The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden

PERSGA

Guideline for The Management of Marine Protected Areas

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The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden

Guidelines for the Management of Marine Protected Areas

Strategic Ecosystem Management of the Red Sea and Gulf of Aden

2016

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Preface:

By protecting habitats, marine protected areas(MPAs) safeguard the vital life-support processes of the sea — photosynthesis, movement of nutrients, maintenance of food chains, productivity, and the degradation of pollutants. Hence they protect both biological biodiversity and water quality. The protection of marine habitats in their natural state provides an essential foundation for sustainable nature-based tourism, which is becoming a world industry and provides major benefits to local communities.

Every MPA needs a management plan. The best management plans are a combination of conservation and business plans prepared through a joint consultation process incorporating MPA management bodies, local stakeholders, government and business leaders, conservation groups and other NGOs, marine tourism companies, fishermen, researchers and members of local communities. The management plan sets out the species and ecosystems to be protected, the research and educational programs, the zoning of the area to enable and restrict certain uses and the degree of protection for each, the management and enforcement regime, and the schedule for periodic monitoring and review. A management plan should elaborate its conservation goals and assign tasks to those involved. As with a business plan, it should have a budget and specify how funds will be appropriated and spent. Finally, a management plan must say how it will address threats to species and ecosystems, not only in the MPA but in the overall region as part of ecosystem-based management.

The aim of these guidelines is to help PERSGA countries manage their marine protected areas as a key component of the integrated management of their coastal and marine areas and as part of their overall sustainable development .Creation and effective management of MPAs has lagged behind those of protected areas on land, but are just as important. MPAs are a vital part of broader programs to conserve the marine heritage and life-support system of the world, and to ensure that where living marine resources are used, that use can be sustained ecologically. The PERSGA region urgently needs a comprehensive and efficient system of MPAs to conserve biodiversity and to help rebuild the productivity of the Red Sea and Gulf of Aden.

Table of Contents

1. Background

Each MPA should have a Management Plan that is designed to ensure that the objectives are effectively achieved. The way in which the Plan is prepared, its content and its presentation all affect the extent to which it is useful.

The Management Plan is the main tool to guide the development and management of a protected area and all MPAs should have one. It helps to:

- Improve use of human and financial resources, by setting priorities
- Provide continuity in case of staff changes
- Increase accountability both at the level of the MPA itself and the management agency
- Improve communication with stakeholders, the public, and potential donors
- Ensure that management decisions are based on a clear understanding of the MPA's objectives

Management Plans have tended to be 'issue-driven', or focused on issues that were important when they were prepared. A more useful approach is for a Plan to answer the question 'what is needed for the objectives of the MPA to be met?' Objective-oriented management is proactive rather than reactive, emphasizes outcomes, and makes progress easier to measure.

Most protected area agencies are required by law or policy directive to produce and implement Management Plans, and the format, content and process may be defined in the legislation. Management agencies should aim to promote a common approach and format for the Plans for all MPAs under their mandate, in order to harmonize

objectives, facilitates comparison between sites, and streamline planning and reviewing procedures. However, each MPA is unique and its Management Plan must be designed specifically to address its own needs. Where an MPA has an international or other specific designation (e.g. World Heritage Site), the Plan should address this and may require a particular format. Some Management Plans have the status of legal documents, in which case failure to manage an MPA in accordance with it may constitute an offence. Although this may seem stringent, legally binding Plans are advantageous as they have greater force and help to backup management decisions and actions.

Once the plan and any supporting documents are produced, they should be used to *guide implementation of the MPA management*, and monitoring programs should be designed to assess their effectiveness. Plans are often not used or are difficult to implement, particularly if they were prepared without the participation of all those involved in implementation, or if they were poorly structured and written. Management Plans should be revised and adjusted at intervals to reflect new issues, lessons learnt or changes in management objectives, adapting the contents according to any new information gained from monitoring. The review process is usually laid out in the legislation or in the Plan itself.

2. Marine Protected Areas Management Plan

2.1. Definitions

A "goal"

- A broad statement of what the MPA is trying to achieve
- A goal is a qualitative (or non-numeric) outcome that is difficult to measure or quantify, but "you'll know it when you see it"
- Simple to understand and communicate
- Written as the present tense some years from now (e.g. "Local aquatic habitats will be protected") or as an unspecified or indefinite endpoint (e.g. "To improve the environmental quality of local aquatic habitats")

An "objective"

- A specific measurable statement of what must be accomplished to achieve a specific goal
- Usually two or more objectives are involved in attaining one goal
- Should describe the intended impacts, or results of the program on participants and/or the issue. In other words it should be written in terms of **what** will be accomplished, not how to do it
- An effective outcome should be defined within a limited time period, and be achievable

Being "strategic"

This means response preparation. Strategic planning involves preparing the best way to respond to the circumstances of the organization's environment, whether or not its circumstances are known in advance; organizations must often respond to dynamic and even hostile environments. Being strategic, then, means:

- Being clear about the organization's objectives
- Being aware of the organization's resources, and
- Incorporating both to be responsive to a dynamic environment

Strategic planning

Strategic planning is a disciplined effort to produce fundamental decisions and actions that shape and guide what an organization is, what it does, and why it does it,

with a focus on the future. Strategic planning can be used to determine the mission, vision, values, goals, objectives, roles and responsibilities, timelines, and so on. Strategic planning is necessary because:

- It helps an organization do a better job
- It helps an organization focus its energy
- It helps ensure that all members of an organization are working toward the same goals
- It helps the organization adjust its direction in response to a changing environment

A strategy must be realistic, action oriented, and understood through all spheres of management.

A strategy must be more than a cluster of ideas in the minds of a few decision makers. Rather, the concepts must be disseminated and understood by all managers.

Management plan

Planning involves intentionally setting goals (i.e., choosing a desired future) and developing an approach to achieving those goals.

- Setting goals (i.e., choosing a desired future)
- Having an approach to achieve those goals

Operational Planning

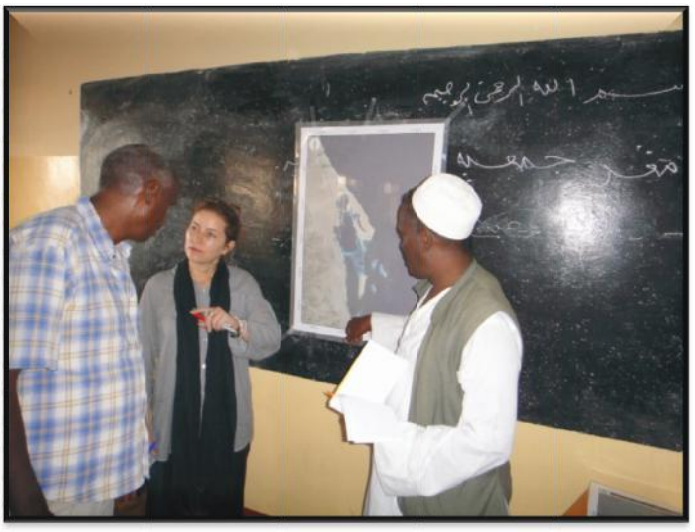
Operational planning is an effort to set direction and steps to achieve on-site management actions. Operational planning dictates localized, day-to-day operations (e.g., building a walkway/fence, cleaning up debris, issuing permits, etc.); it details where and how operations will be carried out; and it contains details on site design, scheduling of works, and cost.

Co-management

Co-management is defined as “a situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management functions, entitlements and responsibilities for a given territory, area or set of natural resources(Borrini-Feyerabend *et al.,* 2004). Community-based management (CBM) is a central element of co-management.

2.2. MPA management planning process

2.2.1. Section objectives



- To understand the steps and the key factors for establishing an effective management plan
- To understand the role of the community in managing MPAs
- To understand agency-community co-management and the pros and cons for each type
- To establish a table of contents for a management plan

2.2.2. An effective management plan

One that:

- Supports the organization's goals
- Has the support of stakeholders
- Is realistic to achieve given the resources available
- Has a way to measure progress towards outcomes
- Addresses key environmental, economic and social issues
- Is concise and easily read by staff, stakeholders and funders
- Involved stakeholders and interest groups in its development
- Is flexible enough to address changes in understanding or situations

2.2.3. Steps to develop effective management planning

An Assessment Phase provides much of the information used in the current and emerging issues section as well as the background section of the plan.

Steps for Developing Effective Management Plans:

- Declaration document
- Legal base (national and international)
- Organization goals
- MPA benefits provide for sectors and stakeholders interests
- Available scientific data and reports

Step 1

Documentation (review)

- Status of the living and non-living resources
- Local community (history, interests and profile)
- Current uses and impacts on the natural resources
- Future development trends, expected impacts and mitigation plan

Step 2

Data gathering

- Key stakeholders
- Management partners
- Overlapping, competition and conflicts of use
- Management plan consultation committee

Step 3

Define & identify

- Law enforcement
- Monitoring and research
- Zoning plan (core areas, restricted uses/areas, regulated areas/uses, buffer areas)
- Community participation
- Visitation plan

Step 4

Analyze the plan (analyze & define)

- Strengths and weakness
- Opportunities and threats
- Cost-Benefit analysis

Step 5

Develop goals & objectives

- Institutional/organization structure for the MPA
- Staffing (numbers and capabilities)
- Facilities, equipment and supplies
- Revenue, expenditures and funds (business plan)
- Community benefits

Step 6

Identify key activities & outputs

- Short, mid and long term outcomes
- Biological, socio economic and governmental objectives

Step 7

Identify required resources for implementation

- Biological and socioeconomic indicators
- Evaluation steps based on goals and objectives

Step 8

Develop evaluation plan (address)

- See the proposed table of contents

Step 9

Write the plan

<u>Distribute the plan to:</u>

- Key stakeholders
- Agencies/organizations
- Funders
- Partners
- User groups
- Staff
- Awareness campaign to introduce the plan

Step 10

Distribute & use the plan

2.3. Community participation in MPA management planning

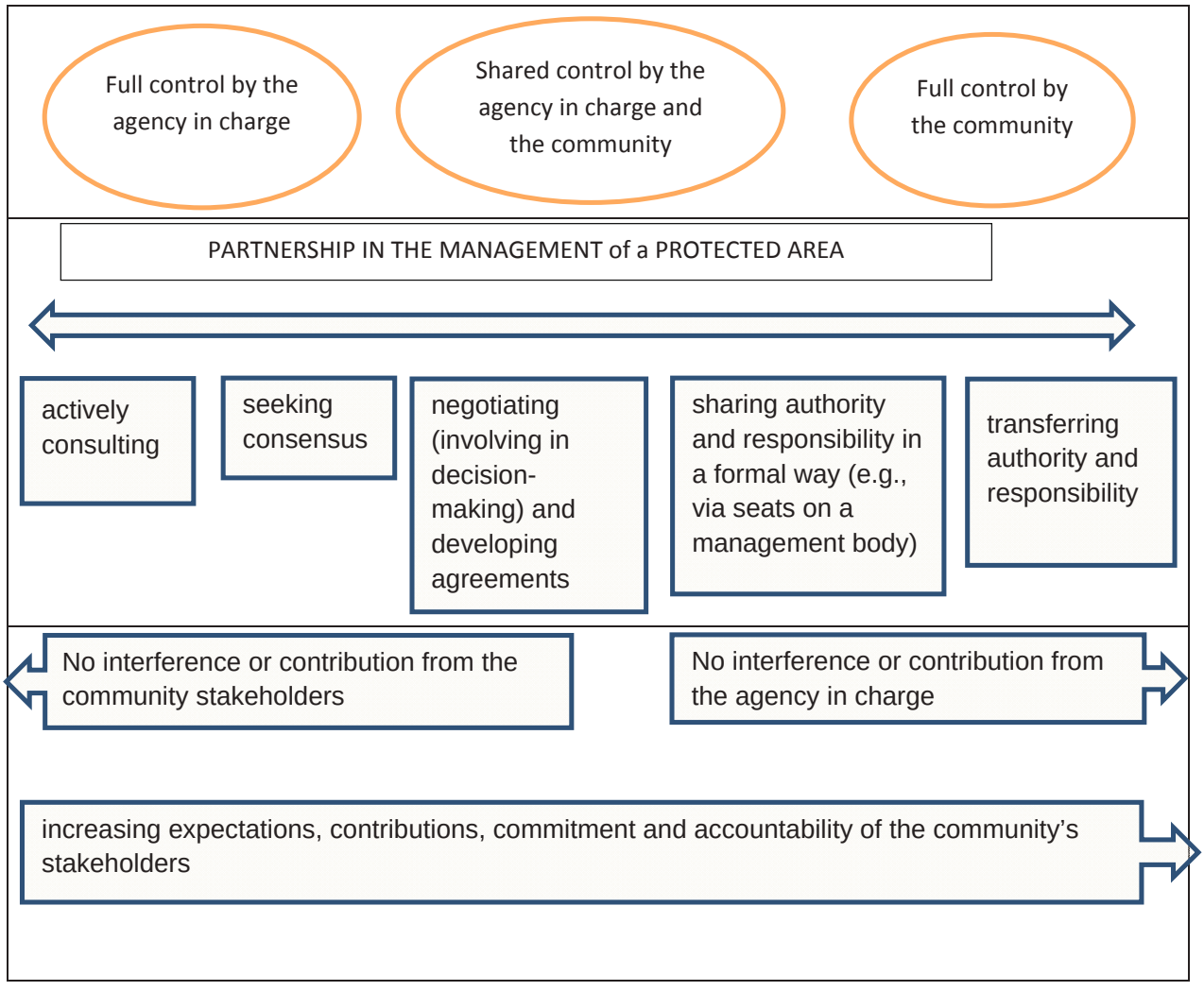
2.3.1. Community and stakeholders

The term “community” can have several meanings. Community can be defined geographically by political or resource boundaries, or socially as a community of individuals with common interests. For example, the geographical community is usually a village political unit (the lowest governmental administrative unit), such as Mohammed Gol or Dungonab villages near Port Sudan (Sudan) and Qolaan Village near Wadi ElGemal (Egypt); a social community may be a group of fishers using the same fishing gear or a fisher organization. A community is not necessarily a village, and a village is not necessarily a community. Care should also be taken not to assume that a community is a homogeneous unit, as there will often be different interests in a community based on gender, class, ethnicity and economics. Recently, the term “virtual community” or “community of interest” has been applied to non-geographically based communities of fishers. Similar to the “social community”, this is a group of fishers who, while they do not live in a single geographical community, use similar gear or target the same fish species or have a common interest in a particular fishery.

The term “stakeholders” may also aggregate people with disregard for their differential needs and interests. Stakeholders as only the direct users of the coastal resources, is a limiting concept. The non-recognition of women as direct users because they are not fishers (in the traditional sense) has resulted in their limited access, participation and benefits in coastal resource management projects and similar interventions focused on fisheries.

2.3.2.Partnershipsformanaging MPAs

Community involvement in protected area management—a continuum from the perspective of the agency in charge:



After, Kelleher, G. (1999).Guidelines for Marine Protected Areas. IUCN, Gland, Switzerland and Cambridge, UK.xxiv +107pp.

2.3.3. Pros and cons of different partnership management styles

Following table summarizes the pros and cons of three management approaches:

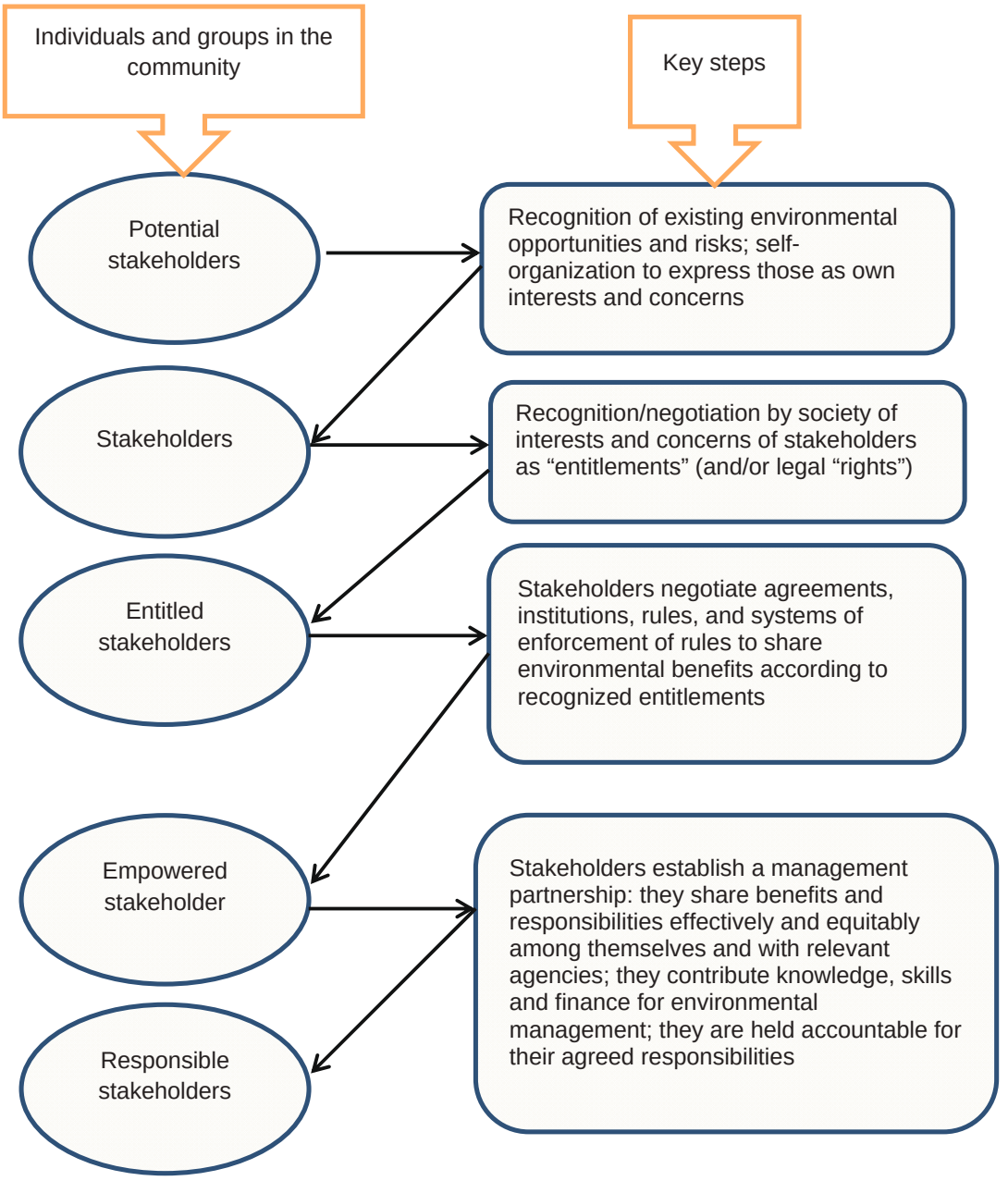
Management approach	Pros	Cons
Full control by the government	• Stronger political support and willingness Government obliged to support the MPA financially • Gives full rights to the community to lobby against the government's decisions regarding MPA management • Does not need a cooperative, like-minded and responsible community	• Weak support for the community's needs and requirements • In creased bureaucracy in the decision making process • Increased conflict between MPA authority and the community • More expensive management costs • Lack of any community feeling of ownership • Less care by the community towards MPA regulations • Therefore, less management effectiveness
Co-management	• Reasonable support for the community's requirements • More indigenous cultural aspirations • Ensures support and respect by the community of the government's policies, decision making process and regulations • Less conflict between MPA authority and the community • More defined resource-access rights • Less cost for management activities, especially monitoring and law enforcement • Easier to implement business plan/ revenue generation programs/self-finance system/willingness to pay for resource-access • Higher ownership feeling in the community, therefore, more management effectiveness	• Authorization conflicts between community and authorities • Increase in the conflict rate between community members • May create political conflicts with the indigenous communities • Needs a well-educated and like-minded community • Sometimes members are biased to their community rather the MPA's management • Could be used by some community representatives for personal benefits and rights
Full control by the community	• A relatively high level of community participation in decision making • Continuing advice from the implementing organization • Inputs from the municipal government • Full support to the requirements/interests/concerns of the community • Highest ownership feeling • Lowest cost of management operations • Reduces the financial load on the government agency	• The indicators of effectiveness are not constant and change for every place and time • Needs an altruistic, educated and responsible community • Measuring conservation effectiveness is more complicated • Intensive consultation with local experts needed • Conflict between agency and community, mainly on access rights to the MPA's resources and agency policies, is to be expected

2.3.4. Steps to develop empowered and responsible stakeholders

The establishment of empowered and highly responsible stakeholders and supporters is a key process to ensure effective partnership and management planning for the MPA (see the following flowchart). The main tasks of such a committee/group include:

- Consulting on management planning, including the zoning plan for the MPA
- Participating as a partner in the approval process of the MPA's management plans
- Consulting and supporting the MPA's policies
- Representing the community/stakeholders and acting as the contact body between them and the MPA authority
- Reducing the conflicts between different users and between the MPA authority and the stakeholders
- Lobbying to support conservation and sustainable resource use policies
- Following up the implementation process of the MPA management plans

Key steps to establish empowered and responsible stakeholders/supporters



After Kelleher, G. (1999).Guidelines for Marine Protected Areas. IUCN, Gland, Switzerland and Cambridge, UK.xxiv +107pp.

2.3.5. Measurements of success for a community-based MPA

There are many aspects of success or indicators that can be used to define the effectiveness of a community-based management approach, including biological, management-community responses and socio-economic aspects. The following table addresses some of these indicators, signs of success and failure, using the Red Sea as an example.

Aspects	Indicators	Success	Fail
Biological	▪ Coal health at selected reefs ▪ Fish abundance ▪ Predator/prey indices ▪ Algal cover ▪ Species richness	▪ Steady/increased ▪ Steady/increased ▪ Constant ▪ Steady/decreased ▪ Steady/increased	▪ Decreased ▪ Decreased ▪ Unbalanced ▪ Increased ▪ Decreased
Management and community responses	▪ Adherence to the regulations of the MPA based on the number of violations ▪ Numbers or percent of people involved in the conservation process to total numbers of people ▪ Marker buoys ▪ Community signboards ▪ Management plan ▪ Management committee	▪ Decreased ▪ Increased ▪ Exist ▪ Exist ▪ Established & implemented ▪ Established & active	▪ Increased ▪ Decreased ▪ Non existent ▪ Non existent ▪ Non existent ▪ Non existent or not-active
Socio-economic variables	▪ Job opportunities ▪ Catch per unit effort ▪ Number of sustainable biodiversity-based industrial sectors ▪ Number of non-sustainable industrial sectors ▪ Revenue generation plan ▪ Number of visitors	▪Increased ▪Steady/Increased ▪New ones added ▪Decreased ▪Implemented ▪Increased	▪ Decreased ▪ Decreased ▪ Reduced ▪ Increased ▪ Nonexistent ▪ Decreased

The following section covers the main topics that need to be included in the **Table of Contents** for an MPA management plan (modified from Kelleher,1999).It uses the Dungonab and Mukkawar National Park as a case study.

2.3.6 Proposed Table of Contents for a MPA management plan

Chapter 1: Introduction

General description of the area and location; area history and goals of the national park declaration; needs and approaches to co-management

Chapter 2: Resource Description

2.1. Physical features: climate, oceanography, geology, coastal landforms, bathymetry, tides, water quality, flooding

2.2. Living resources:

2.2.1. Key habitats (status, description, distribution, demarcation, mapping):e.g., coral reefs, mangroves, sea grasses, others; biodiversity and,

2.2.2. Key species(status, description, distribution, demarcation, mapping):e.g., marine mammals (dugong, dolphin aggregations), marine turtles, manta ray spawning aggregations, sea birds, others (e.g., sharks, commercial fish spawning or feeding aggregations, etc.)

2.2.3. Impacts on natural resources: Human impacts (e.g., fisheries, solid waste and/or liquid pollution, use of mangrove trees as a source of feed for camels or as a source of energy, etc.); Natural impacts (crown of thorns starfish, coral bleaching or other diseases, etc.)

Chapter 3: History and the Local Community

3.1. Archaeology

3.2. Community profile

3.3. Human uses and development

Chapter 4: Management Plan Aspects

4.1. Needs and objectives

4.2. Conservation status and legal base

4.2.1. International legal base

4.2.2. National legal base

4.2.3. Cultural/community traditional legal base

4.3. Methodology and approaches (emphasis on a co-management approach)

4.3.1. Resource uses and conflicts

4.3.2. Natural/hot spot areas (in term of naturalness and ecological value)

4.3.3. Development areas

4.3.4. Areas of impact (mainly fisheries and coastal development)

4.3.5. Historic, current and potential conflicts

4.4 Zoning

4.4.1. Methodology and approaches (focus on data available, criteria to be used and consultation with the local community)

4.4.2. Demarcation/mapping of the current resources and uses

4.3.3. Zoning plan (map of regulated zones to include such as: no take zone/park core areas, fishing grounds, coastal development areas, recreational areas, mooring areas, MPA buffer zone, etc.)

4.4. Management policies for resource uses

4.4.1. Fisheries

4.4.2. Recreational activities

4.4.3. Aquaculture

4.4.4. Urban/coastal development

4.4.5. Others (if any)

4.5. Monitoring

4.5.1. Monitoring of sensitive habitats and key species: to include, for example, coral reefs, mangrove, sea grasses, dugong, marine turtle nesting and feeding sites, manta ray aggregations, mega-sharks, commercial fish spawning aggregations, etc..

4.5.2. Role of the local community in the monitoring programs

4.6. Education and outreach

4.6.1. Awareness and education program objectives

4.6.2. Communication problems

4.6.3. Environmental problems

4.6.4. Current awareness and education activities

4.6.5. MPA social marketing campaign

4.6.6. Proposed short term actions/activities

4.6.7. Print materials

4.6.8. School teachers and children

4.6.9. Signage plan

4.6.10. Media support

4.6.11. Capacity building

4.7. Implementation/maintenance and administration

4.7.1. Institutional structure

4.7.2. Staffing and operational structure

4.7.3. Operational role of the local community

4.7.4. Training

4.7.5. Budget

Chapter 5: <u>Business plan guiding principles or opportunities for revenue generation</u> (recommendations)

Chapter 6: <u>Annexes</u>

- Legal declaration of the MPA
- Declared boundary (map)
- Distribution of key species and habitats (maps)
- Zoning plan (maps)
- Monitoring plan
- Training program
- Education and outreach program
- Park business plan

3. Zoning in a MPA

3.1. Section objectives

- To understand functions of zoning through spatial or temporal allocation of uses and activities within a MPA
- To understand how zoning can be used as a tool to address resource use conflicts
- To understand how priorities determine spatial and temporal distribution of no-take zones
- To understand the stages in the development of a zoning plan

3.2. Goals and objectives of the zoning plan

Common objectives for zoning in MPAs are to:

- Protect the ecosystem, species, or habitats critical to the survival of species
- Reduce or eliminate conflicts between resource users
- Manage resource users
- Provide a buffer between managed and unmanaged areas
- Reserve suitable areas for particular human uses while minimizing adverse impacts
- Reserve areas for specific purposes such as research and education

3.3. Guidelines for the zoning plan process

- Rely on the best available science for making decisions
- Engage stakeholders at all possible levels
- Take into consideration that most of the conflicts are created when consumptive(such as fisheries) uses and non-consumptive activities(such as diving) occur for the same resources or in the same areas
- Avoid biasing the zoning plan strongly towards either conservation or uses, but try to find the most appropriate balance
- Keep in mind that the best approach is to link conservation and use, such as establishing no-take zones to keep the livelihood/income for fisheries (i.e. secure the fishermen's future livelihood)

- Keep the zoning plan as simple and understandable as possible
- Use natural attributes such as a reef or an island to delineate zones
- Try to minimize interfering with customary uses and rights
- Use buffers to avoid sudden transitions of use in adjacent zones
- Incorporate a range of linked habitats in resource protection zones
-

3.4. Key requirements for the zoning plan

- User willingness and community support
- Legal base
- Based on adequate data
- Incorporates monitoring and enforcement
- Balances public interests and private options
-

3.5. Conflicts between uses/users

The conflict types and frequency between the users of the natural resources in a MPA vary based on the resources available, the type of MPA, its legal status and the level of the users' environmental awareness and ownership. The following table gives examples of the conflicts between the different uses taking place within MPAs.

Coastal development						Education Research	Fishing		**Uses**	
Navigation	Mining	Trade	Industry	Tourism	Urban		Commercial	sport		
*	***	**	***	*	***	*	*	*	Beaches	Tourism
**	***	**	***	*	**	**	***	**	Diving/snorkeling	
*	**	*	**	**	*	*			Sport	Fishing
**	***	*	***	***	**	***			Commercial	
**	***	*	***	**	***				Education &Research	
*	*	*	*	*					Urban	Coastal develop-ment
**	***	*	***						Tourism	
*	*	*							Industry	
*	*								Trade	
*									Mining	

* Low ** Moderate *** High

3.6.Common types of zone

- *Managed resource use zones:* Areas where activities/uses are managed to reduce impacts and/or conflict rates between different user groups
- *Preservation or conservation zones:* Areas created only for preservation/conservation, usually consumptive uses are prohibited
- *Scientific research zones:* Areas established for scientific research only and kept pristine as control sites for education and research standardization and comparison
- *Limited use zones:* Areas with limited and/or restricted uses
- *Seasonal closures:* Areas closed seasonally to conserve valuable key species, such as closing the nesting beaches of marine turtles; or to sustain fisheries, such as closing the areas of commercial fish aggregation during the spawning season
- *Replenishing areas:* Area closed for recovery or rehabilitation of an ecosystem, community or a key species population
- *Tourist/marine park zones*: Areas created for recreational activity, mainly for tourists non-consumptive uses such as diving, snorkeling, beach picnics, water sports (kites, water-ski), marine mammal and bird watching

Laffoley (1995) suggested a schematic zonation for a biosphere reserve:

- Core area
- Buffer zone
- Transition area
- Human settlements
- Research station
- Monitoring
- Education and training
- Tourism and recreation

Similar zones can go by different names in the literature. However, they can be grouped into three main types:

- Core, conservation, biodiversity
- Buffer, limited use
- Transition, limited use, recreation, water sports

3.7.No-take areas

No-Take means **Take Nothing**. Such areas are closed to all forms of extraction. Often called reserves or sanctuaries, depending on the MPA and the home country, creating a no-take zone is done to protect the unique and valuable biodiversity and the genetic resources within a site(such as a rare endemic species),or to conserve resources such as specific areas known to be fish spawning aggregations or nursery grounds.

3.8. Multiple-use zone

This is a zone designed to accommodate various uses by people and reduce the conflict rates between them. The key point for the proper success of a zoning scheme is to separate the consumptive and non-consumptive uses. In the Red Sea case it is to separate recreational activities, as non-consumptive uses, and fisheries as the main consumptive use. The principal zones can be grouped as follows:

- *Core, conservation, biodiversity:* often included for conservation of natural resources
- *Buffer zone:* Buffers provide a transition space between highly protected areas such as core / no-take areas and surrounding zones where heavier activity is allowed; as well as between the MPA and areas outside the MPA that are less closely managed
- Fishing
- Diving/snorkeling zones
- Research (as scientific research control sites)
- Traditional use zones
- With one or more buffer zones between the core and any intensive resource use areas

3.9. Zonal planning stages and community consultation

In general, the zonal planning and the approval process follow these steps:

1. ***Initial information gathering and preparation****:* Collection of the information required for zoning based on the available data, surveys and interviewing MPA resource users.

2. ***Community consultation****:* This can be carried out through the establishment of a Steering Committee. The committee includes representatives from government agencies (fisheries, planning, tourism, and maritime affairs), as well as local NGOs, fishers, tourism businesses, and dive operators. The role of the steering committee is to: guide stakeholder engagement; provide assistance to the technical team; review and approve data and analyses; serve as a focal point for disseminating information about the marine zoning plan to their agencies, organizations and departments; the committee members also play key roles in other aspects of the overall effort such as liaising with government and reviewing policy analyses.

3. ***Draft plan:*** After collection of the required data and its analysis, as well as collecting comments from different stakeholders, the technical team has to establish the draft zoning plan.

4. ***Public participation/consultation****:* Public participation can be carried out through a series of workshops and meetings with different government and community groups to promote the first draft of the plan and collect public comments as well as to ensure that the planning effort was based on in-country needs. All of these meetings need to be carefully coordinated to include all appropriate stakeholders. Target audiences in these meetings and workshops should be carefully researched to include key stakeholders from high-level government officials to local community groups, the private business sector and fishers' associations.

5. ***Zoning plan finalization****:* Based on the outcomes and comments from these meetings, the technical team will be able to finalize the zoning plan.

What are the techniques to collect the necessary data for establishing MPA's zoning plan?

Based on the available scientific data, education and skills of resources users (especially fishermen and dive operators), tools and resources available for gathering field data, the

The approach and techniques used for data collection can be simple, based on gathering basic data from visual observations, mapping the habitats, key biological features, area uses and threats, and interviewing the key users for relevant socioeconomic information. More intensively, techniques can be deployed that involve sensitivity mapping based on scientific data from rigorous field surveys carried out by professional technical teams.

Following are some case-studies of zoning plans with different levels of data collection:

3.10. Data collection case studies

Case study 1:

Samadia Reef (Dolphin House), Egypt

Samadai Reef is a unique geographic feature along the Egyptian Red Sea coast. This horseshoe-shaped reef surrounded by deep-sea waters and isolated from other land masses, creates an inner semi-circular lagoon with a diameter approximately 300 m wide, well sheltered from the northerly winds, where spinner dolphins spend the daylight hours resting from their nocturnal forays in the open sea. Samadai could easily be considered one of the world's prime locations for whale watching, and would present none of the concerns expressed about swim-with programs because, unlike in most cases, the presence and conduct of visitors are amenable to complete control, and encounters are taking place only on the dolphins' terms.

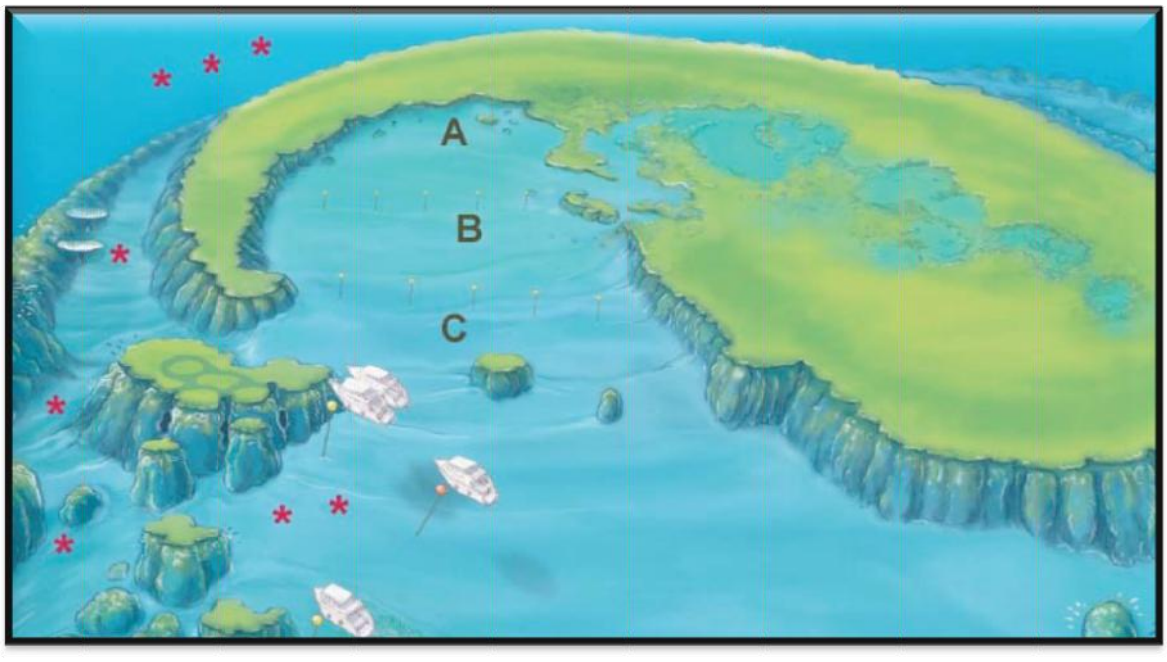
To mitigate the impact of divers and snorkeling in contact with dolphins, the area is simply zoned into three main areas, as follows:

Zone A: is the core area, in general no activities are allowable in this zone

Zone B: is a snorkeling and diving area, but activities are day-time restricted (between 10.00 a.m. and 2.00 p.m.)

Zone C: is a mooring area for pleasure boats

See the following layout for Samadai reef (Dolphin House) and defined zones



Case study 2:

Wadi ElGemal-Hamata National Park (WGHNP), Egypt

The zoning plan of the WGHNP is completely based on qualitative/observation data rather than quantitative data, such as areas with the presence of dolphins, dugong, or sea turtles (feeding and nesting grounds). Divers and local fishermen played a key role as sources of data. Figure1shows the basic zoning plan for WGHNP.

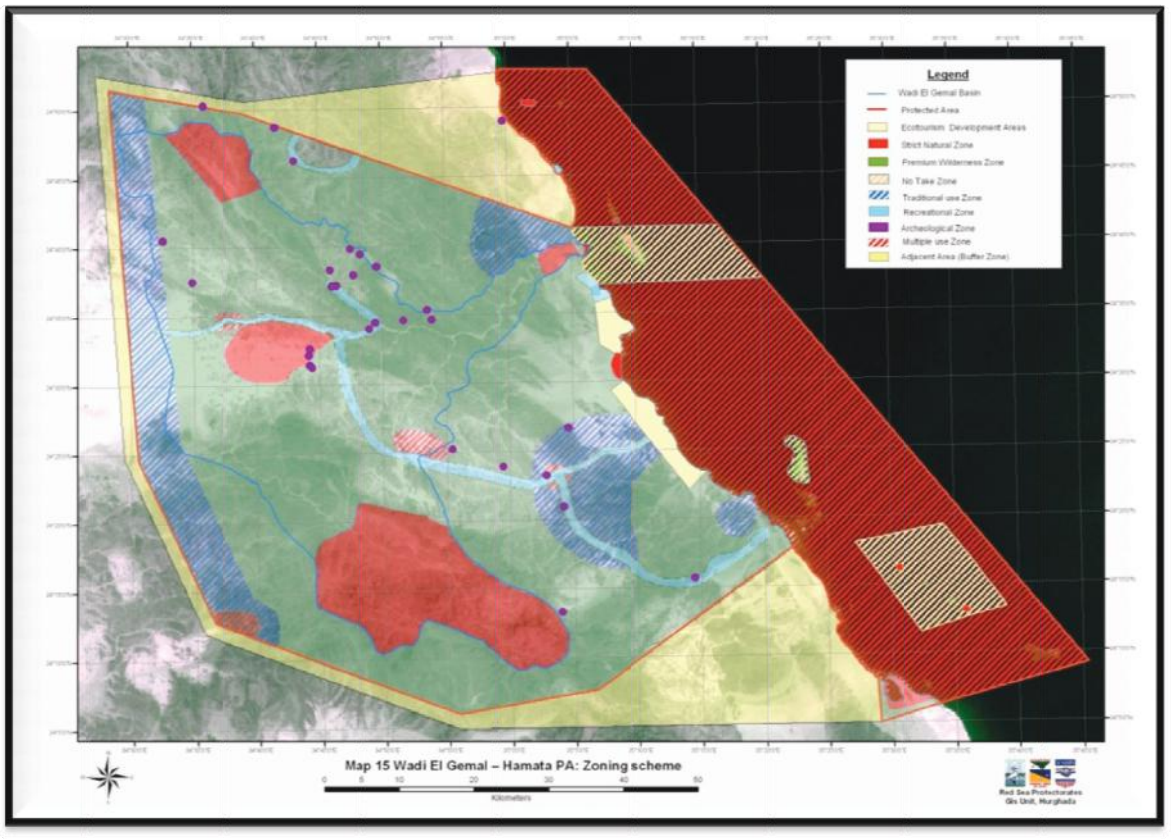


Figure1. The basic zoning plan for WGHNP

Case study 3:

Asinara Island National Marine Reserve, Italy

According to Villa *et al*. (2002),the zoning plan of the Asinara Island National Reserve of Italy was established using a Spatial Multiple-Criteria Analysis (SMCA) approach. It is based on ranking of the variables according to the relative importance for each variable on three steps:

a). Select carefully the necessary variables needed for MCA and define the data sources (Table 1).

b). Aggregate the raw variables through the SMCA as natural resources and recreational.

c). Evaluate the aggregated data based on priority weights for each value (Table 2), under each protection scenario in Table 3.

Table1. Spatial coverage used as raw data for the spatial multiple-criteria analysis

Mapped variable	Source
Geology and geomorphology	DC
Benthic assemblages	DC
Diversity of the fish community (no. of species)	DC
Nursery areas for fish populations	DC
Sites relevant for the biological cycle of *Patella ferruginea*	DC
Sites relevant for the biological cycle of *Caretta caretta*	DC
Sites relevant in the biological cycle of marine cetaceans	DC
Potential for transit and settling of Focamonaca	DC
Hatching sites for marine birds	DC
Interest for archeology based on presence of archeological sites or knowledge of previous settlements	DC, S
Interest for scientific research and education	DC
Suitability for traditional fishing techniques based on presence of installations or existence of traditional fishing sites	S
Suitability for commercial fishing	DC, S
Suitability for aquaculture	DC
Suitability for scuba diving	DC, S
Suitability for snorkeling	DC
Suitability for whale and dolphin watching	DC
Suitability for recreational fishing	DC, S
Suitability for sailing, recreational boating	DC, S
Suitability for swimming	DC, S
Density of commercial navigation and commercial harbors	DC
Industrial installations and power plants	DC
Tourist infrastructure (e.g., hotels, camping sites)	DC
Tourist harbors	DC, S
Input of pollutants from urban, industrial sources, and rivers	DC
Density and severity of acoustic and other forms of pollution	DC
Areas subject to military control	DC

Abbreviations: DC, data collection in the field; S, information provided by stakeholders.

Table 2.Weights used in aggregating the raw variables through spatial multiple-criteria analysis to obtain maps of natural coastal value (left) and recreational value (right)

Variable	**Weight**	**Variable**	**Weight**
Abundance of *Patella ferruginea*	420	Archeological sites	26
Sightings of coastal cetaceans	149	Suitability for recreational diving	191
Suitability for *Monachus monachus*	46	Suitability for snorkeling	229
Presence or suitability for key avian species (Larusadouinii)	384	Potential for dolphin watching	203
		Suitability for recreational navigation	104
		Suitability for swimming	247

Table 3.Activities allowed for each planned level of protection

Category	**Activity**	**No-entry, no-take**	**Entry, no-take**	**General reserve**	**Partial reserve**
Research Sea access	nondestructive monitoring	A	A	G	G
	sailing	P	R	G	G
	motor boating	P	P	R	R
Staying	Swimming	P	P	G	G
	anchoring	P	P	R	R
	mooring	P	R	A	G
Recreation	diving	P	R	A	G
	guided tours	P	R	A	G
	recreational fishing	P	P	R	G
Exploitation	artisanal	P	P	R	R
	sport	P	P	P	R
	scuba, and	P	P	P	P
	commercial fishing	P	P	P	P
Abbreviations: A, allowed upon authorization; G, allowed without authorization; P, prohibited; R, subject to specific limitations.					

Case study 4:

Sensitivity mapping for the Egyptian reefs of the Red Sea

The preparation of sensitivity maps allowsfor the creation of a more accurate zoning plan. The sensitivity assessment can be based on six classes of information: diversity, coral coverage, coral healthiness, coral reef fishes, exploited species/population, tourism, and fishing, with the following secondary attributes:

- Diversity
  - Coral genera
  - Fish species
  - Endemic fish species
  - Exploited commercial fish species
- Coral coverage
  - Coral living coverage
  - Soft coral coverage
  - Branching coral coverage
  - Massive coral coverage
- Coral healthiness
  - No. of newly recruited colonies >2
  - No. of newly recruited colonies >5
  - No. of newly recruited colonies >10
  - No. of broken colonies
  - No. of infected colonies
  - No. of bleached colonies
- Coral reef fishes
  - Populations with limited range
  - Fish abundance
  - Herbivore abundance
  - Corallivore abundance
  - Top predator abundance
  - Butterflyfish abundance
  - Angel fish abundance
- Exploited species/populations

- Sea cucumber abundance
- Giant clam abundance
- Sea urchin abundance

- Tourism
  - Number of tourism rooms
  - Beach facilities
  - Walkways/jetty/marina activities
  - Diving rate on the house reef
- Fishing
  - Observed fishing activities
  - Site accessibility to fishermen

Each attributeis weightedon a scale from 1 for minimum weight to 5 for maximum weight. Zero is used when the value of the attribute has zero impact(neutral). Negative ranks are given to attributes that have a negative impact on the enviromental sensitivity of the site.Based on the total score for each site, sensitivity ranking as well as zoning-based sensitivity can be established. The following is an example of a spreadsheet-

based ranking.

Sensitivity Ranking

Attribute	Weight	Normalized Weight	Value	Assessment of Attribute Property Relative to sensitivity ranking	Weighted Assistment of Attribute
	5 =most important 1 = least important			High = 5 Nuetral = 0 Low = -5	
Diversity					
Coral genera	5.00	0.36	70%	4.00	1.43
fish species	5.00	0.36	65%	4.00	1.43
encemic fish species	2.50	0.18	55%	3.00	0.54
exploited commercial fish species	1.50	0.11	45%	3.00	0.32
	14.00	1.00		Average	3.71
Coral coverage					
coral living coverage	5.00	0.48	62%	4.00	1.90
soft coral coverage	1.50	0.14	75%	4.00	0.57
branching coral coverage	2.50	0.24	55%	3.00	0.71
massive coral coverage	1.50	0.14	81%	5.00	0.71
	10.50	1.00		Average	3.90
Coral healthiness					
No. of newly recruited colonies >2	2.5	0.14	50%	3.00	0.43
No. of newly recruited colonies >5	2.5	0.14	46%	3.00	0.43
No. of newly recruited colonies >10	5	0.29	38%	2.00	0.57
No. of broken colonies	2.5	0.14	10%	1.00	0.14
No. of infected colonies	2.5	0.14	5%	1.00	0.14
No. of bleached colonies	2.5	0.14	1%	1.00	0.14
	17.50	1.00		Average	1.86
Coral reef fishes					
populations with limited range	5	0.22	63%	4.00	0.89
fish abundance	5	0.22	70%	4.00	0.89
herbivores abundance	2.5	0.11	55%	3.00	0.33
Corallivores abundance	2.5	0.11	44%	3.00	0.33
top predators abundance	2.5	0.11	45%	3.00	0.33
Butterfly fishes abundance	2.5	0.11	52%	3.00	0.33
Angelfishes abundance	2.5	0.11	44%	3.00	0.33
	22.50	1.00		Average	3.44
Exploited species/population					
sea cucumber abundance	1	0.29	54	3.00	0.86
Giant clam abundance	1.5	0.43	52	3.00	1.29
sea urchin abundance	1	0.29	35	2.00	0.57
	3.50	1.00		Average	2.71
Human impacts					
Tourism					
number of touristic rooms	1.00	0.25	66	-4.00	-1.00
Beach facilities	1.00	0.25	70	-4.00	-1.00
walkway/Jetty/Marina activities	1.00	0.25	49	-3.00	-0.75
Diving rate	1.00	0.25	38	-2.00	-0.50
	4.00	1.00		Average	-3.25
Senestivity					
Diversity	5.00	0.23	3.71	3.00	0.68
Coral coverage	4.00	0.18	3.90	4.00	0.73
Coral healthiness	4.00	0.18	1.86	3.00	0.55
Coral reef fishes	4.00	0.18	3.44	3.00	0.55
Exploited species/population	4.00	0.18	2.71	2.00	0.36
Tourism	1.00	0.05	-3.25	-3.00	-0.14
	22.00	1.00		Average	2.73
				Senestivty Score 2.73 (Moderate)	

4. Research and Monitoring

4.1. The importance of research and monitoring for management

Monitoring is a key component in the management of MPAs. The implementation of an efficient monitoring program provides an accurate tool to measure the effectiveness and success of the management plan. A research program seeks to expand our knowledge and understanding of the marine environment, provide a regular update on the health of marine ecosystems and the nature and extent of activities occurring in the marine park, and it indicates the effectiveness of zoning and other management actions. Key research areas are:

- biodiversity and ecological processes
- aboriginal and non-aboriginal culture and heritage
- ecologically sustainable use; and
- specific impacts
- management actions

1. Develop annual park research plans consistent with any Marine Park Strategic Research Plan, in consultation with research organizations.

2.Develop collaborative research and monitoring programs with tertiary institutions and other research groups.

3. Assess research permit applications and seek expert advice where required for applications that involve collection, capture, tagging or harm.

4. Develop a database and information set of research carried out or underway in the park.

4.2. Research and monitoring in the Red Sea region

The following table addresses the proposed research and monitoring topics and the leading agencies and contributors for each topic.

Topic	Monitoring	Partners	Research	Partners
Conservation of sensitive marine ecosystems (coral reefs, mangrove and sea grasses)	Identify, classify, map and create zoning criteria; define control sites (un-impacted) and compare with any historical records; characterize associated biotic communities and exploitable living resources, mainly commercial fish stocks; define the level of impact on different marine zones and habitats; identify factors that may determine habitat sustainability and appropriate measurable indicators of these factors; quantify relative extents of modified habitats and areas reclaimed for aquaculture, tourism and shore urbanization; develop aproper database to hold all such records. Select monitoring sites (impacted and non-impacted); monitor the periodic changes in the selected sites/ecosystems according to the standard survey methods produced by PERSGA	PA, URI, FC	Implement a long-term program to quantify physical, biological and ecological changes in habitats with a particular focus on more sensitive ecosystems, species, communities and processes; define and scientifically approve bio-indicators for the healthiness of different sensitive ecosystems to measure the effectiveness of the conservation plan	URI
Key species				
1. Manta rays spawning aggregation areas	Identify and map spawning aggregation grounds; seasonal monitoring of the manta ray aggregations (population size and structure)	PA, FC, DG	Reproductive biology and cycle of manta rays, tracking the migration route, quantifying the natural stock and the aggregation of manta ray populations, biotic and abiotic factors influencing manta ray spawning aggregations; genetic characteristics and gene flow	URI
2.Dolphin populations resting/breeding areas	Identify and map dolphin populations, resting and feeding grounds; monitor population structure, behavior, seasonal occurrence and abundance	PA; FC; DG	Reproductive biology; feeding behavior and selectivity; changes in behavior, abundance and population structure due to impacts; genetic characteristics and gene flow; movement tracking	
3. Mega shark, (especially whale shark)	Aggregation occurrences; catch composition and effort; distribution	PA, FC, DG	Seasonal distribution: reproductive and feeding biology; movement tracking; population structure; genetic characteristics	URI

4. Marine turtles	Identify and map nesting beaches; nesting season; nesting density; female nesting population structure; foraging grounds	PA, FC, DG	Changes in nesting behavior, level and female nesting population structure; genetic characteristics and gene flow	
Fishery management	Identify and determine valuable fishing grounds, seasonality in commercial fish spawning aggregations; catch analysis (catch composition, fishing effort, population structure of commercial fish species)	PA, FA, FC	Investigate reproductive biology and life-cycles; feeding habit and requirements; biotic and abiotic factors influencing spawning aggregation of commercial fish; impact of fishing techniques, over-fishing, shark finning, pollution, climate changes, changes in prey/predator ratios, predation potential, habitat deterioration on the natural stocks of the valuable fish species	URI
Phenomena and impacts				
1. Coral bleaching and coral resilience	Monitor changes in water temperature and pH through installed loggers; assess coral reef resilience based on IUCN guidelines; follow up bleaching on selected monitoring reefs; establish monitoring network with the users	PA, URI	Investigate the impact of climate change on sensitive marine ecosystems and key species; define the resilience potential of the valuable coral reefs; determine the rate of recovery after bleaching events	
3. COTs outbreaks	Monitor COTs outbreak on selected monitoring reefs; determine the areas of reef damage due to COTs; establish a notification network regarding COTs outbreak occurrence	PA, FC, DG,	Investigate the reproductive and feeding biology of the COTs; factors influencing outbreaks; rate of coral recovery; genetic characteristics	URI
4. Pollution	At periodical intervals, determine the level of pollutants in water and sediments, bacterial count in water and sediments, nutrient and eutrophication level (chlorophyll *a*)	PA, URI	Identify major sources of pollutants and their impact on the function and diversity of marine ecosystems and key species; develop suitable sampling and analytical methods	URI

FA = Fisheries Authority; FC = Fishermen's community; DG= Dive guides; PA= Park Authority; URI= Universities and Research Institutes

4.3. The role of the community in monitoring resources

Worldwide, community and volunteer groups play a vital role in supporting research and monitoring the natural resources of MPAs. In the case of marine monitoring in the Solomon Islands, the following guiding principles (guidelines) were discussed and adopted by the partners for community-based monitoring protocols for some key species and habitats. The guidelines cited, as follows:

I) Communities must be clear about why, how, and what type of data need to be collected and for whom.

II) Maintain scientific monitoring principles so that data is reliable for community marine resources management and awareness purposes, for example, importance of replication, use of control sites, site selection, and stratification (where necessary).

III) Community must use the appropriate methods for data collection/analysis and be clear about what results are expected.

IV) Community monitoring is undertaken with the following objectives:

- Participation, involvement, and education
- Awareness at the community level
- To help the community to make management decisions
- Monitoring and evaluation for projects and country network

V) Community monitoring should, as much as possible, be voluntary but in the future Solomon Islands Locally Managed Marine areas (SILMMA) may be in a position to facilitate with incentives if a community meets certain requirements e.g. registration, management plan, commitment to monitoring, etc.

VI) If community-based monitoring is done well, it can also support government and other institutions' monitoring initiatives.

VII) Involve provincial Fisheries Officers wherever possible.

In comparison, for community-based monitoring in Dungonab Marine National Park considerable effort and training will be needed before a reasonable level of performance in data gathering and data quality is achieved. Inside the park,

fishermen can play a key role in the monitoring process, based on their traditional knowledge. The following table addresses some of the monitoring activities that could fit with local community traditional and cultural knowledge and needs to be part of the monitoring process:

Monitoring activity	Community contribution	Needs
Fisheries	Source and gathering of data on: catch composition& quantity, fish spawning and fishing grounds, fishing methods, by-catch quantity and composition	Data sheet; fact sheet; training
Dugong population	Sighting of dugong locations, population size and structure, accidental mortality	Data sheet; fact sheet; training
Dolphin populations	Sighting dolphin species, population & locations, population size and structure, basic behavior, accidental mortality	Data sheet; fact sheet; training
Turtle nesting	Data gathering on: nesting beaches, number of true and false nests, track and nest diameter .etc., based on the method provided by PERSGA	Data sheet; fact sheet; training
Mega-sharks	Sighting species, locations of aggregations, accidental and illegal fishing	Data sheet; fact sheet; training
Phenomena and impacts		
Coral bleaching	Locations of mass coral bleaching	Data sheet; fact sheet; training
COTs	Location of COTs outbreaks	Data sheet; fact sheet; training

5. Capacity Building

5.1. Key steps to buildcapacity within a MPA

Staffing: sufficient staffing is considered as a key step toward successful management of a MPA. The exact number of employees (park rangers and support staff) should be determined based on the current and expected future management activities and efforts. In other words, the deployment plan should be based on the level of activities to properly manage the MPA. The plan should also include job descriptions and duties for each position, corresponding to the level of management, current and near-future activities, the function unit level and support staff. In general, three steps should be followed to build the capacity for effective management:

1. Establish a structure with separate management units for different functions
2. Based on this structure, determine the number of employees
3. Determine the necessary qualifications and job description for each position
4. Establish a training plan according to the functional unit

Training: Training for the MPA rangers may depend on the establishment of important partnerships, such as with nature conservation authorities, NGOs, regional and international organizations. The areas that require training are grouped into the following categories: administration, basic skills, underwater skills, English language, geographic information systems (GIS), coastal zone management, protected area management, biological monitoring, operations, public awareness, environmental education, field survey and mapping methods. Conferences can provide participants with opportunities to broaden their professional knowledge.

The following table summarizes a proposed training plan by subject matter, subject description and the priority for each subject. The training subjects are modified from the ranger training plan for the Red Sea Protectorates in Egypt.

Training subject	Description	Priorty
A: Administrative Training		
Computer skills	Microsoft software (Word, Excel, Power-point, basic GIS & remote sensing)	1
Accounting skills	Budget preparation, procurement	2
B. Basic Training		
Ranger Induction Course1	Ranger code of conduct; understanding environmental international, regional and national conventions/laws; Orientation and roles of marine park ranger	1
C. Biological Monitoring		
Course on basics of marine biology (for non-marine biologists)	Overview on: basic ecology of the Red Sea and Gulf of Aden, productivity; biozonation, habitats, marine ecosystems, sustainable fishing, introduction to different marine groups	2
Biology of selective key species	Biology of selective endangered and threatened species, such as marine mammals with emphasis on dugong, marine turtles, whale shark and others	1
Monitoring of sensitive habitats and key species	Methods; emphasis on sensitive habitats of: coral reefs, mangroves, seagrasses; as well as key species, marine mammals, marine turtles, mega-sharks especially the whale shark, threatened and endangered water birds (Based on the Monitoring Manual produced by PERSGA, 2000)	1
Local community as monitoring partner	Focusing on how to: establish a network with the local community, creating a data sheet/questionnaire for data gathering through the local community, standardize and analysis of the data and reporting	1
D. Coastal Zone Management		
Training event on “Ecosystem Based Management”	Introduction to the ecosystem-based management approach, ecosystem services and ways to manage	1
E. Mapping and Geographic Information Systems		
Marine surveys and mapping	Data gathering techniques and mapping of marine resources	1
Introduction to remote sensing and GIS	Introduction to the application of remote sensing and GIS applications in the MPA	2

F. Marine Protected Areas Management (on the job training)		
Observational study tour and on the job training: marine protected areas management	Through a rangers exchange program between the regional network of MPAs in the Red Sea and Gulf of Aden, and between local/country MPA networks	1
MPA management internships	Through a rangers exchange program between the regional network of the MPAs in the Red Sea and Gulf of Aden	3
G. Public Awareness		
Public awareness and environmental education	Introduction to public awareness raising and interactions, strategies for influencing public attitudes	1
H. Marine Water Skills		
Boat operations and maintenance	Boat steering and maintenance	1
Swimming	Tread water, distance swimming, swimming with equipment	1
Life Saving	Marine safety and rescue training	1
PADI Open Water scuba diving:	Diving to depth of 18 meters, basic skills	1
PADI Advanced Open Water:	Diving to depth of 30 meters, underwater navigation, specialized diving techniques	1
Underwater photography	Basic techniques and equipment operations for monitoring	2
Medic First Aid	First Aid training as part of ranger safety and rescue	1
Equipment maintenance	Maintenance of field and diving equipment	2

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