Most of the projects are run by specialists in conservation, not development. This finding is corroborated by those from the evaluation of AFD protected areas (see quote).

95. Capitalising on experience gained in projects co-funded by the FFEM

Evaluation of the AFD "Protected Area" conservation and development intervention contributions (2000-2017)[96]:

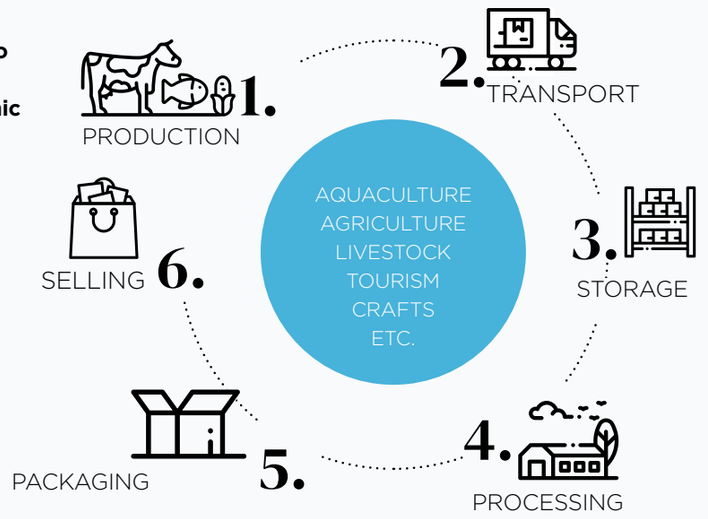
The results in the socio-economic development of populations generally fall short of expectations for a number of reasons: a marginal number of supported beneficiaries; poor means compared to the size of the populations concerned and target areas; low direct involvement of the communities in the selection of activities; weak or inappropriate technical assistance; limits in the functionality of infrastructure implemented; unsuitability of the studies or assessments carried out upstream; and inadequate identification and support of value chains development opportunities.

New projects have a greater focus on development. They put more attention and resources into ensuring that the industries created continue. They tend to build on existing industries and seek to make them more robust by establishing a link with the managers of the MPAs (e.g. Kobaby, Mangroves MPA).

Activities address a wide range of circumstances. This may be introducing wholly-new activities, redeploying some of the operators in the area to other activities, or improving existing activities to make them more profitable and more compatible with environmental protection. They are also increasingly linked to climate change adaptation.

Activities are often introduced to generate income for the populations. Exceptionally, they may also be established to cover some or all of the running costs of the MPA (e.g. Narou Heuleuk project in Senegal during start-up, or the Hafafi/ Kobaby project in Madagascar).

Value chain links to be considered in setting up economic activities in MPAs.



96. Quesne G., Belvaux E., Gabrié C., Castellanet C., Fétiveau J., 2018. Evaluation of the AFD "Protected Area" conservation and development intervention contributions (2000-2017). AFD Report. 175 pp.

User testimony

Jean Goepp,
Director of the NGO Nébéday

In Africa, more than anywhere else, it is impossible to protect a region without giving due consideration to the local inhabitants that depend on its natural resources. It is essential to link conservation with development opportunities!

In MPAs with specific potential, these activities can also be used for community projects, helping to finance key activities such as stewardship of the MPA (e.g. Bambourg in Senegal during start-up, Mesoamerica). This offers community MPAs in countries where state resources are insufficient, a way of alleviating that problem, while also generating local employment.

However, the success of these economic activities depends on very many complex factors resulting from the cultural context and local socio-economic situation, but that are above all driven by the markets. Many past projects made the mistake of acting on local community wish lists, without any link to what the market could actually support. Most of these activities did not outlive the project.

Some key factors for success are outlined below.

Identifying beneficiaries: prioritising the populations impacted

The economic initiatives must (at least in the short term) prioritise communities affected by the existence of the MPA. Other communities can of course be included, but it's essential not to overlook the most affected. However, projects do not always try to identify these people or communities, often fishers - including migrants and nomads - but may also be agricultural or livestock farmers, etc. in onshore MPA elements. The SMMA project in St Lucia, RAMP-COI in Rodrigues (Mauritius) and OPAAL-OECS have for example specifically identified activities for displaced fishers (offshore FAD fishing, seaweed farming, aquaculture).[97]

Seaweed farming project in Sainte-Marie, Madagascar © GRET

97. facebook.com/SMMAInc

Identifying suitable activities and industries often calls for a feasibility study, except when building on robust existing industries.

- The Kobaby project in Madagascar, for example, launched a call for projects which asked applicants to demonstrate that they had the capacity to develop the industry and sell their products into reliable markets, while supporting the producers to be able to provide the desired quantity and quality within the expected timeframe. To facilitate the process, the project even requires linkage between an economic driver (e.g. NGO, private operator) and the manager of the MPA (NGO or, here, Madagascar National Parks), as well as support from the municipality to ensure the industry to be developed is locally accepted and integrated. The aim is to find local expertise capable of supporting this type of industry, skills that conservation specialists rarely possess. The industries selected are in broad sectors, some of which are for export, such as fragrant rice (cultivated in lowlands in onshore parts of MPAs), fruit, sustainable fishing and honey.
- The MAR Fund project has established a supply chain for Marine Stewardship Council (MSC) certified lobsters, which has helped local fishers to get better prices for their produce while preserving the resource.
- The PANGATALAN project in the Philippines is planning to develop a fishing industry based on post-larval capture and culture (see Chapter 3.4: Ecosystem Resilience) to improve local food security.

Observing hippopotamus. Orango national park, Guinea-Bissau © T. Clément

© Nébéday

Bee-keeping in Mnazi Bay © C. Gabrié

Drawing on a thorough assessment of the sector

Understanding of which industries to support in connection with the MPA needs to be based on economic studies (e.g. feasibility, market research, sectoral) and on social and cultural studies (e.g. community capacity to adapt to the new practices). Ready-made solutions should be avoided, and measures should be tailored as necessary to the location and the communities identified. Priority should be given to activities aiming to add value to existing sectors, as it is unrealistic to aim to set up sustainable industries from scratch within the lifetime of a project.

While it is essential to understand the context, sometimes this is still not enough, as shown by the Mnazi Bay project in Tanzania. Here, several studies were conducted into the successes and failures of projects in developing AIGAs regionally and worldwide, together with socio-economic analysis of the area, without the activities developed however being successful. The best way forward for these development projects therefore seems to be to call for proposals from professionals in local economic sectors (businesses or NGOs).

Bread oven, Quirimbas © C. Gabrié

Over the period of more than 20 years analysed in this capitalisation exercise, we have then seen a clear shift in economic support, from the setting-up of small projects mostly intended to compensate for losses and often lacking professionalism, to projects that are built around the economy and specific characteristics of MPAs. These projects (such as Kobaby, Mangroves MPA and MAR Fund MSC lobsters) were designed to develop industries that would deliver significant economic benefits for the communities. In some cases, the intention was also that part of the income would go back to the MPA and/or the municipality to help ensure their buy-in to the initiative.

For craft products, with the exception of local industries which are usually well managed, the development of new lines nearly always encounters problems with standards and requires substantial support in the range of products, design and finish. The most sustainable activities tend to be in food and drink (e.g. jam, alcohol).

© Maam Nature

Small-scale projects also generate income

While fragmenting support is generally not a good idea, by contrast small boosts can sometimes help economic activities to develop. This is one of the aims of the Small-scale Initiatives Programme. The FFEM has developed these projects in Africa, the Indian Ocean (GDZCOI project) and the Mediterranean (MedPan IMCAM project), and has supported their development in Mesoamerica via the MAR Fund. Evaluations have shown that they can produce good results (e.g. linking MPAs with local restaurants in the IMCAM project; or the small export industries being set-up by the NGO Nébéday in the Saloum Delta MPAs, such as mangrove honey and moringa powder).

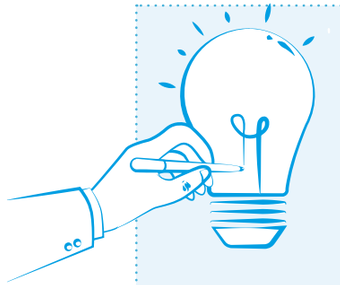
Microcredit as a tool to support economic development

Among the projects studied, some included a microcredit facility (e.g. SMMA, St Lucia and Quirimbas) or sought partnerships with specialised institutions (e.g. OPAAL project with the Global Environment Facility's Small Grants Programme providing up to USD 50,000 per project), which also produced good results.

The cost of supporting economic activities runs from tens of thousands to hundreds of thousands of euro

There is no "typical" cost in this field. Projects clearly have to be identified and set-up on a case-by-case basis. The costs of this support for "old" style projects are of the order of EUR 25,000 to EUR 50,000. In more recent projects however (e.g. Kobaby in Madagascar, Mangroves MPA in Senegal), the calls for proposals are sometimes far in excess of this, reaching hundreds of thousands of euro, as long as there is sufficient economic rationale for the expenditure and it is subject to strict monitoring, verified through external audits, and carries a guarantee that the products will be sold at a satisfactory price. Certifications such as "organic", "fair trade" or "MSC", as mentioned above, add credibility to the initiative.

Market gardening in Urok, Guinea-Bissau © C. Gabrié



Questions for the future
LET'S BRAINSTORM!

To make current and future projects as effective as possible, we must find ever more innovative solutions and learn from past mistakes and successes. Coming together to share our thoughts about the issues raised should help us find answers to the questions below.

For fishing:

- **How can we convince fishers to commit** to sustainable management?

- **How can we better combat poaching?**

- **How should we address the issue of migrants and nomads?**

- **How can we find the means to ensure reliable, continuous monitoring of fishing** that effectively informs and assists management?

- **How can we secure better prices locally for fishing produce,** to increase the added value of the catch?

- **How can we improve cooperation between the various stakeholders in fishing?**

- **How can we develop and test methods of working with industrial fishing** (including eco-certification)?

- **How can we capitalise on ways of developing alternative fishing activities** that are realistic and competitive, and that are appropriate and will be welcomed by fishers?

- **For closed areas, questions arise over how to** ensure the sustainability of ecosystem function, maximise protection of sensitive habitats, restore marine and fishing resources within an MPA, and guarantee sufficient spillover to meet the needs of local fishing communities:

  - What is the critical minimum size for these zones?

  - Where should these zones be located, and how far apart?

  - How many no-take zones should be created per MPA (or what percentage of the area should be covered)?

- **How can we support the manager to allow them to manage fishing outside the no-take zones?**

To answer this, scientific studies are to be encouraged in order to understand the structure of species assemblages, the regional structure of fish populations within these assemblages, and the size and extent of larval and/or adult dispersion in local recruitment.

For other economic activities, the questions relate to:

- Appropriation of sites by domestic tourists, something which is poorly documented. Tourist sites are too often marketed to foreign visitors. **What policies would help local communities reclaim and benefit from this natural and cultural heritage?**

- Effect of MPAs on land value in surrounding and coastal areas (only addressed in SMMA and Cayos Cochinos). **How can we avoid an MPA triggering the urbanisation** of a previously natural area?

- Inclusion of cultural and social management perspectives in tourism management activities and plans (guides to good practice, making the most of cultural as well as natural heritage, etc.). **How can we ensure indigenous culture is respected?**

- Impact on direct or indirect employment created by tourism. **How can we avoid local employees being simply menial workers, and how can we use MPAs as a local social ladder to provide real career opportunities?**

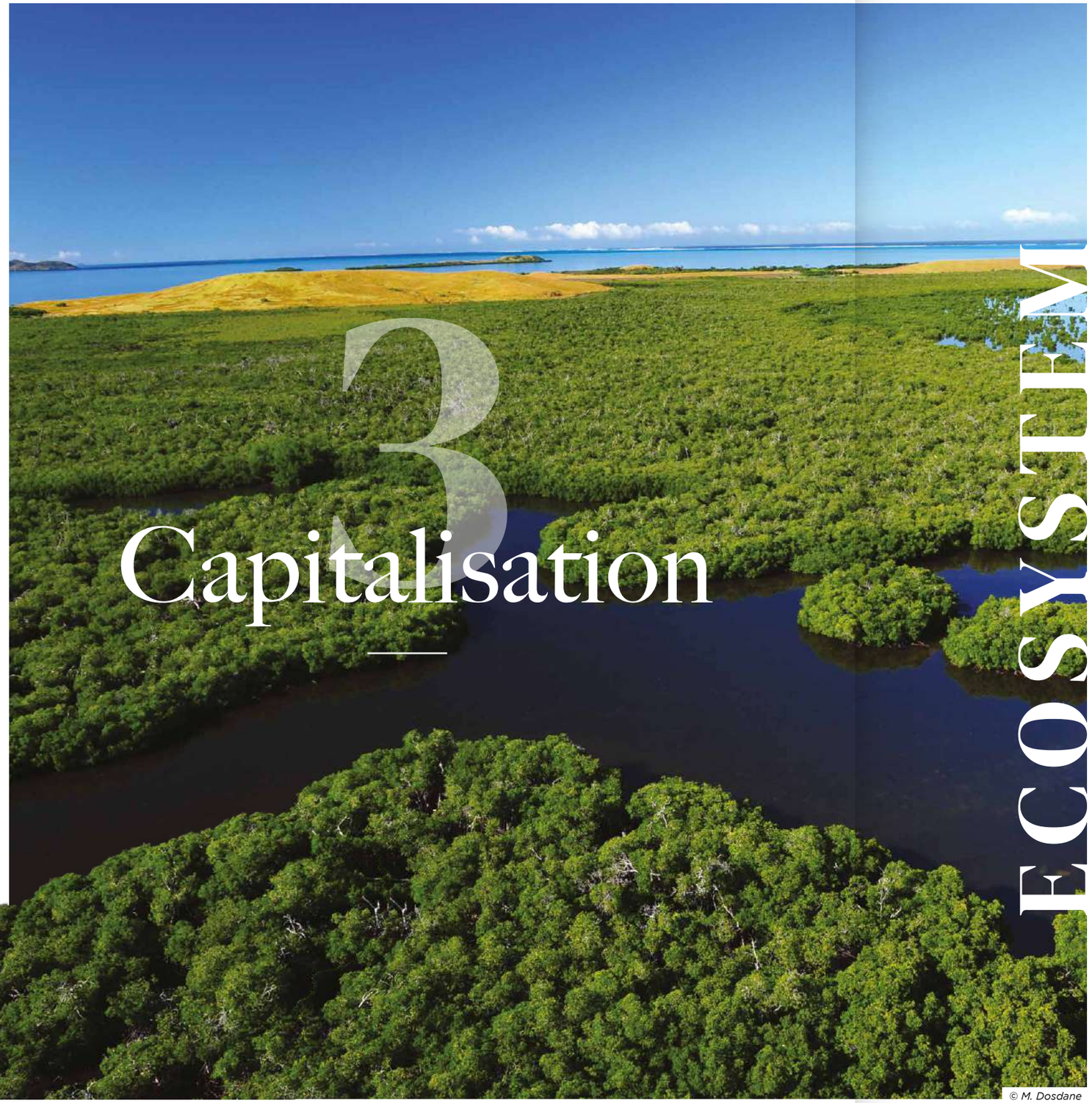
- **How can we embed tourism projects into regional strategies** (complementarity of various MPA projects within a region, as in the Indian Ocean)? And how can we raise the profile of destinations, as part of the projects?

- **How can we continue to support communities that develop ecotourism activities, beyond the end of the project?**

- **How can we link conservation with economic development, while minimising as far as possible the risks** of spiralling land value, cash crops, agricultural or tourist over-development, etc.?

- **How can we find the right balance between development and conservation in projects?** And how can we measure the impact of this development on the protection of natural resources?

- **How can we avoid the drift toward industrial development of crops** initially intended to improve local living conditions, such as cashews, oil palm, and orchards? How can we frame this process from the outset? What role could certification play in controlling these potential drifts?



3 Capitalisation

© M. Dosdane

ECOSYSTEM RESILIENCE

4

To what extent have these projects strengthened the resilience of coastal ecosystems, and supported the conservation and restoration of their ecological function, through approaches that integrate the climate, environmental and economic issues?

The basics

Expanding the vision and scope of intervention for increased protection

Restoring ecosystem functionality

“Integration”: the watchword

Drawing upon Nature-based solutions

The challenge of capitalisation

To identify and scale-up methods and techniques which help to reduce anthropic pressures on marine and coastal ecosystems and coastal communities, while reinforcing their resilience.

Introduction

Expanding the vision
The scope of FFEM's action is expanding: from a single isolated MPA to the integrated management of neighbouring coastal areas (ICZM), or to the Marine Spatial Planning (MSP) of marine use and governance, and from protection against adverse human activity, to strengthening ecosystem resilience in the face of global changes and especially of climate change.

In fact, any MPA is part of an ecological, social, governmental and economic "landscape" reaching far beyond its simple geographical perimeter. Protecting the marine space itself is insufficient to relieve the many pressures it faces from activities in related river catchments and coastal areas (pollution, sedimentation and habitat degradation), all of which impact the protected area. The RESCCUE project, which focuses particularly on increasing climate change resilience via integrated management of coastal areas, and the GDZCOI, MedPAN, IMCAM, COGITO and NOCAMO projects are participating in the sustainable development of regions through the lens of the ICZM.

Adapting to constraints
The disruption linked to climate change has led the FFEM to increasingly make coastal and small island resilience a strategic priority: "Preserve and restore the functionalities of coastal ecosystems, by incorporating climate, environmental, and economic considerations." FFEM 2019-2022 Strategy)". Several recent projects have adopted this strategy, including RECOS and WACA, projects restoring mangroves (Costa Rica – Benin and the Philippines) and reefs in Pangatalan in the Philippines.

These two approaches are complementary, since ecosystem resilience to climate change is closely linked to reduction in anthropic pressures - the only factor that can be subject to human control at project level (see Box).

Most of the projects operating under this strategy are too recent for any results to be confirmed. Nonetheless, completed projects (RESCCUE, GDZCOI, MedPAN IMCAM) have already demonstrated the significance of these integrated approaches and work underway on other projects should in the medium term bring new responses to this complex situation.

The RESCCUE Project (South Pacific)

To promote action towards climate change resilience, the RESCCUE project prioritised an approach based on the ICZM, relying on the theory that better integration of coastal areas management can logically only result in a better-protected environment, and subsequently to healthier ecosystems more resilient to climate change. Local populations which depend on the services of these ecosystems are then themselves more resilient to climate change.

1 REGIONALLY INTEGRATED PLANNING

Integrated Coastal Zone Management (ICZM)

Integrated Coastal Zone Management (ICZM) and Integrated Marine and Coastal Area Management (IMCAM): the terms have evolved and the regions addressed extended, but the concepts and key words remain the same: integration, participation, co-management.

Conception, Seychelles © T. Clément

INTEGRATION: THE WATCHWORD

There are numerous definitions and various understandings of the ICZM. We hold to the view that it takes the form of managing in a way that promotes integration at several scales within the same region:

- **INTERSECTORAL:** horizontal integration across the different sectors operating in the coastal and marine space, and integration of this space with the onshore sectors which influence the coastal and marine area.
- **GOVERNMENTAL:** coordinated public policy at national, regional and local administrative levels.
- **SPATIAL:** taking into account interactions between land and marine environments. Thus in island situations where water catchments are very short and steep, management will be "from the summit of the mountain to the lapping of the waves", or the "ridge to reef' concept. ".
- **MANAGEMENT AND SCIENCE:** involvement of the various relevant disciplines in the management of coastal areas.
- **INTERNATIONAL:** dialogue between states, for cross-border projects.

The setting-up and implementation of ICZM relies on a medium to long-term dynamic process (15-20 years) taking place over several phases. The involvement of people from very different backgrounds, with different and sometimes conflicting issues, requires a strong collective effort. The FFEM's approach to ICZM utilises three-faceted strategies: governance, planning and action.

SHARED GOVERNANCE

The need for integration between sectors involves the systematic implementation of ICZM governance, which allows for inclusive exchange and sharing of experience across all involved, from planning right through to the ultimate roll-out of action. This governance can take various forms (a cross-sector ICZM committee or a discussion forum for example) but it must include the main stakeholders from the region and encourage participative approach. "Involving citizens' participation in decision-making is an essential tenet of ICZM. " (RESCCUE)

OUR APPROACH

During the course of FFEM projects, relationships developed and partnerships formed between stakeholders from different backgrounds within the region, with growing involvement in particular by the private sector (tourism and fishing).

For the GDZCOI project, ICZM committees were set up (or re-established in the case of Rodrigues) for the three pilot sites.

- At Sainte Marie (Madagascar)[98] a "Platform for consultation for sustainable development in Sainte Marie Island" (PCADDISM) was set up on the basis of an inclusive and consultative process. Initially, this gave rise to a unit in every Fokontany (village), which were very active in the development of *dina be*[99], then a regional platform (Sainte-Marie Island) with a representative from every Fokontany. The local units remain in place but struggle to remain active without a joint project. However, the platform has been widely adopted by civil society, private actors and development projects.

- At Mohéli (Comoros) the SHAWIRI platform, created by the project, subsequently became an ad hoc association with 7 specialist colleges. According to the project review, "the only concern now is how the platform and technical colleges can continue in the absence of financing.".

- To help increase the resilience of Pacific island nations and regions to global change, the RESCCUE project made adaptation to climate change part of the ICZM process, allowing resilience at 7 pilot sites to be improved. In Fiji, for example, development of the regional ICZM plans initiated by the existing national framework, relies on regional ICZM committees to bring together representative from regional administrations, the government, the private sector and local communities. The process was supported by the project in the Ra and Kadavu regions and the ICZM plans adopted guided the roll-out of actions on the ground.

98. Where a national ICZM committee has existed for several years *99. Traditional Madagascan law*

Village meeting in Madagascar © V. Rasoloarison

LESSONS LEARNED: apart from the creation of more or less formal committees, the ICZM approach encourages and strengthens connections and interaction between stakeholders within the region, helping them to organise and conclude more formal arrangements with each other; supporting this aspect of projects is then essential.

The MedPAN project (IMCAM) resulted in numerous relationships between stakeholders, especially in the tourism sector, at the projects' pilot sites. In Tunisia for example, agreements were made with the private sector (dive club in the Galite Islands), the Tabarka Declaration on Sustainable Tourism was signed by government agencies, investors, civil representatives and international organisations, while links were also strengthened between the forest department, the Coastal Protection and Planning Agency (APAL) and local authorities with a provisional consultative council and a charter for shared management of the Kuriat archipelago being established.

In Algeria, a pilot committee for the marine area of the Gouraya national park was set up, bringing together the local community, fishing industry management, coast guards, the fishing chamber of commerce, the university, CNL for the environment, tourism operators, disaster and emergency services and civil organisations (the fishers' NGO, local NGOs). Many relationships between organisations were established and continue to strengthen thanks to the current COGITO project.

Project RESCCUE:

The involvement of locally selected "champions", seen to legitimately represent the community, is an essential factor in the success of these projects, as is solid methodology. Top down and bottom up approaches are not mutually exclusive in this context; rather, they are complementary.

PLANNING

ICZM project planning guides

Three guides have been produced with FFEM support, two of them as part of the RESCCUE project:

• ***Integrated coastal management plans: critical review and recommendations for Pacific Island countries and territories*** (Rochette et al., 2015). Based on a review of the literature and five case-studies, this report aims to identify lessons learnt and best practices regarding: i) the ICM plan development process; ii) ICM plan content; and iii) the relevant governance mechanisms to be established by or around the ICM plans.

• ***Guide to good practice: Pacific Island Countries and Territories Integrated Coastal Zone Management*** (2018). This report records the ways in which ICZM experience gained on the INTEGRE[100] and RESCCUE pilot projects was capitalised.

• ***Guide to methods for drawing up a coastal zone ('bay') contract*** (Montbrison et al. , 2021). A coastal zone ('bay') contract is an ICZM plan adapted to the specific case of a bay-wide project. This document is a step by step guide for those involved in drawing up a 'bay' contract.

> "Such documents are ICM plans when they have, first and foremost, the objective of integrating sectoral policies with strategic resource management planning over an extended timeframe."
>
> ***Integrated coastal management plans: critical review and recommendations for Pacific Island countries and territories (Rochette et al., 2015).***

An ICZM project plan is a regional planning document together with a plan of action. The process of drawing up 'bay' contracts is similar. The contract must specify the project sponsor and scope, balancing ecological and administrative constraints; include an assessment of the region,identify the main issues to be addressed and the stakeholders involved, then implement the iterative consultation process reflecting the cooperative nature of the plan.

100. The INTEGRE project, the Pacific Territories Initiative for Regional Management of the Environment is a joint sustainable development project in the four European Overseas Countries and Territories (OCT) in the Pacific, funded by the European Commission.

LESSONS LEARNED: As shown by many FFEM projects using ICZM, including the RESCCUE, GDZCOI, MedPAN COGITO and IMCAM projects, it is possible to apply ICZM without a formal plan as long as an integrated and participatory process is employed. Furthermore, there is no 'one' type of plan; rather various plans each adapted to its own project context. **#TOOLS**

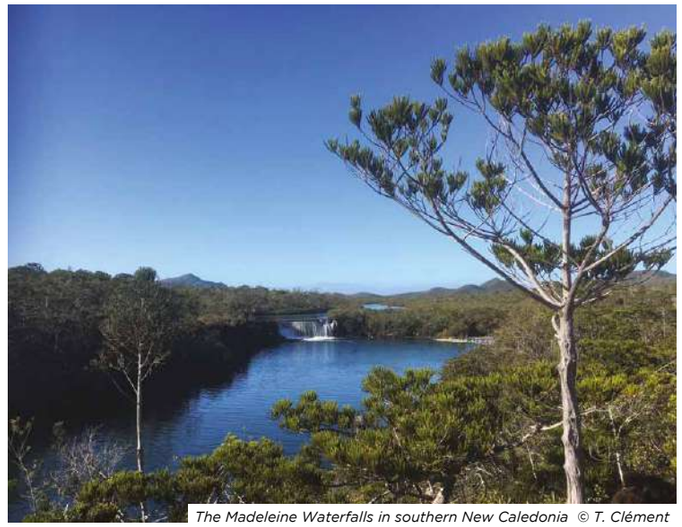
Mohéli Marine Park, Comoros, 2013 © C. Gabrié

ICZM plans have been developed in more than 10 areas

• Within the RESCCUE framework the plans created for projects in Fiji in the Ra and Kadavu provinces, in Vanuatu in the North Efate province, and the development plan created for the South Province in New Caledonia, will all be retained.

• For the GDZCOI project, we should mention the plans for Mohéli in the Comores, Sainte Marie in Madagascar and Rodrigues in Mauritius which were not only taken on board by the local ICZM platforms but were also recognised nationally in Rodrigues and Madagascar.

• As part of the MedPAN IMCAM project, later consolidated by the COGITO project, sustainable tourism sector plans have been implemented instead for the Taza National Park in Algeria, Kas Kekova in Turkey and the Karaburun-Sazun National Marine Park in Albania.



The Madeleine Waterfalls in southern New Caledonia © T. Clément

Sharing skills and experience and encouraging participant commitment through sector activities

During the experimental phase of projects and regions, the ICZM concept has largely translated into the development and sharing of good practices and activities from an ICZM perspective: that is to say, participatory activities tackling a wide range of topics, addressing natural resource management (of fauna, flora, water etc), combating invasive species, tourism management, fishing management, watershed habitat restoration, waste management etc. Many different solutions have been developed within the framework of these projects.

- For example, the IMCAM and COGITO projects allowed the development of sustainable and innovative practices in local economic activities such as fishing and tourism to be supported, and the development at these pilot sites of several ecotourism initiatives such as fishing tourism, the development of dive club, underwater trails, kayaking, sale of locally-sourced food and products, and local crafts. In Albania for example, most of the management plan goals have been put in place including collection of ship wastes, monitoring of water quality, water treatment plants, coast guard training, trial management of a recreational fishing scheme, monitoring of fisheries by the government fishing agency and coast guard service.

Feedback of experience (GDZCOI project)

Small grants create leverage for developing sustainable economic activities and helping give birth to local initiatives. More than that, they play an essential role in implementing new governance dynamics. Financing of small concrete actions identified by local communities helps gain their confidence, mobilises those involved and encourages collective regional activity ("seeding action"/start-ups). They have facilitated the setting-up of ICZM platforms and promoted discussion of environmental issues. The project has shown the importance of cultural aspects, beyond that initially identified (iconic species, traditional management techniques), with new recognition of the value of local tradition and knowledge to the proper management of resources and environments.

© GRET

Travelling educates young people, it reduces ignorance and stupidity.

Ismak Crophe Beassou, former mayor of Sainte-Marie, President of the ICZM platform, talking about work experience in the Indian Ocean

Integrated management on small islands and the "Sustainable Island" accreditation

Islands are globally recognised as fragile environments. Their natural, cultural, economic and social well-being faces several threats as a result of global change. The interaction between land and sea in a small island environment is even greater than it is for larger areas, and integrated management is essential.

Fishing boat at a small Greek island © C. Gabrié

OUR APPROACH

As a "sustainable development research body", FFEM is supporting the creation of an international "sustainable island" accreditation scheme with the aim of "instigating, maintaining and highlighting the value of biodiversity management and sustainable development on small islands". This internationally recognised accreditation is aimed at public or private islands of less than 15,000 hectares, and is designed to recognise and highlight the value of better practices in resources management.

Marine Spatial Planning (MSP)

Marine Spatial Planning (MSP) is a policy process intended to establish more rational spatial organisation of activities and interaction between the various uses of the marine area considered, to balance social and economic development with the need to protect marine ecosystems. The process is "integrated, adaptive, strategic and participatory" (UNESCO, IOC).

- The northern Mozambique Channel is the world's second largest coral triangle, contributing much to the marine diversity of this part of the western Indian Ocean. The coral is severely threatened, particularly by the significant development of oil and gas exploration and extraction. The NOCAMO project is working towards "collaborative management of marine and coastal resources in the northern Mozambique Channel" by establishing a marine spatial planning process for the area.

Mangroves in the Mozambique Channel © C. Gabrié

LESSONS LEARNED: Rather than planning being the final result, here the significant outcome has been the dynamic of inter-institutional and transnational exchange and dialogue (Madagascar, Mozambique, Tanzania, Comoros, France) inspired by the planning process, and governments' commitment to the process with the setting-up of national MSP platforms, drawing on the national ICZM committees where they exist (Madagascar, Comoros, Tanzania) and engaging with communities, followed by the setting-up of a regional platform to standardise differing national approaches. Several activities are planned including multi-stakeholder workshops, training, knowledge mapping, proposals for future scenarios to assess the options for project set-up and planning, evaluation of each scenario using the InVEST review toolbox[101] along with planning and reporting structures, with the aim of encouraging the oil and gas sector to adopt best environmental practices. **#STAKEHOLDERS**

2 INCREASING CLIMATE CHANGE RESILIENCE

The latest reports from the IPCC are unequivocal about the risks presented by global warming, even if their extent and impact are not yet clear: ocean warming and acidification, sea level rise, more frequent and more intense extreme weather events such as cyclones, droughts, flooding etc.

Coral bleaching caused by ocean warming © A. Rosenfeld

101. InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) is a tool for the analysis of scenarios from an ecosystem value perspective. It comprises a suite of open-source software models, developed by the Natural Capital Project, for the mapping and valuation of the goods and services provided by an ecosystem (ES).

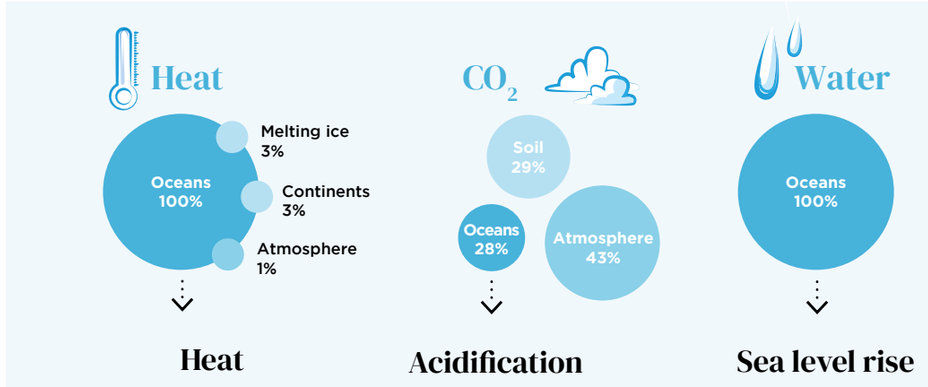
In tropical regions and island environments, where many FFEM projects are underway, the ecosystems and populations which depend directly on natural resources are vulnerable and will be particularly badly impacted by climate change.

Coral reefs, which are involved in all our projects in Mesoamerica, the South Pacific, the Indian Ocean and Asia, are particularly vulnerable to climate change because of coral bleaching caused by ocean warming and acidification. These are in the front line of these impacts, and significant loss of coral cover is anticipated.

Mangroves are also expected to be affected by warming and sea level rise, even though some of the degradation due to warming temperatures and sea level rise could potentially be at least partially restored in other locations provided this was not hindered by man-made barriers such as urbanisation and coastal infrastructure. Coastal areas are subject to rapid change and are already strongly impacted both by rising sea levels and changes in sedimentation, both from natural causes, and from coastal infrastructure which alters sediment flows with resulting coastal erosion, flooding etc.

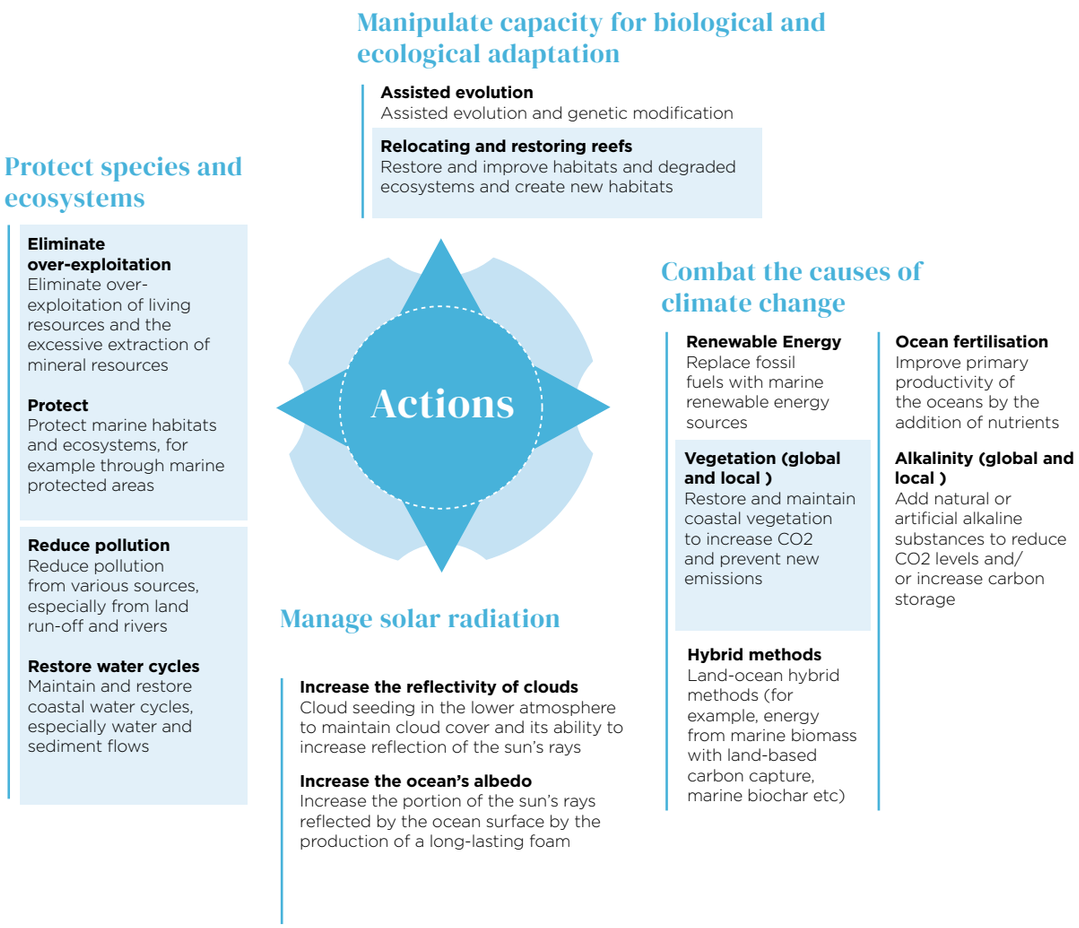
Climate change creates uncertainty: MARFISH and changes to spawning grounds

The effects of climate change on many marine species is already apparent, as witnessed by the displacement of populations due to changes in water temperature. Very little is known about how climate change could affect spawning grounds. Each species uses specific sites and geophysical characteristics for spawning, possibly associated with oceanographic variables such as current and temperature. It is therefore likely that climate change will negatively impact these areas. A status quo assessment of the Nassau grouper at one site estimates that by 2100, potential spawning habitats in the Caribbean will be reduced by 82% (Asch & Erisman, 2018, in the MARFISH NEP).



WHAT SOLUTIONS TO ADOPT?

Work supported by the FFEM presents an array of ocean-based solutions to limit climate change and its impacts on marine ecosystems[102]. See the schematic below:



Several of these measures (included in the schematic) were developed during FFEM projects (WACA, RESCCUE, RECOS, COBI etc) Approaching the problems in different ways, all of these projects had the goal of reducing vulnerability, and increasing the resilience of ecosystems and communities and their capacity to adapt.

102. Gattuso J.P. et al., 2018. https://tethys.pnnl.gov/sites/default/files/publications/Ocean_Solutions_to_Address_Climate_Change_and_Its_Effects_on_Marine_Ecosystems.pdf

In this context, the main activities have several objectives:

1. **BETTER UNDERSTANDING** and monitoring of the impacts of climate change (Quirimbas, RECOS)
2. **PROTECTING** marine habitats and ecosystems by strengthening the network of MPAs and their management (numerous projects).
3. **REDUCING** other stresses on environments, particularly via the ICZM and regulatory restrictions (impact studies, compensation etc): reducing pollution, regulatory control of coastal development, better management and limitation of over-exploitation of natural resources and minerals extraction (sand, oil, gas etc) (RESCCUE, RECOS, NOCAMO etc.)
4. **RESTORING** ecosystems (mangroves, reefs) and development of ecological engineering
5. **PROMOTING** adaptation through ecosystem and nature- and human-based solutions (WACA, RECOS, RESCCUE).
6. **DIVERSIFYING** sources of socio-economic development.

|LESSONS LEARNED: as regards adaptation, analysis shows that the 'solution' lies in integrating global and local measures (see report[103] on climate change in the RESCCUE project) combining bottom-up approaches that take into account current strategies and adaptation initiatives together with local knowledge, with top-down approaches of interest to politicians and law makers, in an integrated and coordinated way (Quirimbas NEP).

Ecosystem-based adaptation is defined as "the use of biodiversity and ecosystem services to help populations adapt to the adverse effects of climate change" (CBD)
Nature-based solutions are defined by the IUCN as "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits".

Beach erosion. Sainte-Marie, Madagascar © C. Gabrié

103. https://bit.ly/37kGfMV

BETTER UNDERSTANDING AND MONITORING OF CLIMATE CHANGE TO IMPROVE ADAPTATION

Evaluating climate change trends in various scenarios, the related risks and impacts, and evaluating the vulnerability of the environments and communities and the consequences for them, even where uncertainty remains, should help to guide decisions.. This is the first stage in developing an effective adaptation plan. From their different regions FFEM projects have contributed to building our knowledge on these matters and the total data acquired on these regions in the different oceans has increased global knowledge of the impact of climate change.

In the Quirimbas, the goal of the FFEM project was to "prepare the Park's ecosystems and surrounding areas for the effects of climate change", assessing in particular the probable impacts of climate change on critical ecosystems (coral reefs, seagrass beds and mangroves) and on fisheries, so that proposals for adaptation strategies and management options for these key ecosystems could be developed.

Result: the data from the study of the Park's mangroves show that these have some resilience to climate change, and that the affected areas are often near villages or fishing locations (Arimba, Quissanga, Quirimba, Ulombo and Mussemuco) where human activities are adding to natural pressures.

The resulting recommendations address several points:

- reduction of non-climate related stress factors (human impact)
- protection of critical areas (for example, community mangrove reserves with green belts and buffer zones to allow migration of mangroves)
- sustainable use (mangrove timber collection areas distant from the sea)
- restoration of degraded areas by increasing the density of coastal mangrove belts using "the most resilient species" or "intelligent species", so those able to tolerate a wider range of sea levels such as *Ceriops tagal* and *Rhizophora mucronata* (NEP)
- enforcement of laws to reduce illegal forest exploitation, and the effective management of coastal areas
- management of upstream activities to maintain sediment flows, and the development of alternative sustainable subsistence means.

Feedback of experience (RESCCUE project):

According to the project sponsors, extensive research is not strictly necessary in all contexts, because even if unquantified the global processes are known:

"The use of climate change science was minimal if not completely absent. Despite our attempts to work with the data and vulnerability analysis that we obtained initially, the project largely used very general elements such as the fact that ocean temperatures will rise and acidity increase, that the sea level will rise, that extreme rain events will probably get worse and that droughts will be longer and more severe etc."

Several projects implemented acquisition tools for physical data (temperature) and ecological monitoring allowing community responses to changing conditions to be measured: indicator species such as sea fans (MedPAN), biological and physical changes in multi-species spawning grounds (Mesoamerica), and migratory route changes (PACIFICO).

Coastal erosion in Senegal © T. Clément

Methodological approaches for developing adaptation based upon ecosystem- and nature-based solutions (PEBACC project; AFD SPREP): ESRAM methodology for analysing and mapping ecosystem and socio-economic resilience and decision-aiding tools such as cost benefit (CBA) and multi-criteria analysis (MCA).

REDUCING STRESSES

The RESCCUE and GDZCOI projects adopted an approach based on mitigating the vulnerability of environments and populations based on the communities' own perception of the risks, so primarily the degradation of their environment and quality of life. Project action - particularly in the framework of ICZM - was led by these drivers for reducing anthropogenic pressures (pollution, overexploitation, invasive alien species, destruction of habitats):

- For example, in the northern Province of New Caledonia, RESCCUE supported the management of water catchments and drinking water capture by controlling invasive ungulate species (wild pigs and Rusa deer) and by the restoration of water catchments through active control measures (bringing-in local species and encouraging colonising hoverflies, adapted to temperature rise) and passive erosion control (small-scale infrastructure), enabling the resilience of the forest ecosystem to be improved.
- In Fiji, work on ecosystem restoration and control of erosion was done in over 30 villages where communal nurseries were established, concentrating on growing sacred species for fire breaks, replanting water catchments, rehabilitating river banks, and mangrove restoration.

Reforestation of degraded land with native dry forest species New Caledonia © T. Clément

Feedback of experience (RESCCUE project):

Integrating climate change into the various ICZM plans gave mixed results. It was beneficial in the sense that it obligated the different partners not to lose sight of climate change, to think about the overall coherence of the plans and activity programs put in place to reduce vulnerability, and to consider the ways in which this issue should affect those. That did not however always translate to significant added operational value, with little final impact on the content of ICZM plans. The summaries of climate change impacts expected on pilot sites shared this mixed result.

RESTORING FUNCTIONING ECOSYSTEMS

Several projects have developed or plan to develop (RECOS) activities to restore coral reefs (Pangatalan project), mangroves (Costa Rica/Benin and Philippines projects) and water catchments (RESCCUE). More unusually, a few projects have worked on restoring species populations. For example, the (mixed) experience of the translocation of the limpet *Patella ferruginea* from the Zembra archipelago to the Galite archipelago (Tunisia-MedPAN IMCAM) and the eradication of invasive species (the ice plant and rats in the island MPAs in the Mediterranean, Seychelles and on the Cocos islet).

There are numerous mangrove restoration projects around the world, but many have failed because simply replanting is not enough to restore them and reforestation is a long-term endeavour. There are examples of dieback in Rhizophora forests that are over 10 years old (in Madagascar and Casamance). There thus remains much to learn about the dynamics of these environments. On the other hand, the Costa Rica/Benin project aims for the ecological, natural and assisted restoration of mangroves over some 31 hectares on three sites in Costa Rica (Cuajiniquil, Terraba Sierpe, Chomes) and 30 hectares in Benin (Ouidah) between 2017 and 2021. Natural regeneration will be supported by managing the hydrological dynamics following very detailed analysis of the environment (pore water, sediment, biomass etc).

Flows will be restored by an extensive network of channels, which will be dug by the local communities after any invasive species - such as the *negraforra* fern at Terraba Sierp - have been eliminated. Finally, the natural regeneration of vegetation cover will be supplemented by the planting of mangrove propagules. Work accomplished so far is impressive, and while the recovery is not yet quite sufficient results can already be seen, as at the Terraba Sierpe site where the channels are functioning well and natural regeneration, supplemented by major reforestation works, is underway.

Digging of channel networks to restore water flows. On the left, Benin, and on the right the Cuajiniquil channel network. Costa Rica © Claudia Agraz, Epomex (Mexico)

Claudia Maricusa AGRAZ HERNÁNDEZ, Professor, Epomex Institute, The Autonomous University of Campeche (Mexico)

A whole-ecosystem restoration was undertaken in the North Pacific and Central Pacific areas of Costa Rica and Western Africa, transferring the technology applied in Mexico. Physico-chemical analysis of the pore water led to an action plan for water flow restoration. This is achieved by the construction of a network of channels which ensure long-term water flow and the natural recovery of the vegetation cover, supplemented by reforestation. The resulting physico-chemical water conditions then become intolerable to invasive plants, but are tolerated by mangrove species, so favouring survival of the restored areas and the recovery of ecosystem services in the medium to long term.

Growth of coral cuttings, French Polynesia © A. Rosenfeld

- After the CRISP project which had already undertaken reef restoration work, and produced technical guides on the subject, the goal of the Pangatalan project was to restore the coral in three MPA sites using the method already tested in the Pantagalan MPA. This uses locally-made Sulu-Reef prostheses (SRP), modular reinforced concrete blocks which encourage the growth of coral cuttings[104] and the creation of new habitats for fish, supporting the natural recolonisation of coral and other beneficial organisms. The SRPs have been monitored since 2017, showing an annual cumulative survival rate of 76.63% (Pantagalan NEP).

SRP prostheses for reef restoration at Pangatalan, Philippines © F. Tardieu

104. The cuttings come from loose or unstable fragments of broken coral, collected directly from the environment and attached to the concrete structures by steel bars (no chemical or plastic products).

COMBINING GREEN AND "GREY" SOLUTIONS TO INCREASE RESILIENCE

Green and grey solutions protecting the coastal mangroves in the Philippines © Conservation International

A combination of green and grey infrastructures combines ecosystem conservation and/or restoration (green solutions) with selective application of conventional engineered solutions (grey solutions, such as sea walls). This combination brings the advantages of both solutions, while minimising the limitations of using one or other in isolation.

In the Philippines, the project's objective is to "strengthen coastal resilience to reduce the risks of disasters, and climate change adaptation by integrating green and grey infrastructure" at four pilot sites in the Iloilo Province, which was particularly badly affected by Typhoon Haiyan (2013). Several types of structure were installed on the sites, combining soft solutions (mainly bamboo structures) and grey solutions (small, stone sea walls) to trap sediment and/or reduce the size of the swell before reforestation began. A practical guide has been produced but it remains too early to assess the effectiveness of these solutions.

COMBATING COASTAL RECESSION

The WACA project has the goal of promoting and implementing soft solutions for adaptation to, or protection against, risks to the coastline at pilot sites in Benin, Senegal and Togo. The report into the nature of possible soft solutions makes several proposals. This document[105], which is both detailed and very clear, addresses in particular:

- ecological engineering solutions in response to coastal risks such as re-establishing sediment flows, restoring beach profiles, rebuilding and stabilising coastal dunes, restoring mangroves and coastal vegetation structures;
- soft solutions appropriate to the geographical context of the county in question, such as high-energy sandy coastlines, coastal lagoons and lagoon systems, low-energy sandy coastlines, small estuaries and areas of mangroves;
- the place of coastal risk soft mitigation measures in the INDC (Intended Nationally Determined Contributions) and in strategy plans relating to the adaptation of each project country.

Several concrete actions have already been planned for the project's pilot sites: coastal protection windbreaks (filao tree and *Chrysobalanus icaco* reforestation, mangrove restoration, dune stabilisation) and/or breakwaters, development of local climate change adaptation plans (LCCAP), strategic withdrawal of the fishing quarter in the town of Bargny (Senegal), and the creation of MPAs. Soft solutions such as the typhavelles (paling-type fencing made from typha) implemented at Saint-Louis (Senegal) to reconstitute the dunes, are very promising.

Erosion management: two strategies[106]

RISK REDUCTION		PROBLEM MITIGATION	
Protection through hard infrastructure	**"Soft" solutions**	**Allow natural coast the space in which to develop**	**Appropriate coastal planning**
Walls, riprap defences, piers, breakwaters	**Beach replenishment, drainage, by-passing, geotextile works, dune management**	**Strategic withdrawal**	**Raised construction (stilts) etc.**
Ecological and landscape disturbance. Excessive cost	**Cost-benefit analysis of relocating local inhabitants**	**Progressive solutions. No ecosystem disturbance, no landscape degradation. Nearness of Imraguen to their protected sea**	**Mud-sand floor along water's edge Raised construction is more restrictive than relocation**

IMPROVING THE COLLECTION AND CULTURE OF POSTLARVAL STOCK

Post-larval Capture and Culture (PCC) was one of the key areas of the CRISP programme. These now-proven techniques for the capture of postlarval stock[107], especially of fish, and the stock's subsequent farming increases their value in 3 potential ways: aquaculture for producing fish as food, reseeding ecosystems to strengthen biodiversity and population density, and finally the (high-value) aquarium industry. The Pangatalan project targets the first two, alongside reef restoration. Reseeding will help to counter environmental degradation, assist in re-establishing fish and invertebrate stocks in the protected areas and develop fish farming as an economic activity for local communities, following the ban on fishing in MPAs. The first trials are looking very promising, recruitment and the diversity of this recruitment being particularly important in the bay.

105. Characterisation study of soft solutions in relation to coastal risks in the different INDC in Benin, Senegal and Togo.

106. Source: De la Torre et al., 2014 in Ewan Trégarot, et al., Evaluation of ecosystem services of the Banc d'Arguin, Mauritania: final report, 2018

107. The postlarval phase of fish and crustacean reef species is the phase of development which precedes their settling in the lagoon and growing on to adult stage. Most species begin their life cycle with a pelagic phase of around one to three months, following which these fish and crustaceans settle in the lagoon in numbers ranging from a few hundreds up to millions. Roughly one individual in a million will survive to adulthood, most juveniles falling victim to predation.

HAS MY PROJECT SUCCEEDED IN REDUCING THE VULNERABILITY OF TARGET SPECIES?

A climate change Vulnerability Reduction Assessment (VRA) is one method deployed by RESCCUE to monitor and evaluate project results and to facilitate the adaptation of local populations to climate change. It relies on perception surveys to assess populations' perception of their own current and future vulnerability, of their capacity to adapt, and of how they see the need to sustain the actions initiated by the project. Follow-up surveys of local residents' perceptions are used to monitor their observation of changes in their vulnerability and to give an indication of the project's effectiveness.

TAKING PART IN INTERNATIONAL DISCUSSION

While these projects focus on local solutions, some also contribute to the development of public policy (RESCCUE, RECOS, MedPlan, WACA etc. see Chapter 3.5 Sustainability of MPAs) and support each country in the implementation of their Nationally Determined Contributions (NDCs). These NDCs are central to the Paris Climate Agreement and embody the efforts made by these countries to reduce their national emissions and adapt to climate change (WACA).

Toward "bluer" projects (RESCCUE)

During the pilot phase of implementing the Pacific Community's social and environmental responsibility policy, RESCCUE became the first carbon neutral project in the Pacific Community by: (i) avoiding unnecessary travel, (ii) reducing unavoidable emissions as much as possible by, for example, holding regional meetings near an airport hub or selecting caterers who work with locally-sourced products, (iii) offsetting any emissions that can not be reduced or avoided by, for example, partnership with the Nakau forest conservation program in Fiji and Vanuatu.

Fisher in the Sandfly MPA, Soloman Island © T. Clément

Questions for the future
LET'S BRAINSTORM!

To make current and future projects as effective as possible, we must find ever more innovative solutions and learn from past mistakes and successes. Coming together to share our thoughts about the issues raised should help us find the best possible answers to the questions below.

- **How do we convince and bring together** all stakeholders to work towards goals and expectations that often conflict?
- **How, for relatively short-duration projects, do we move beyond** the "ICZM" mindset to a truly integrated regional approach?
- **How can we work more effectively** on reducing anthropic pressures around MPAs so we can better protect them?
- **How can we convince everyone of the benefits and effectiveness** of ecosystem- and nature-based adaptation solutions?
- **How can we scale up successful solutions?**
- **How can we put the brakes on** fast and uncontrolled development in coastal zones?
- **How can we further promote development of innovative solutions** for greater marine and coastal ecosystem resilience, and the resilience of coastal communities?
- **How can we encourage coastal development** that is less environmentally-damaging?
- **How can we reduce the vulnerability** of coastal communities?
- **How can MPAs be rewarded** for the amenities which they provide by the surrounding areas that benefit from them?

RESCCUE

Some urgent fundamental questions remain. While Nature-based solutions - which are at the heart of the project's actions - are justifiably a priority for many of those involved, even beyond the Pacific, they rest on two key assumptions.

- **The assumption of the effectiveness** of Nature-based solutions in increasing ecosystem resilience - a matter fiercely debated by scientists. What if marine protected areas do not in fact increase the resilience of coral reefs?
- **The assumption that they will remain relevant** in the long term, the goal being to remain robust and viable over the long-term, irrespective of future climate conditions. But can better local management really ensure the survival of the ecosystems in question in the face of climate change?

3 Capitalisation

SUSTAINABILITY OF MPAS

5

How have FFEM projects contributed to improving the sustainability of MPAs and embedding them in their regions?

The basics

Ensure project outcomes are sustained	Build skills and encourage experience sharing
Maintain MPAs, especially MPA teams, and secure their operating means	Develop shared governance

The challenge of capitalisation

To sustain project outcomes, ensure that project efforts are not in vain, and that continuity will be assured after the project is completed.

Introduction

This chapter addresses the crucial topic of the conditions required by MPAs for sustainability beyond the project term. This sustainability is delivered through capacity building for MPA managers and other parties involved (particularly via networks), improved public policies and regulatory tools around the management of MPAs, and long-term financing of MPAs.

1 CAPACITY BUILDING AND EXPERIENCE SHARING FOR BETTER MANAGEMENT

FFEM projects themselves are not intended to continue long-term, and commit to ensuring local autonomy through capacity building for stakeholders working within the MPAs (managers, communities, operators) and beyond (e.g. authorities responsible for MPAs or fishing, elected officials, students). This building also covers technical aspects (e.g. monitoring and surveillance methods), as well as organisational or governance aspects (e.g. governance of management committees, benefit sharing). The training approaches and tools are many and varied, including training in the field (e.g. exchange visits), academic training (e.g. workshops), networking (e.g. managers' networks, learning networks, peer learning) and technical assistance.

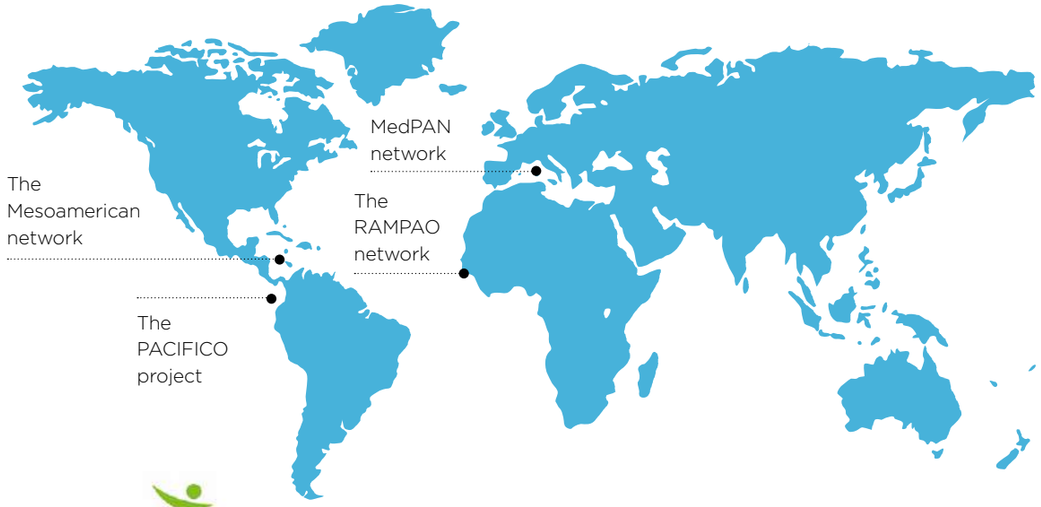
Below are some examples of these recurrent activities, which are crucial over the short or long term.

Practitioner networks, coalitions, alliances, partnerships, etc. Governance of MPAs is widening and becoming more participatory and inclusive. Networks improve the effectiveness of management in a number of ways: by sharing knowledge and gaining a wider perspective - for example at regional scale; building skills, sharing experience, pooling resources, testing approaches in pilot regions, etc. Capacity building for stakeholders can take many forms, depending on the target group, often being followed-up by complementary measures.

Meeting in Casamance, Senegal © T. Clément

Networks of MPA managers to encourage and sustain

The FFEM has supported the building of two networks of MPA managers, MedPAN (the network of Mediterranean managers) and RAMPAO (the West Africa network), as well as other less formalised networks. These networks aim to safeguard regional biodiversity through coherent and effective management of the MPAs in their regional network.



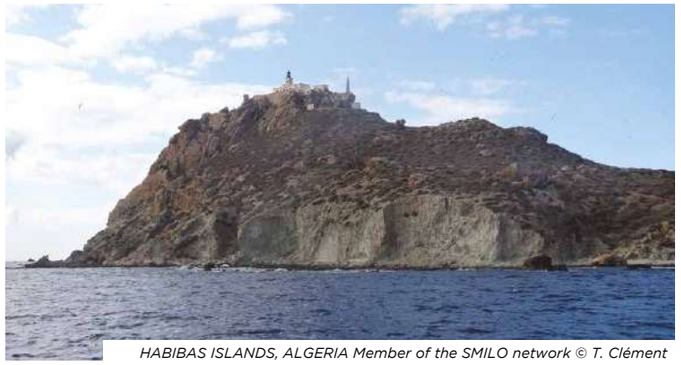
The MedPAN network was created in 1990, and the MedPAN organisation in 2008. The aims of MedPAN are to promote interaction between its members and to build their capacity to effectively manage MPAs in conjunction with other stakeholders in the Mediterranean region. The MedPAN Secretariat works with partners including the UNEP SPA/RAC, WWF, the French Coastal Protection Agency, IUCN Mediterranean, the French Office for Biodiversity, ACCOBAMS and the General Fisheries Commission for the Mediterranean (GFCM). Its focus areas include capacity building and exchanges between MPAs (MPA forum, regional experience sharing workshops, numerous training workshops), development of shared methodologies (see Chapter 3.1: Knowledge and monitoring and Section 3.3.1 on fishing) and regional biodiversity knowledge. Its Small Projects scheme, launched in 2013 as its first FFEM project, has proved very useful. The support provided through these small grants to numerous managers and NGOs has been widely acclaimed, and the scheme has been continued under two other FFEM projects (IMCAM and COGITO, ongoing). The concepts are evolving today and it is now proposed that some MPAs, particularly in the North, act as resource centres for other MPAs.

The RAMPAO network, created in 2007, has the objective of creating synergies between managers and with other technical partners involved in managing MPAs in the West Africa region, promoting exchanges and mutual learning among its members, building capacities for management, advocacy, etc. Financed by the FFEM, RAMPAO has recently also launched a small grants programme aimed at giving fresh impulse to selected projects and increasing RAMPAO's legitimacy among its members, improving cohesion in the MPA network by developing experience-sharing between small projects, and building the capacity of national NGOs to implement conservation projects in the field.

The Mesoamerican network of MPA managers is not formalised like MedPAN or RAMPAO, but is supported by the MAR Fund, a private regional environmental fund (see Financing sub-section below). In practice, the region's MPAs act as an effective exchange network. Under its first project supported by the FFEM, the MAR Fund created a community of practice to build capacity among MPA teams. It also has a small projects programme supported by the FFEM.

The PACIFICO project also includes a component intended to build capacity and promote information and experience sharing. In addition, it aims to provide technical assistance to MPAs with shared regional tools to improve their effectiveness and develop a common set of indicators. This initiative also includes experience-sharing with other regional platforms dedicated to marine conservation, such as the MAR Fund, Caribbean Biodiversity Fund (CBF), MedPAN and the Transatlantic MPA Network.

The SMILO project has created the international network called the Sustainable Small Islands Initiative. This brings together the managers of small islands who are signatory to the Declaration on the Sustainable Development of Small Island Developing States, along with technical experts and project partners (e.g. funders, NGOs, patrons, research foundations). It aims to initiate operational exchanges between sites that are part of the network, through field visits, workshops and conferences, in a spirit of knowledge transfer. One component of the project focuses on implementing an accreditation process[108] on a sample of 24 pilot sites. The process, involving three levels of accreditation, aims to support interested small islands in establishing a sustainable development project in their region.



HABIBAS ISLANDS, ALGERIA Member of the SMILO network © T. Clément

108. Accreditation: awarding a quality accreditation to a product or action that meets the criteria defined for the accreditation.

Mesoamerican reef MPA network Cayos Cochinos, Honduras © C. Gabrié

LESSONS LEARNED: it is essential to provide networks of managers with long-term support, extending beyond the end of projects. This can include maintaining a website for which the financial and administrative sustainability is guaranteed, but most importantly the holding of regular meetings allowing members can meet up and exchange ideas. Maintaining network momentum is essential, keeping it active and dynamic to ensure annual meetings take place and to develop joint training and activities to cement relationships. Exchanges are now also starting to emerge between different networks of MPA managers.

User testimony

Marie Romani, Director of MedPAN

Networks of MPA managers, such as MedPAN, are an effective platform to address the needs of MPA managers. By bringing managers together with an operational focus, they provide a forum for creative problem solving and for sharing of knowledge, expertise and financial resources between MPAs that are facing the same challenges. They use a dynamic bottom-up approach, linking experience on the ground with decision-making processes to coordinate the voices of MPAs and make joint recommendations to support the development of national and international policies.

Network learning through exchange of experience and sharing of good practices

An increasing number of FFEM projects are supporting the creation or enlargement of exchange networks. In the first instance good practices are identified, which are then shared among stakeholders in an area or region, through meetings, platforms or field exchange visits. This exchange approach is particularly effective in that it puts stakeholders facing particular problems in touch with others who have found successful solutions to them. That enables these good practices to be scaled up.

The MAR Fund project has a component dedicated to creating a community of practice within the MPA network, to initiate exchange of ideas and promote peer learning and the sharing of best practices emerging from the Small-scale Initiatives Programme.

The NOCAMO project[109] should help to identify practices for managing marine resources and PHE (population, health and environment) within certain marine settings, and promote them through a learning network on pilot sites. Members learn effective practices from each other, and this capacity building is designed to deliver long-term benefits. The project will support the activities of these learning networks through a technical assistance facility and, where possible, financial support through microcredit or project income (small grants or accelerators).

In Quirimbas, the aim was to replicate the learning forums put in place in Kenya in partnership with the Ministry of Fishing - the Annual Fishers' Forum. This forum brings together fishers, scientists and management institutions, to analyse research findings and discuss and test management interventions. The mutual learning serves to inform and educate about marine conservation, improve social organisation, and more effectively involve coastal communities in the sustainable management of marine resources.

The COBI project, through its Connectivity component, aims to develop a social innovation network that connects fishers in the project region, both men and women, initially with each other and then with others in Mexico and Latin America. This network would be made up of individuals and organisations wanting to solve a complex problem by working together, adapting over time and generating a steady flow of activities with proven impacts.

> "To take marine biodiversity conservation and sustainable fishery forward, we need to roll out successful existing practices and co-create solutions with coastal communities that can be shared among them to spread the benefits."
> NIP COBI

109. This project includes the districts of Kilwa and Lindi in Tanzania, the north-west coast of the Diana region in Madagascar, the BATAN (Bays of Ampasindava, Tsimipaika, Ambaro and Nosy Be, north-west Madagascar), the province of Cabo Delgado in northern Mozambique, and the Sima peninsula on the island of Anjouan in the Comoros.

The GDZCOI project, through surveys and field visits, has identified nearly 100 good practices and ICZM initiatives on eight themes: marine protected areas, sustainable fishing, sensitive ecosystems, watersheds, biodiversity, ecotourism, waste management and management tools. These good practices were featured in factsheets made available on a dedicated online platform on the IOC website (no longer operational). This gave rise to a whole exchange network, where those bringing these good practices could pass on their experience.

GDZCOI project: some key statisticss from 2014 to 2017

24 regional exchanges conducted

41 regional ICZM practitioners involved

117 individuals travelled for exchanges

300 individuals trained

17 good practices adopted in new locations

3 industries created and/or developed: organic market gardening in Mauritius, and bee-keeping and seaweed farming in Sainte-Marie, Madagascar

Craft project. Sainte-Marie, Madagascar © GRET

Academic, technical, field and workshop training

The training tools used are many and varied, as are the recipients of the training, as is illustrated by a few examples: training rangers in surveillance and safety at sea (BIOCOS project), training in understanding coastal risks or in database development techniques for coastal projects (WACA project), and training in financing mechanisms which led some countries (e.g. Albania, Turkey etc., MedPAN projects) to open up on financial sustainability issues.

Training in market gardening. Ankivonjy MPA, Madagascar © T. Clément

In additional to traditional workshops, some tools are innovative: cube training[110] or webinar training (COGITO project,[111]which introduced a system for quantitative monitoring and qualitative evaluation of its project training), *task force*[112] (SRFC/CEPIA/BIOCOS project) - which merit revisiting, particularly in projects working in the same area, to capitalise on this unique experience. Also worth mentioning are multilingual massive online open courses (MOOCs), as used by the SARGADOM project, which is developing a programme on governance and conservation of the high seas that is intended for the international scientific community, government officials and private sector operators.

One of the problems of this type of training is the fast turnover of individuals trained.

A helpful and forward-looking approach is to allocate funds for activities to facilitate communities of practice right from the start-up of a project, as sustaining these is always a challenge. Training the leaders from among the populations and operators has also often proved effective. There are many guides available, which have often been developed alongside this training, relating to the needs for capacity building among stakeholders. Some of these have already been referred to in previous Chapters.

Training in the gathering of oysters without cutting mangrove roots. Casamance MPA, Senegal © T. Clément

110. Extended training, delivered face-to-face, at each location. 111. Profiles of MPA practitioners: ranger/manager; elected official; NGO/researcher (COGITO project) 112. Group of experts who intervene at managers' request to assist with problems encountered.

2 MPAS PLAY A CATALYTIC ROLE IN THE DEVELOPMENT OF PUBLIC POLICIES

MPAs are in effect laboratories, experimenting with different management approaches that may prove conducive to regulatory change.

- For example, the creation of the first two community MPAs financed by the FFEM (through the Narou Heuleuk and BIOCOS projects), Bambourg in Senegal and Urok in Guinea-Bissau, opened the way to formalising the status of these MPAs - something that was previously non-existent in the legislation of these two countries. The concept was subsequently adopted by other countries in the area, and the whole sub-region has now recognised this type of MPA alongside more traditional designations such as national parks and nature reserves.
- As a result of experience in the Taza MPA (Algeria, MedPAN IMCAM project), two new decrees were issued in 2016. One related to fishing tourism (after France and Italy, Algeria is the third Mediterranean country to formally establish this activity); the other addresses the establishing of an interministerial committee to assess proposals for the designation of new protected areas (including MPAs). Within the same project, in response to a proposal by WWF Turkey, the Turkish government adopted new legislation prohibiting the fishing and sale of grouper, recorded in the new bulletin on commercial and amateur fishing 2016-2020.
- The Mangroves Costa Rica/Benin project should lead to the development of a "national strategy for social blue carbon", and accompanying planning and policy instruments.

In the COGITO project supported by the MedPAN network, one component is dedicated to the "developing and harnessing of scientific understanding to inform management and policy", with a stated aim of drawing on science to modify policies ("science to policy"). The project aims to mobilise networks of islanders to develop national conservation strategies for island territories. An encyclopaedic atlas of the small islands of the western Mediterranean is currently being developed, to ensure the islands are better taken into account in Mediterranean environmental policies. In addition, the PIM Initiative for small Mediterranean islands has begun to draw-up an inventory and to evaluate conservation strategies. As the COGITO project enters its third year, it is vital to ensure that its knowledge exchange continues after the project ends.

The RECOS project, meanwhile, aims to strengthen frameworks for regional and national governance of coastal and marine ecosystems.

OUR APPROACH

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Novateur, the FFEM project on seamounts in the southern Indian Ocean, aimed to improve governance of the high seas and integrated management of marine areas beyond national jurisdiction. It also intended to assess the potential for creating MPAs beyond EEZs,[113] drawing on a feasibility study for an MPA on the Walters Shoals.

113. An exclusive economic zone is a marine area over which the coastal state has sovereign rights in economic matters. It generally extends up to 200 nautical miles from the coast.

3 SUSTAINABLE FINANCING OF THE MPA IS VITAL TO ENSURE LASTING OUTCOMES

Sustainable financing of MPAs remains a major problem for a great majority of managers. In fact once the project has ended many MPAs established as part of "good" projects find themselves in great difficulty, even in some cases becoming MPAs on paper only (e.g. Mohéli in the Comoros at one point, Tristao in Guinea, and so on).

Funding from international or bilateral partners, like that from large NGOs, which is intended to finance the start-up of MPAs and the investments that requires - particularly for operating costs (personnel, boats, buildings, buoys) - is only available for a limited period. This financing stops when the project ends, which more often than not results in available funding drying-up completely so that not even operating costs can be covered.

In the best case scenario managers turn to other bridging projects, but this simply defers the problem until the end of each project, even for MPAs with their own income such as from charges for entry or for use (e.g. SMMA, Tobago Cays).

In most cases, the governments of developing countries lack the necessary financial resources to ensure these costs are covered, let alone to fund further investment following the projects. Taxes and revenue linked to tourism (where an option) and other income streams are generally insufficient to cover these operating costs.

In most of the areas analysed, sustainable finance remains a headache for managers. Possible exceptions are Caribbean and certain Mediterranean MPAs with significant tourism, and French territories in the Pacific where the authorities do have the financial resources to manage these areas.

In theory, there are many sources of finance for MPAs (see table opposite), but in reality only some are available in each location, and not all are easy to implement. This finance may (in rare cases) be fiscal, coming from taxes; may be based on activities (usually limited to tourism); or may involve various forms of donations.

Fisher and shearwaters © L.-M. Préau

In all cases, it is essential to prepare a business plan early on in the process, in order to obtain a clear picture of the financial requirements and potential financing solutions, as well as of any possible savings. This plan should not underestimate the workload that may be involved in collecting certain fees. Simplicity and effectiveness should be prioritised. The business plan is a prerequisite for seeking sustainable finance, and is essential for approaching any potential financer. The business plan is discussed in Chapter 3.2: Creation and management of MPAs. See also the guide to preparing simplified business plans for protected areas on the RAMPAO website (in French), or the Blue Seeds MAVA guide to sustainable financing of Mediterranean MPAs.

Among the cases analysed in this capitalisation, very few had secure financial sustainability (with the exceptions of the Banc d'Arguin National Park in Mauritania, Cayos Cochinos in Honduras, and partially SMMA in St Lucia, Caribbean). Most had no business plan either. In addition, for many MPAs we see the following:

- inadequate records of financial information;
- disorganised financial information, for which the director is rarely able to provide a summary;
- a budget often based on funding available, for which the proportion relating to operating costs is often unknown.

Sustainable financing of the MPA is thus a central issue when setting up projects, but especially in managing the MPA itself, to ensure the outcomes achieved through the creation of MPAs are lasting.

FINANCERS	STATUS	EXAMPLES OF FINANCIAL INSTRUMENTS
Public authorities	Voluntary	• Operational budget for MPAs under public management • Community subsidy
Users	Voluntary	• Donations on site or via a website • Payments for ecosystem services • Commercial agreements (fishing agreement) • Bioprospecting
	Obligatory	• Entry taxes/fees • Usage fees: diving, anchorage, trading, etc. • Cruise ship berthing fees
Third parties	Voluntary	• Trust funds, foundations • Patronage, public-private partnership, cause-related marketing • Blue carbon or REDD+
	Obligatory	• Airport taxes • Fines (although having these reimbursed to the MPA is often complicated)
	On request	• Development or conservation projects • NGO support
MPA	Developed	• Income-generating activities for the MPA

OUR APPROACH

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The FFEM has co-funded FAPBM in Madagascar, Bacomab in Mauritania, BioGuinée in Guinea-Bissau, The Med Fund in the Mediterranean, and MAR Fund (plus MAR Fish, as a distinct MAR Fund sub-account for the Cayman Crown). It is also about to co-fund the PACIFICO project. This co-funding has averaged EUR 500,000 to EUR 1 million per fund.

Details are given below only for trust funds, payments for ecosystem services (PES) and carbon finance, as these are the main instruments prioritised by the FFEM to date. Further, many guides to the other instruments in this field already exist.

TRUST FUNDS AND FOUNDATIONS

Trust funds are legally autonomous private institutions that provide long-term finance for conservation and ecologically sustainable development. They are a source of stable, lasting funding.

The first trust funds were developed through bilateral debt conversion programmes and donations from multilateral agencies. Trust funds now also receive funding through government grants, foundations, NGOs or private companies. The endowments they manage are then made available to protected areas, government agencies (such as national park management agencies), NGOs or community organisations, to fund conservation. They are not executing agencies, but funding agencies. There are many types of trust funds. Most have hybrid mechanisms combining several ways of employing their capital, from using only the interest earned to gradually releasing the capital itself over a long period. The FFEM and the AFD have contributed to many of this type of fund, some of which are outlined below.

- **MAR Fund**[114] in Central America. This fund feeds into the national environmental funds of four countries: Belize, Guatemala, Honduras and Mexico. A tool to evaluate financial requirements and sources for each MPA (MARFIN) has been produced with FFEM support.

- **The Madagascar Biodiversity Fund (FAPBM)**[115] aims to secure financial sustainability for Madagascar's protected areas. The Fund works in various ways to finance the recurring costs related to managing protected areas, and related to projects aiming to reduce pressures on these areas. It holds endowments of over USD 75 million and provides around EUR 2 million of finance each year to projects in protected areas.

- In Mauritania, **Bacomab**[116] was set up primarily to finance protection of the Banc d'Arguin national park (PNBA). Its endowment of around EUR 25 million is from a combination of donations and a 5% levy on the value of fishing agreements between the EU and Mauritania.

- In Guinea-Bissau, the **BioGuinée** fund is seeking EUR 10-15 million to finance the country's MPAs (managed by IBAP [117]) which is in the course of appropriation, but this is proving difficult.

- **MedFund** is a hybrid environmental fund comprising an endowment fund, a sinking fund and a revolving fund. It aims to mobilise public and private stakeholders to promote the long-term development and effectiveness of Mediterranean MPAs, especially in terms of operating costs, which are often not covered by projects. By 2025, the MedFund's goal is to support 7,000 km² of MPAs on some twenty locations[118].

- The AFD and the FFEM have committed to providing 5-year support to the **Caribbean Biodiversity Fund (CBF)**[119] and its 12 affiliated national trust funds, financing EUR 4 million to the Caribbean Regional Architecture for Biodiversity (CRAB) programme in "support for a biodiversity conservation programme run by the CBF", aimed at developing innovative sustainable finance mechanisms to encourage the protection of biodiversity.

Ultimately although many initiatives have emerged, only a few tend to be used. To avoid duplicating national initiatives, funders turn to regional ones such as the MedFund, which focuses in particular on financing the operating costs of MPAs, or MAR Fund. A forthcoming AFD/FFEM publication on trust funds will be a valuable resource for managers and other stakeholders in MPAs.

LESSONS LEARNED: trust funds are useful instruments for financing. However:

- They take a long time to set up and require significant co-funding (several millions, or ideally tens of millions of euro) before they can deliver sums substantial enough to provide real support for managing MPAs.

- It takes time and significant lobbying to attract financers. For example, the BioGuinée fund in Guinea-Bissau has still not managed to raise sufficient capital to properly support management of the country's MPAs, in particular in the Bijagos islands.

User testimony

María José González, Director of MAR Fund

The Mesoamerican Reef Fund (MAR Fund) is a private regional environmental fund dedicated to the conservation, restoration, and sustainable use of the Mesoamerican Reef. It was created from four existing funds: Fondo Mexicano para la Conservación de la Naturaleza (Mexico); *Protected Areas Conservation Trust (Belize); Fundación para la Conservación de los Recursos Naturales y Ambiente (Guatemala)* and *Fundación Biosfera (Honduras)*. One of MAR Fund's five programmes focuses on establishing a functional interconnected network of priority coastal and marine protection areas. It provides financial support to MPAs, for example through small grants. With support from the FFEM and KfW Development Bank, 97 small grants have been made to 18 coastal and marine protected areas (covering 1,247,316 hectares), 38 NGOs, 21 communities and 4 academic institutions. These grants represent a total value of USD 2,786,748, and have enabled USD 3,864,857 of match funding to be mobilised.

114. marfund.org 115. fapbm.org 116. bacomab.org

117. ibapgbissau.org 118. themedfund.org 119. caribbeanbiodiversityfund.org

"The FFEM is also supporting a new initiative bringing conservation trust funds (including those supported by the FFEM, such as the MedFund, MAR Fund and RedLAC) together with networks of MPA managers, as a global alliance for marine protection. This is intended to act as a global community of actors to support effectively managed, sustainably financed MPAs and support implementation of the post-2020 targets for MPAs."

Marie Romani, Executive Secretary, MedPAN

PAYMENTS FOR ECOSYSTEM SERVICES (PES)

PES are economic incentives, based on voluntary agreements, designed to modify the practices of those using an environment, to limit their negative impacts on their ecosystem or, alternatively, reward the ecosystem services they have generated.

A PES is a voluntary transaction where a user purchases a defined environmental service from ecosystem service providers, based on a payment that is made only if the provider delivers the expected service. The payment is designed to make users take into account in their decision-making the services provided by the ecosystem, by assigning these services an economic value. For example, payments from a service buyer to the occupants of territories producing water are intended to reward the efforts they make to preserve the ecosystem service of water supply.

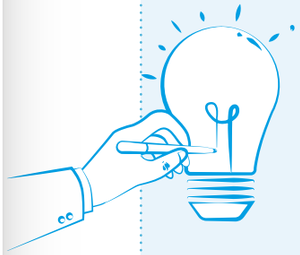
The European Union's payment of a subsidy taken from fees for fishing agreements with Mauritania and Guinea-Bissau, to replenish their respective trust funds for protection of their MPAs, can also be seen as a PES. These payments help to maintain the ecosystem service of fish production. Finally, in the COGITO project, a collaboration with *Blue Seeds*[120] to co-develop a public-private partnership project to make the eco-mooring system profitable is helping to provide long-term finance for the MPA. This project involves the diving club, the Kas-Kekova marina and the central government.[121]

COMPENSATION – CARBON FINANCE AND REDD+

The oceans and forests – including mangroves – are the two largest carbon reservoirs on the planet. "Blue carbon" and REDD+ are incentive schemes that attach an economic value to the carbon sequestered in these reservoirs. This means they provide an opportunity to generate carbon credits through projects to preserve carbon stores or to reduce greenhouse gas (GHG) emissions. These carbon credits are then purchased on the voluntary markets by companies, NGOs or individuals who want to offset their GHG emissions.

These mechanisms could potentially generate income to develop MPAs, through selling carbon credits for the carbon sequestered in mangroves and seagrass beds. In this way, they help to gain recognition for the role played by MPAs in mitigating the effects of climate change. MedPAN has conducted an assessment of the potential value of blue carbon sequestration by the Posidonia meadow in the planned Katic MPA, in Montenegro. A similar study is underway in the Banc d'Arguin national park. The Quirimbas II project also planned to implement a REDD+ project. In this context, companies such as Danone and Yves Rocher (or their foundations) have funded programmes to replant mangroves or forests, some of which are in or near MPAs (e.g. in Senegal, India and Indonesia).

120. blueseeds.org 121. See also: Payments for Ecosystem Services. From Theory to Practice - What Are the Prospects for Developing Countries? French Development Agency. A SAVOIR COLLECTION, NO 7.



Questions for the future
LET'S BRAINSTORM!

To make current and future projects as effective as possible, we must find ever more innovative solutions and learn from past mistakes and successes.
Coming together to share our thoughts about the issues raised should help us find the best answers to the questions below.

Capacity building

- **How can we sustain** the networks that have been built?
- **How can we move from training a few beneficiaries** to wide-scale knowledge sharing?
- **How can we identify/introduce tools tailored** to each context, target group and training objective?
- **What activities would practically enhance** the effectiveness of training?
- **How can we encourage the more adoption of sustainable practices** by users - especially fishing communities - in a world where the resource is shared?

Sustainable finance

- **How can we ensure** financial sustainability is looked for right from the outset of a support project?
- **How can we encourage managers** to consider sustainable financing of their MPA in good time, before they are forced to do so when resources run out?

4 Conclusion

© T. Clément

Oceans, seas and coastal areas play a crucial role in the major planetary cycles and provide essential ecosystem services. However, they are subject to great pressures and threatened by global changes. Faced with these threats, and to meet France's commitments under international biodiversity and climate agreements, the FFEM has for many years been involved in worldwide environmental preservation, both on land and in marine and coastal settings.

Currently, 7.5% of the world's seas are covered by protected areas, some way off the Aichi Biodiversity Target of 10%. At the same time, although there has been a significant expansion in marine protected areas (MPAs) over the past 20 years, many of these are inadequately managed and protection is far from guaranteed. This is why for over 20 years the FFEM, under its mandate for preservation and sustainable management of biodiversity and natural resources and protection of marine waters, has been working alongside MPA managers and governments in its areas of operation to support the creation and sustainable management of MPAs.

Capitalising and sharing experience are at the heart of the FFEM's mandate. This capitalisation around MPAs and the protection of marine biodiversity focused on issues relating to knowledge for management, the creation and management of MPAs, economic development within MPAs, building coastal resilience, and sustained support for MPAs. From the sample of around 40 FFEM projects (representing a total of EUR 50 million of support), the study sought to identify experience and good practices worth sharing, and to highlight how the FFEM has contributed to the many discussions on related topics: the level of knowledge needed for effective management, how management can be improved and sustained, how we can ensure sustainable development, and how to build the resilience of communities, coastal areas etc.

Ouvéa, New Caledonia. © T. Clément

Knowledge for management

To protect these areas effectively, we need to understand them. The FFEM has through various projects helped to advance knowledge of many of the world's eco-regions, in coastal environments or on the high seas, including in the Eastern and Western Pacific, Mesoamerica, the Caribbean, West Africa, the Mediterranean and the Indian Ocean. This knowledge has helped to identify areas of high ecological value to be prioritised for conservation, to guide management decisions in many MPAs, and to inform debate – both in France and worldwide – especially within the context of negotiating international agreements (biodiversity, climate, high seas). Many of the projects have also laid the foundations for surveillance networks, by establishing baselines allowing proper evaluation of the impact of protection efforts. However, a huge amount of work still needs to be done, particularly in the field of marine biodiversity and especially at the microscopic level and in the vast areas of the open seas beyond national jurisdictions. While knowledge about the environments is essential, so too is knowledge of the populations living in these MPAs. This capitalisation demonstrated the full importance of adapting management decisions to the local context, of fostering acceptance among local communities often highly dependent on these resources, and the difficulties of promoting conservation and development in parallel.

Sharing the knowledge acquired and feeding it back to local communities is a key factor in the success of MPAs. This raises community awareness of conservation issues and informs these communities about how protecting their environments and resources can lead to real shared development of directions for management and co-management.

This exercise also demonstrated weaknesses in projects, in terms of capitalising achievements, and the archiving of data and documentation. Numerous tools, many innovative, have been developed within the projects which merit sharing and scaling-up. There is thus significant scope for progress in this area and the FFEM has a critical role.

In terms of knowledge, and within ongoing budgetary constraints, several issues require attention in future FFEM projects: how to calibrate the right level of knowledge necessary for management, how to establish sufficiently robust baselines and monitoring and how to sustain these, and how to improve the transfer of knowledge.

Creation and sustainable management of MPAs

Many projects have focused on creating MPAs, but simply creating them is insufficient if they lack proper management and long-term monitoring. This capitalisation has shown how much the FFEM has helped to extend and support the sustainability of a number of MPAs, while trying to improve their management and so their performance. This has been done by supporting the development of management plans and business plans, and by establishing effective shared governance that involves local communities. The FFEM has also been innovative in its support for monitoring the management effectiveness of an MPA, in order to assess to what extent it is achieving its objectives. Examples include the compass card tool, which illustrated the progress made by many MPAs towards more effective management, and the MedFund tool. Surveillance, which is essential for achieving the objectives of an MPA, requires trained teams and sea-going - or even satellite - resources, at times quite significant. The FFEM has always been very invested in supporting surveillance undertaken by both communities and the state, and here too, new projects have a strong focus on innovative tools. In terms of management several issues need to be considered for future FFEM projects, such as how we can better prepare for withdrawal from a project, and how we can convince funding partners to work together over a longer term to ensure greater consistency in their approaches and that their activities are more complementary.

Coron Island, Philippines © T. Clément

Economic and social development, essential ally of conservation

Conservation goals must take into account the situations of the communities which live in, and are part of, these environments, particularly the fishers who are the principal stakeholders in many MPAs and whose involvement is often key to its effectiveness. The exercise has shown that FFEM projects attach increasing importance to the blue economy and the economic and social development of communities in MPAs, giving increasing focus to fishing in particular. MPAs also have onshore elements however, sometimes very extensive, where the communities live and other economic activities are being developed to support conservation, with industries that are becoming ever more robust. These include tourism where the site is suitable, while limiting its negative impacts[122] along with agriculture, livestock, aquaculture and harvesting in mangroves or forests. Managing the level of development of these activities often requires a delicate balance. It is important to

122. *Land acquisition, use of, and competition for, scarce resources such as water and soil, waste generation, impacts of infrastructure on landscape, etc.*

Ankivonjy MPA, Madagascar © C. Gabrié

ensure that these industries – by nature generally diverse, non-intensive and family-run – do not become industries whose development threatens the existence of the MPA and its communities (e.g. concreting of the coastline, extensive monoculture, high use of imported inputs, increasing land value or cultural shocks). The FFEM must continue to address these critical issues and to move even further towards a solidarity blue economy. Many issues remain yet to be resolved: How can we calibrate and enhance fishery management tools, no-take zones and local commercialisation of fishing produce, underpinned by robust and sustainable industries? How can we better involve migrant fishers in managing areas in which they work only intermittently? How can we ensure the robust and sustained development of economic activities and industries – including tourism – without causing significant and irreversible damage to the natural resources of the MPA and to the local culture?

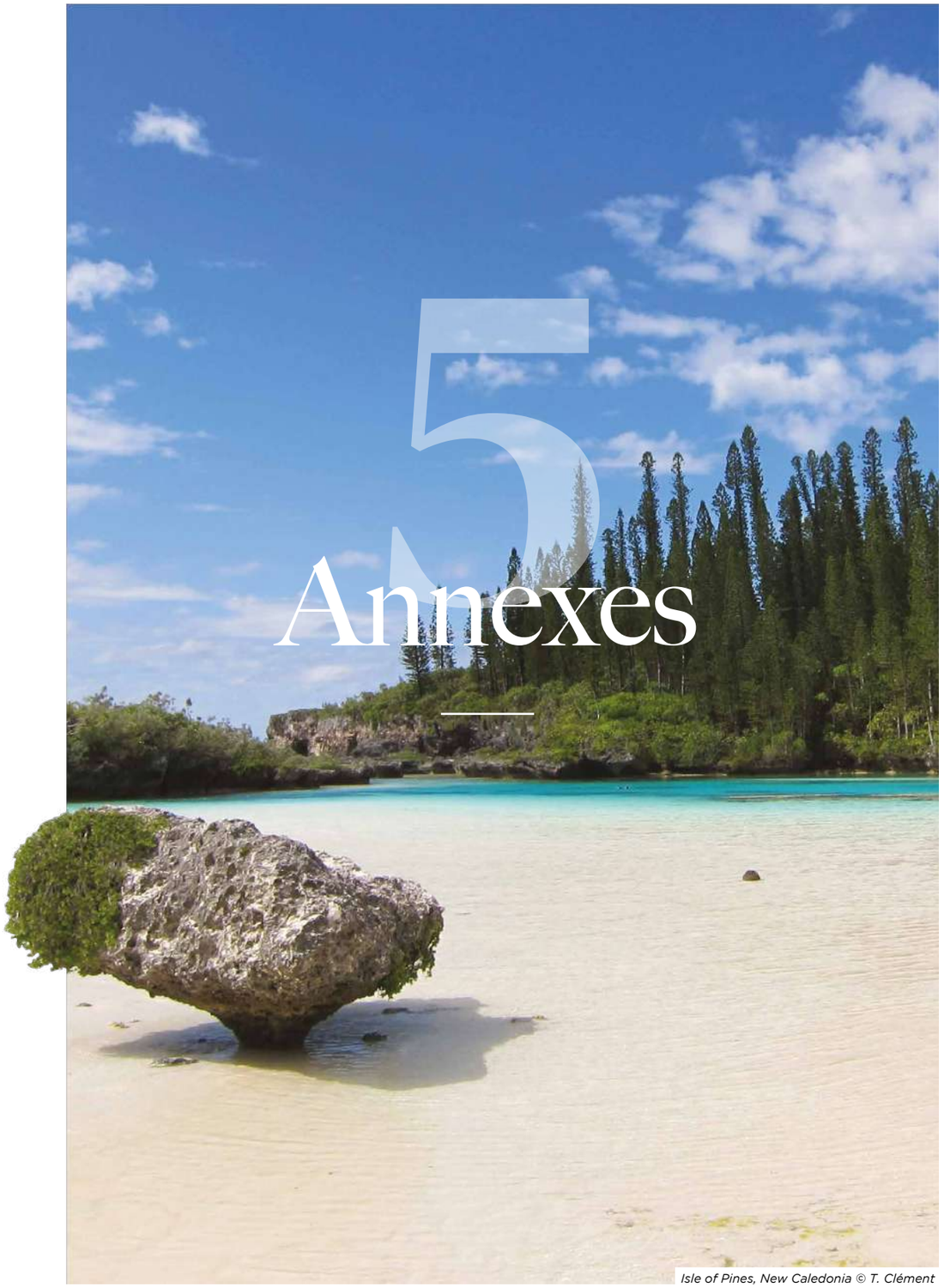
Resilience of coastlines and coastal areas

MPAs are part of regions far larger than just their own perimeter, extending out toward the high seas, along the coast, and upstream on the watersheds that feed into them. For more effective MPA management, we need a more integrated approach to these landscapes as a whole. The FFEM has accordingly financed several Integrated Coastal Zone Management (ICZM) projects, and less frequently Marine Spatial Planning (MSP) projects.

In addition to the coherence this brings to regional management, the approach reinforces the role played by MPAs in dealing with global changes, whether these be coastal ecosystems weakened by climate change, or ever-increasing anthropic pressures on ecosystems and natural resources. For tackling these challenges, the FFEM has shown through its projects the importance of drawing on nature-based solutions (NBS) which have proven effective for thousands of years. As part of the United Nations' Decade on Ecosystem Restoration (2021-2030), it is developing mangrove, reef and coastal restoration projects that seek to restore conditions favourable to natural regeneration, while also using increasingly innovative ecological engineering. These are topics for which plenty of questions still remain for the future, opening-up an important field for investigation and innovation: how, and with what tools (regulatory, governance, financial) can we better integrate MPAs into the overall management of their regions? How can we strengthen climate change adaptation strategies and build the resilience - particularly along coastlines - of natural resources and of all the economic sectors that support the MPA, and above all of the communities affected?

The sustainability of MPAs is a central concern. It is one thing to create an MPA (though not always straightforward), but quite another to keep it in place, operational and effectively protecting the ecosystems and living conditions of the populations. This is a central concern for all managers and funding partners of MPAs, since projects have only a certain duration and the MPA must survive after they have ended. To address these major challenges the FFEM is supporting projects in the inventorying, recording and sharing of expertise and good practices, and in developing collaborative approaches to build upon the skills and autonomy of those involved, particularly through networks of managers, learning networks, or peer exchange. It has also been heavily involved in mobilising more financial resources to cover proper operation of the MPA (at the very least, surveillance, management and activities). For example, the FFEM has helped to establish and support a number of trust funds in various parts of the world, and has supported the introduction of payments for environmental services (PES), forest finance (REDD+) and carbon finance. Finally, it has been involved in supporting and strengthening public policy, since only governments (and sometimes local authorities) have the means and the mandate to look after the commons and preserve them in the long run. These topics present critical questions for the future, which come down to the following: How can MPAs retain skilled teams in countries where these are rare and in much demand? How can we ensure remuneration for the ecosystem services provided by the MPAs? How can we direct revenue from international commercial agreements (e.g. fishing, oil and gas exploitation) towards MPAs to give them the resources to properly fulfil their role?

Through its support for MPAs in its areas of operation for over 20 years, the FFEM has made progress on several key topics to ensure that these MPAs function and have the desired environmental and socio-economic impacts. However, in terms of the major challenges faced by the planet's coastal and marine areas, and by the communities living there, this capitalisation shows how much work remains to be done, and the support needed to develop effective and replicable pilot projects that can be scaled-up. The FFEM should therefore pursue its commitment, while focusing on the specific nature of its interventions: prioritising innovation (particularly frugal innovation), and capitalising and sharing experience. It should also coordinate its support better with the strategies of other partners, to move towards ever more ecologically and socio-economically effective MPAs.



5 Annexes

Isle of Pines, New Caledonia © T. Clément

ANNEX 1 Glossary

A

ACCOBAMS: Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area

ACLED: Armed Conflict Location & Event Data Project

ADEPA: West African Association for the Development of Artisanal Fisheries

AFD: French Development Agency

AGRRA: Atlantic and Gulf Rapid Reef Assessment

AIGA: Alternative income-generating activity

APAL: Coastal Protection and Planning Agency (Tunisia)

B

BATAN: Bays of Ampasindava, Tsimipaika, Ambaro and Nosy Be (north-west Madagascar)

BBNJ: Biodiversity Beyond National Jurisdiction

BMMSY: Biomass-based multi-species maximum sustainable yield for coral reef fisheries

C

CARICOMP: Caribbean Coastal Marine Productivity

CBA: Cost Benefit Analysis

CBD: Convention on Biological Diversity

CBF: Caribbean Biodiversity Fund

CCFD-TS: Catholic Committee against hunger and for development – Terre Solidaire

CCP: Community Fisheries Council

CEN PACA: Conservatory of Natural Areas of Provence-Alpes-Côte d'Azur

CEPIA: Initiative to establish fisheries management incorporating MPAs

CETP: Central and Eastern Tropical Pacific

CLS: Collecte Localisation Satellites (satellite monitoring company)

CMAR: Eastern Tropical Pacific Marine Corridor

COVERAGE: CEOS (Committee on Earth Observation Satellites) Ocean Variables Enabling Research and Applications for GEO

D

DHS: Demographic and Health Survey

E

EEZ: Exclusive economic zone

EPOMEX: Centro de Ecologia, Pesquerias y Oceanografia del Golfo de Mexico

ESE: Ecosystem services evaluation

ESRAM: Ecosystem and Socio-economic Resilience Analysis and Mapping

EVES: Economic valuation of ecosystem services

F

FAD: Fish aggregating device

FAO: Food and Agriculture Organization of the United Nations

FAPBM: Madagascar Biodiversity Fund

FFEM: French Facility for Global Environment

FIBA/MAVA: Fondation internationale du Banc d'Arguin/ MAVA Foundation

FSRA: Fish stock recovery area

G

GBIF: Global Biodiversity Information Facility

GCRMN: Global Coral Reef Monitoring Network

GDZCOI: Project for sustainable management of coastal zones by the Indian Ocean Commission

GFCM: General Fisheries Commission for the Mediterranean

GHG: Greenhouse gas

H

HRI: Healthy Reefs Initiative

I

ICRAN: International Coral Reef Action Network

ICZM: Integrated Coastal Zone Management

IHSM: Institute of Marine Science, University of Toliara

IMCAM: Integrated Marine and Coastal Area Management

IMCS Network: International Monitoring, Control and Surveillance Network

IMET: Integrated Management Effectiveness Tool

INDC: Intended Nationally Determined Contribution

IndoCet: Indian Ocean Cetacean Consortium

INTEGRE: Pacific Territories Initiative for Regional Management of the Environment

InVEST: Integrated Valuation of Ecosystem Services and

Tradeoffs

IOC: Indian Ocean Commission

IOT: Indian Ocean Trepang

IPCC: Intergovernmental Panel on Climate Change

IPUMS: Integrated Public Use Microdata Series (originally, but no longer used as an acronym)

IRCP: Institute for Pacific Coral Reefs

IUCN: International Union for Conservation of Nature

IUU: Illegal, unreported and unregulated fishing

J

JMP: Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (WHO/UNICEF)

K

KOPA: Key Ocean Plankton Areas

L

LCCAP: Local climate change adaptation plan

LMMA: Locally managed marine area

M

MAPAMED: Marine Protected Areas in the Mediterranean (GIS database)

MAR Fish project: Knowledge, Monitoring and Protection of Mesoamerican Reef's Fish Spawning Aggregations

MAR Fund: Mesoamerican Reef Fund

MAR region: Mesoamerican Reef region: Belize, Guatemala, Honduras and Mexico

MARFIN: Financial instrument for the MAR region (Central America)

MCA: Multi-criteria analysis

MCPA: Marine and Coastal Protected Area

MedPAN: Mediterranean Protected Areas Network

MEDTRIX: Surveillance platform for Mediterranean coastal waters and ecosystems

MGEL: Marine Geospatial Ecology Lab (Duke University)

MICS: Multiple Indicator Cluster Survey

MNHN: French National Museum of Natural History

MOOC: Massive Open Online Course

MPA: Marine Protected Area

MSC: Marine Stewardship Council

MSP: Marine Spatial Planning

N

NASA: National Aeronautics and Space Administration

NDC: Nationally Determined Contribution

NEP: Project engagement note

NIP: Project identification note

NGO: Non-governmental organisation

NOCAMO: Integrated Management of the Marine and Coastal Resources of the Northern Mozambique Channel

NTZ: No-take zone

O

OECS: Organisation of Eastern Caribbean States

OHI: Ocean Health Index

OMZ: Oxygen minimum zone

OPAAL: OECS Protected Areas and Associated Livelihoods

P

PARTAGE: Project to support the management of transboundary artisanal fisheries

PCADDISM: Platform for consultation for sustainable development in Sainte Marie Island

PCC: Post-larval capture and culture

PEBACC: Pacific Ecosystems-based Adaptation to Climate Change

PES: Payments for ecosystem services

PGEM: Maritime area management plan

PHE: Population, health and environment

PIM Initiative: Initiative to preserve small Mediterranean islands

PISCO: Partnership for Interdisciplinary Studies of Coastal Oceans

PNBA: Banc d'Arguin national park

PNG: Gouraya national park

PNQ: Quirimbas national park

PPI: Small-scale Initiatives Programme

R

RAMPAO: Network of Marine Protected Areas in West Africa

RAMP-COI: Network of Marine Protected Areas in Indian Ocean Commission countries

RAPPAM tool: Rapid Assessment and Prioritization of Protected Areas Management

RECARGAO: Regional capacity building for fishery management in West Africa

REDD+: Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries

REDLAC: Regional Group on Risks, Emergencies and Disasters for Latin America and the Caribbean

RHI: Reef Health Index

S

SAC: Special area of conservation

SHAWIRI: Contact platform for professionals from the Comoros

SMART:
Specific, measurable, achievable, realistic and time-bound

SMILO: Small Islands Organisation (Sustainable Small Islands Initiative)

SMMA: Soufrière Marine Management Area

SOCMON: Socioeconomic Monitoring Initiative for Coastal Management

SPA/RAC: Specially Protected Areas Regional Activity Centre

SPC: Pacific Community (formerly the South Pacific Commission)

SRFC: Sub-Regional Fisheries Commission

SPREP: South Pacific Regional Environment Programme

SRP: Sulu-Reef Prosthesis

STR: Spatio-temporal restriction

SWIOFish: South West Indian Ocean Fisheries Governance and Shared Growth Project

U

UNCTAD: United Nations Conference on Trade and Development

UNEP: United Nations Environment Programme

UNESCO: United Nations Educational, Scientific and Cultural Organization

V

VRA: Vulnerability Reduction Assessment

W

WACA: West Africa Coastal Areas Management Program

WACOM: West African Coastal Observation Mission

WIO: Western Indian Ocean

WWF: World Wide Fund for Nature

ANNEX 2 Project list

PROJECTS IN PREVIOUS CAPITALISATION(2010)

CRISP: Coral Reef Initiative for the South Pacific

Cocos Island: Protecting biodiversity in the Cocos Marine Conservation Area

MAR: Conservation and sustainable use of coral reefs in the Mesoamerican Reef Eco-region

Mnazi Bay: Development of Mnazi Bay-Ruvuma Estuary Marine Park, Tanzania

Océanium/Narou Heuleuk: Preservation of fish resources by fishing communities Narou Heuleuk (tomorrow's share) project. Océanium project, Senegal

OPAAL-OECS: OECS Protected Areas and Associated Livelihoods

Quirimbas: Quirimbas national park development programme (Mozambique)

RAMP-COI: Network of Marine Protected Areas in Indian Ocean Commission countries

REI: Restoring island ecosystems: eradication of invasive alien species and reintroduction of threatened endemic species in the Seychelles

SAMPAN: Strengthening Andaman Marine Protected Areas Network (Thailand)

SMMA: Protection and enhancement of coral reefs in the Lesser Antilles. Soufrière Marine Management Area (SMMA) in St Lucia (Caribbean)

NEW PROJECTS

BIOCOS: Management of marine and coastal biodiversity in West Africa by strengthening conservation and monitoring initiatives in the MPAs

CNL Algeria: Project to support the National Coastal Commission (CNL) in Algeria

DiDEM: Dialogue between science and decision-makers for an integrated management of marine and coastal environments

GDZCOI: Contribution towards sustainable management and conservation of coastal zones in the south-west Indian Ocean: support for local innovations and partnerships

Indian Ocean seamounts: Conservation and sustainable exploitation of seamount ecosystems and hydrothermal vents in the south-west Indian Ocean, in areas beyond national jurisdiction

Mangroves Costa Rica/Benin: Restoration, conservation and sustainable management of mangroves in Costa Rica and Benin in the face of climate change

Mangroves Philippines: Strengthening coastal resilience to reduce disaster risk and adapt to climate change in small island territories, incorporating green and grey infrastructure (Philippines)

MAR Fish: Knowledge, monitoring and protection of Mesoamerican reef (MAR) spawning areas

MAR Fund: Establishing a sustainable finance fund for the network of marine and coastal protected areas in the Mesoamerican reef

MedPAN network strengthening (PPI1): Strengthening the network of managers of MPAs in the Mediterranean

MedPAN IMCAM (PPI2): Exemplary management of coastal, island and marine territories in the Mediterranean

MedPAN COGITO: Supporting the integrated and sustainable management of coastal territories, islands and maritime areas and MPAs in the Mediterranean

NOCAMO: Collaborative management of marine and coastal resources in the northern Mozambique Channel

PACIFICO: Ecological connectivity in the central and eastern tropical Pacific

PANGATALAN: For a sustainable development of the Shark Fin Bay Coral Triangle (Philippines)

PIM/SMILO: Sustainable Small Islands Initiative implementing an international approach to sustainable small island management and biodiversity protection

PIMFAO: Small initiatives and financial mechanisms for the conservation of marine and coastal biodiversity in West Africa

Quirimbas II: Climate change adaptation in the Quirimbas national park

RECOS: Increased resilience of coastal ecosystems in the Indian Ocean

RESCCUE: South Pacific regional cooperation project for the restoration of ecosystem services and adaptation to climate change

SARGADOM: Contributing to hybrid governance to protect and manage exceptional areas of the high seas: Thermal Dome and Sargasso Sea

Tara Oceans Oceanic plankton: Oceanic plankton, climate and development

The MedFund: Fund to support Mediterranean MPAs

WACA: Monitoring coastal risks and soft solutions in Benin, Senegal and Togo

AFD PROJECTS / FFEM PROJECT SUPPORT

Emerald Arc: Project to improve scientific understanding and effectiveness of management, development and ecotourism, together with long-term territorial integration of the three protected areas located around Libreville in Gabon

Hafafi: Project to manage three new MPAs in Madagascar as part of the Sectoral Innovation Facility for NGOs (FISONG) - Biodiversity and Development

Kobaby/BATAN: Project for natural resource conservation and sustainable economic development in the Diana region of Madagascar, through strengthening of its protected areas

Mohéli Marine Park (AFD) / GDZCOI (FFEM): Support for Mohéli Marine Park

PROJECTS UNDER DEVELOPMENT

COBI: Blue innovation project for adaptation of fishing communities and resilience of marine ecosystems in Mexico

Mangroves MPA: Project to restore and conserve mangroves in the Siné Saloum Delta and in Casamance, with a view to their capitalisation to support the creation of new MPAs in Senegal

SRFC/CEPIA (AFD) / BIOCOS (FFEM): Supporting the SRFC to develop co-management initiatives and include MPAs in fisheries planning in West Africa

PEBAC ++: Climate change adaptation focusing on ecosystems in the Pacific Islands

ANNEX 3 Bibliography

Asch R.G., Erisman B., 2018. *Spawning aggregations act as a bottleneck influencing climate change impacts on a critically endangered reef fish.* Diversity and Distributions. doi.org/10.1111/ddi.12809

Claudet J., Loiseau C., Pebayle A., 2021. *Critical gaps in the protection of the second largest exclusive economic zone in the world.* Marine Policy 124: 104379.

Comley J., Rochette J., 2015. *Integrated coastal area management plans: critical review and recommendations for Pacific Island countries and territories* SPC/RESCCUE Report

De la Torre et al., 2014 in Ewan Trégarot et al. *Évaluation des services écosystémiques du Banc d'Arguin, Mauritanie: rapport final 2018*

Di Franco A., Bodilis P., Piante C., Di Carlo G., Thiriet P., Francour P., Guidetti P., 2014. *Fishermen engagement, a key element to the success of artisanal fisheries management in Mediterranean marine protected areas.* MedPAN North Project. WWF France. 135 pp.

Di Lorenzo M, Guidetti P, Di Franco A, Calò A, Claudet J., 2020. *Assessing spillover from Marine Protected Areas and its drivers: a meta-analytical approach.* Fish and Fisheries 21: 906-915

FAO, 2012. *Fisheries Management. 4. Marine protected areas and fisheries. FAO Technical Guidelines for Responsible Fisheries.* No. 4, Suppl. 4, Rome, FAO. 2012. 206 pp. Roberts et al., 2000, 2001

Gabrié C., 2011. *CRISP: Conservation, management, and development of coral reefs in the Pacific: building on the results of six years of research, collaboration and education.* AFD FFEM Report

Gabrié C., Clément T., Mercier J.R., You H., 2010. *Marine Protected Areas – Capitalisation of FFEM's cofinanced project experiences.* AFD Report. 175 pp.

Garcia S.M., Boncoeur J., Gascuel D., 2013. *Les aires marines protégées et la pêche Bioécologie, socioéconomie et gouvernance: Presses Universitaires de Perpignan.* 9782354121884. hal-01904070

Garcia S.M., Gascuel D., Henichart L-M., Boncoeur J., Alban F., de Monbrison D., 2013. *Marine protected areas in fisheries management: Synthesis on the state of the art.* Sub-Regional Fisheries Commission SRFC/AFD.

Gattuso J.P. et al., 2018. *Ocean Solutions to Address Climate Change and Its Effects on Marine Ecosystems. Front . Mar. Sci., 04 October 2018.* doi.org/10.3389/fmars.2018.00337

GRET, 2018. *Savoir écologique local, dynamiques socio-écologiques, et implications pour la gestion des ressources marines à Sainte-Marie* . Report on the GDZCOI project, Madagascar. 48p.

Habasque J., Bachiri F., Ben Mhamed A., Boncoeur J., Brind'amour A., Tito de Morais L., Weigel J-Y., Laë R., 2012 *Guide d'utilisation du programme de calcul des indicateurs socio-économiques, bio-écologiques et de gouvernance des AMPs* . Internal document, AMPHORE, December 2012 version. 54 pp.

Henocque Y., 2018. *Plans de gestion intégrée des zones côtières des États et territoires insulaires océaniens: guide de bonnes pratiques. Capitalisation of experiences acquired on pilot sites for the INTEGRE and RESCCUE projects.* SPC INTEGRE/RESCCUE Report. 43 pp.

Hubert A., 2008. *Utilisation de la perception des pêcheurs dans la gestion participative des ressources: é tude de cas à Navakavu (Fidji)* . Master's thesis, IRD Unité CoReUs/Ecole Nationale Supérieure Agronomique de Rennes, 49 pp. MAVA, 2016.

Gestion de la Biodiversité Marine et Côtière Ouest Africaine par le Renforcement des Initiatives de Conservation et de Suivi dans les Aires Marines Protégées (BioCoS) . Final technical report.

McClanahan T.R., Muthiga N.A., 2015. *Impact of climate change and adaptation strategy for the coral reefs of Quirimbas National Park.* Report by Wildlife Conservation Society, Mombasa, Kenya. 30 pp.

MedPAN, 2014. Regional experience-sharing workshop of the MedPAN network. Monitoring for managing Mediterranean MPAs (2014, Tirana, Albania)

Montbrison et al. , 2021. *Guide méthodologique pour la construction d'un contrat de baie* . FFEM publication.

Polunin N.V.C., 2002. *Marine Protected Areas, Fish and Fisheries in Handbook of Fish Biology and Fisheries.* doi.org/10.1002/9780470693919.ch14

Quesne G., Belvaux E., Gabrié C., Castellanet C., Fétiveau J., 2018. *Evaluation of the AFD "Protected Area" conservation and development intervention contributions (2000-2017). [Synthesis of the final report available in English].* AFD Report. 175 pp.

Quesne G., Spergel, Besancon C., Gabrié C., Staub F., 2020. *Étude sur les besoins financiers et l'efficacité de la gestion des AMP Méditerranéennes* . MedFund Report.

Roberts C.M. and Hawkins J.P., 2000. *Fully-protected marine reserves: A guide*

Roberts C.M., Hawkins J.P., Gell F.R., 2005. *The role of marine reserves in achieving sustainable fisheries.* Philosophical Transactions of The Royal Society B, Biological Sciences 360 (1453):123-32

Roberts C.M. et al., 2001. *Effects of marine reserves on adjacent fisheries.* Science 294 (5548): 1920-3

Rodríguez-Rodríguez, D. 2016. *MPAs as sustainable fisheries tools* MedPAN. Marseille, France. https://www.researchgate.net/publication/350176759_MPAs_as_sustainable_fisheries_tools

Sadio O., 2015. *Évaluation de l'efficacité des Aires Marines Protégées comme outil de restauration des ressources marines et de gestion des stocks halieutiques: l'expérience ouest africaine* . PhD thesis, Université de Bretagne Occidental (UBO).

Staples D., Funge-Smith S., 2009. *Ecosystem approach to fisheries and aquaculture: Implementing the FAO Code of Conduct for Responsible Fisheries.* FAO.

Tous P., Bailleux R., Sidibé A. L., Tito de Morais L. *Quels indicateurs pour apprécier le rôle des AMP dans la gestion des pêches ?* Workshop presentation

UNCTAD, 2018. *Blue BioTrade: Harnessing Marine Trade to Support Ecological Sustainability and Economic Equity.*

UNCTAD, 2017. *BioTrade Principles and Criteria for terrestrial, marine and other aquatic biodiversity-based products and services*

Weigel J-Y., de Monbrison D., Giron Y., Fossi A., Diop H.., 2013. *Etat de l'art sur la cogestion des pêches: synthèse mondiale, expérience, enseignements.* SRFC workshop, Dakar, Senegal. 30 pp.

Wickel J., 2008. *L'effet-réserve en milieu marin tropical: Synthèse des connaissances internationales et bilan des suivis écologiques effectués sur les récifs coralliens protégés de l'Outre-mer français.* Ifrecor report. ifrecor-doc.fr/items/show/1220

WWF México/Centroamérica, 2006. *Mejores practicas de pesca en arrecifes coralinos, Guía para la colecta de información que apoye el Manejo de Pesquerías Basado en Ecosistemas.* 82 pp. http://pdf.usaid.gov/pdf_docs/PNADI184.pdf

Shin Y.J., 2017. *Scenarios et modèles écosystémiques en support à l'approche écosystémique des pêches* . Les ateliers de l'association française d'halieutique

Zupan M. et al, 2018. *Marine partially protected areas: drivers of ecological effectiveness. Frontiers in Ecology and the Environment 16(7)*

ANNEX 4 The compass card: a tool for representing the performance of each MPA and evaluating its management effectiveness

Whatever their origin, size, location, and composition, all MPAs have many features in common in how they are created and managed. So much so, that this pathway can be represented in a generic format. Excepting a few very rare instances, every MPA must follow this trajectory toward three ultimate objectives (although these often take years, or even decades, to achieve):

- to provide real protection for the spaces and resources concerned, and demonstrate this;
- to enable the sustainable economic and social development of communities living in these spaces, and of these resources, and demonstrate this;
- to achieve technical, financial and institutional autonomy for the entity managing the MPA.

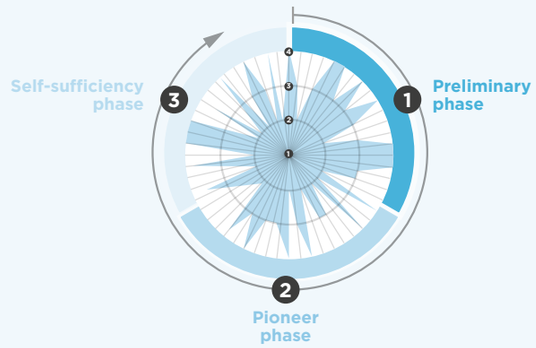
By providing systematic review of the success conditions for an MPA project, the tool has two main uses:

- providing simple visual representation of the MPA's performance right from its creation, up to when the tool was used;
- assessing the effectiveness of its management.

The principle of the tool is that the process of creating and managing an MPA can be divided into three main sequential phases: 1. preliminary, 2. pioneer, 3. self-sufficiency.

The representation takes the form of a circle (using the radar chart function in Excel), with the start at 12:00 (top of the chart), the phases progressing clockwise. The further an MPA has progressed in its development, the further round the circle the chart is filled in. If only recently created, and/or has made little progress, the chart is less filled-in.

Schematic representation of the sequential phases on the compass card



The three phases of MPA progress

- **Phase 1, the "preliminary" or creation phase**, covers all the work of establishing an MPA (this could be seen as like laying the foundations of a building). The criteria relating to this phase allow the quality of the MPA setting-up to be assessed.
- **Phase 2, the "pioneer" phase**, covers implementation and consolidation of the MPA. This could be seen as the launch phase or "adolescence" of the MPA.
- **Phase 3, the "self-sufficiency" or "sustainability" phase**, follows the pioneer stage. This is considered successful if there are visible benefits (e.g. on the natural and economic environment, quality of governance, changes to practices etc.), if these benefits are maintained or even improved, and if the whole is functioning without external support (without of course ruling out the potential for occasional support).

Each of these phases is broken down into a series of criteria, which receive a standard rating from (0) not done, to (1) started, (2) well advanced, or (3) fully completed or achieved.

Compass card indicators per phase

PRELIMINARY PHASE

- Identify areas of ecological interest
- Identify stakeholders concerned
- Identify pressures and threats, including climate change, oil, etc.
- Identify areas to be protected
- Establish management rules for the MPA
- Identify potential financing for the MPA
- Identify development projects to link to the MPA project
- Identify benefit-sharing rules for the MPA
- Identify and approach regional MPA network
- Provision of information and awareness-raising for stakeholders
- Ownership of the project by stakeholders
- Ownership of the project by the authorities
- Prepare base data for a business plan
- Establish management teams for the MPA
- Procure equipment to operate the MPA
- Establish a management committee
- Establish a surveillance committee
- Officially document creation of the MPA

PIONEER PHASE

- Mark out MPA boundaries (possibly on marine chart, if not physically possible)
- Launch MPA management
- Launch MPA stewardship
- Join a regional MPA network
- Implement projects to finance the MPA

- Implement development actions linked to the MPA conservation project
- Baseline inventory of natural resources
- Baseline socio-economic status
- Identify measures to improve the MPA's resilience to climate change
- Identify measures in relation to risks of exploitation for oil, gas, minerals, etc.
- Capacity building for MPA management teams
- Maintain and enhance MPA equipment
- Capacity building for MPA members
- Support for MPA manager where faced with stakeholder pressure and infringements (attempted corruption)
- Finalise business plan
- Finalise and approve management plan
- Setting-up of bank account and/or accounting system for the MPA
- Inform stakeholders about MPA management rules
- Publicly communicate MPA management rules
- Regular village and/or sectoral committees
- Regular management committees
- Publication of MPA accounts to management committee
- Monitor and evaluate project activities (compass card)
- Start of monitoring of ecological impacts of MPA, in partnership with research community
- Start of monitoring of economic impacts of MPA, in partnership with research community
- Extent of management plan implementation

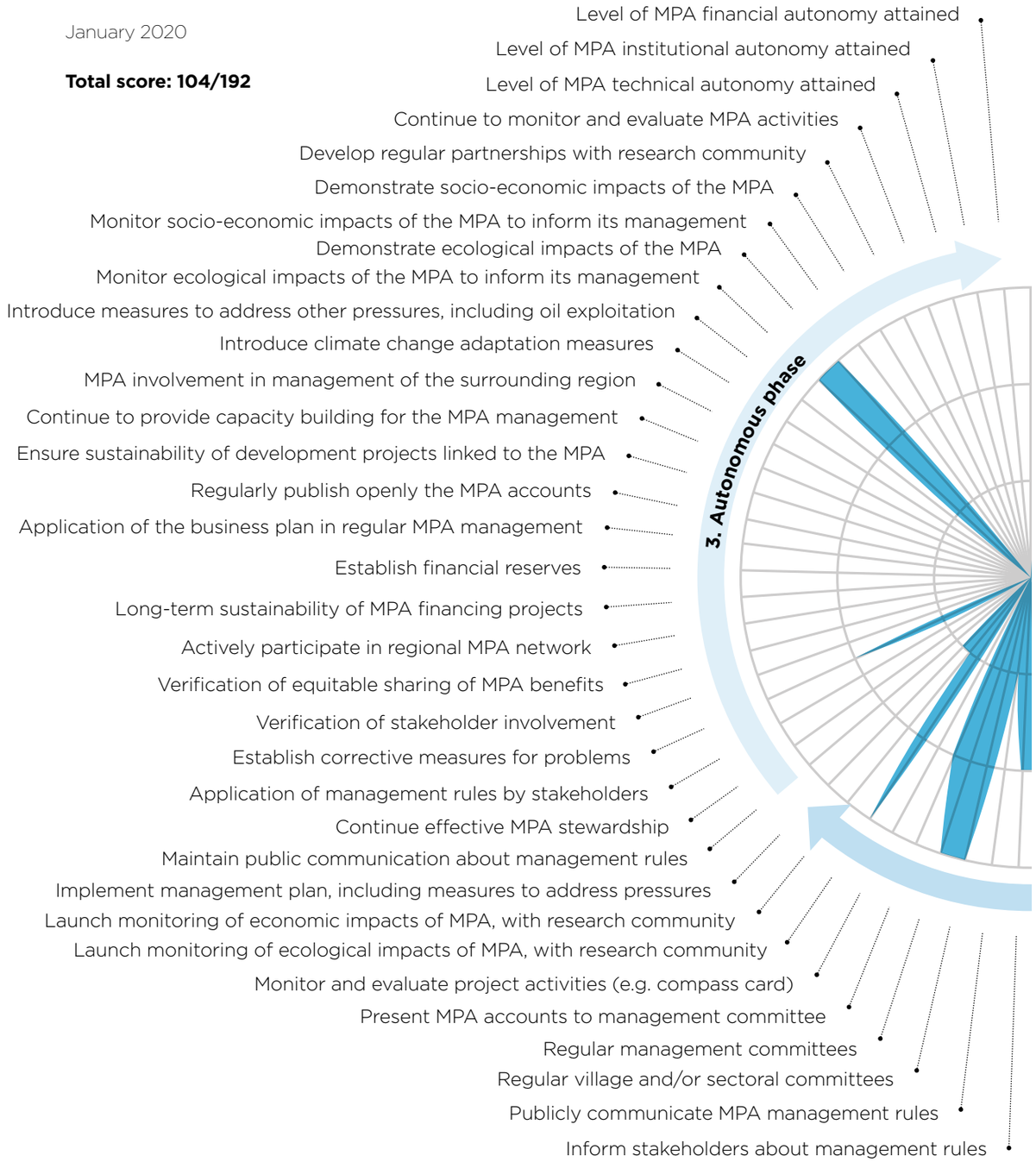
AUTONOMOUS PHASE

- Maintain public communication about management rules
- Continue effective MPA stewardship
- Ensure stakeholders follow management rules
- Establish corrective measures for any MPA problems (operation, relationship with stakeholders, etc.)
- Verification of stakeholder involvement through meetings, awareness-raising, etc.
- Verification of equitable sharing of MPA benefits
- Active participation in regional MPA network
- Long-term sustainability of MPA financing projects
- Establish financial reserves
- Application of the business plan in regular MPA management
- Regular publication of MPA accounts to ensure full transparency
- Long-term sustainability of MPA-related development projects complementary to conservation
- Continue management capacity building for MPA stakeholders (MPA team, management committee, etc.)
- Continue to support manager to handle stakeholder pressure and infringements (attempted corruption)
- MPA involvement in management of the surrounding region
- Introduction of climate change adaptation and resilience measures to the MPA
- Introduction of measures to address other pressures, including exploitation for oil, gas, minerals, etc.
- Monitor ecological impacts of the MPA, to inform its management
- Demonstrate ecological impacts of the MPA
- Monitor socio-economic impacts of the MPA, to inform its management
- Demonstrate socio-economic impacts of the MPA
- Develop regular partnerships with research community, particularly for ecological and economic monitoring
- Continue to monitor and evaluate MPA activities (compass card)
- Level of MPA technical autonomy attained
- Level of MPA institutional autonomy attained
- Level of MPA financial autonomy attained

Compass card for the BAMBOUNG MPA

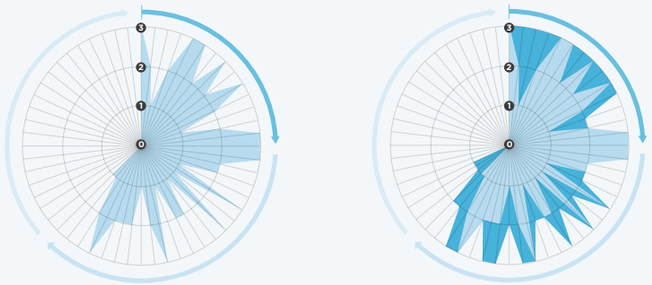
January 2020

Total score: 104/192



The tool is therefore a way of representing an MPA at a point in time (t), but also of monitoring it over time by superimposing the charts for two time periods and comparing the results.

Example of compass cards illustrating the progress of an MPA over time



Year T1 + Year T2

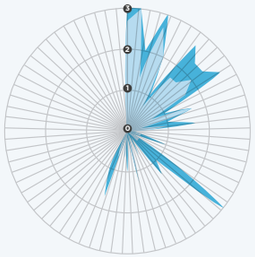
It is also possible to create averaged compass cards, for example to represent a group of MPAs receiving the same support (e.g. Mangrove MPA project, BIOCOS MPA). These can all be created simply from a pre-programmed Excel spreadsheet.

This approach provides a generic tool for assessing how effectively an MPA is being managed, and how well it is performing. The tool enables us to see at a glance where weaknesses need correcting, visible as "troughs" on the compass card.

This can therefore also be used as a basis for designing a roadmap to improving MPA management and making the process more robust.

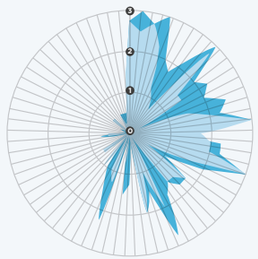
"CREATION" COMPASS CARD

Example of an averaged compass card for the support of a group of MPAs during creation



"CONSOLIDATION" COMPASS CARD

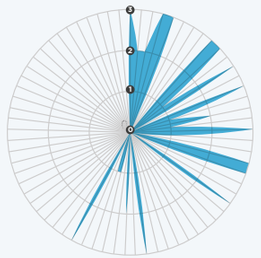
Example of an averaged compass card for support of an existing group of MPAs



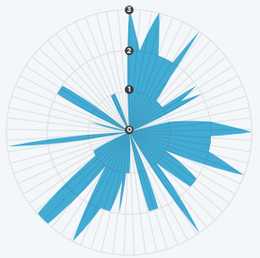
average 2008
average 2011

Examples of compass card profiles, ranging from poorly-performing MPAs to strongly performing ones

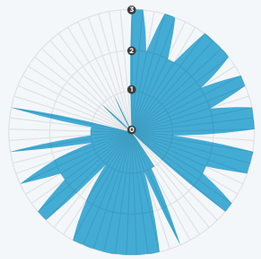
LOS ISLANDS GUINEA



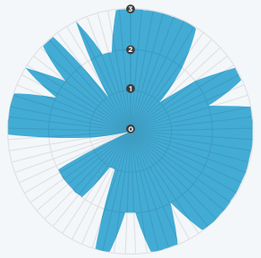
PONGARA NATIONAL PARK GABON



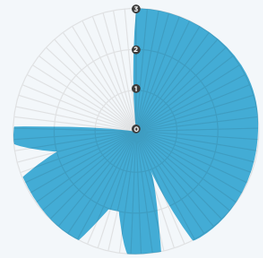
ORANGO NATIONAL PARK GUINEA-BISSAU



ANKIVONJY MADAGASCAR



ENTRECASTEAUX REEFS NEW CALEDONIA



“Over more than 30 years, we have witnessed the creation of many MPAs and the development of existing ones. Over this period, we have noted a significant shift in approach, from narrow conservation perspective towards shared management, with increasing involvement of local populations and operators, with a particular focus on fishers. There has been a shift from conservation-centric approaches to projects that increasingly tie-in local development and open-up the MPAs to their surrounding environments (e.g. watersheds, adjacent coastal areas). We have seen a growing interest in exchanges and transfers of experience between sites and between communities, along with the emergence and development of increasingly-active diverse practitioner networks, employing ever more innovative methods. Despite the huge efforts still needed, the results achieved remain encouraging and show that MPAs are useful tools for managing biodiversity and marine and coastal resources, and that – subject to receiving further support – they can contribute to local development in their regions. At a time when humanity is facing increasingly numerous and serious challenges, it is clear to us that the FFEM, which has been making progress in this area for over 20 years, should maintain and increase its efforts to produce ever more innovative pilot projects that can then be replicated at much larger scale, with the support of its partners.“

Thierry Clément

An agronomist and forestry expert by training, Thierry Clément has been working in the sustainable management of natural resources for over 45 years within Oréade-Brèche, the consultancy firm he founded. He took an interest in protected areas - particularly MPAs - very early in his career. He has been working on these sites for over 25 years, with a particular focus on their sustainable management and on measuring the effectiveness of this management in environmental, social and economic terms.

Catherine Gabrié

Catherine Gabrié has a PhD in oceanography, and has been working in the protection and management of marine and coastal habitats for many years, specialising in coral reefs. She has been involved in numerous projects creating, managing and evaluating MPAs, including for the FFEM and AFD, in many parts of the world (including the Pacific, Mesoamerica, the Indian Ocean, West and East Africa).

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