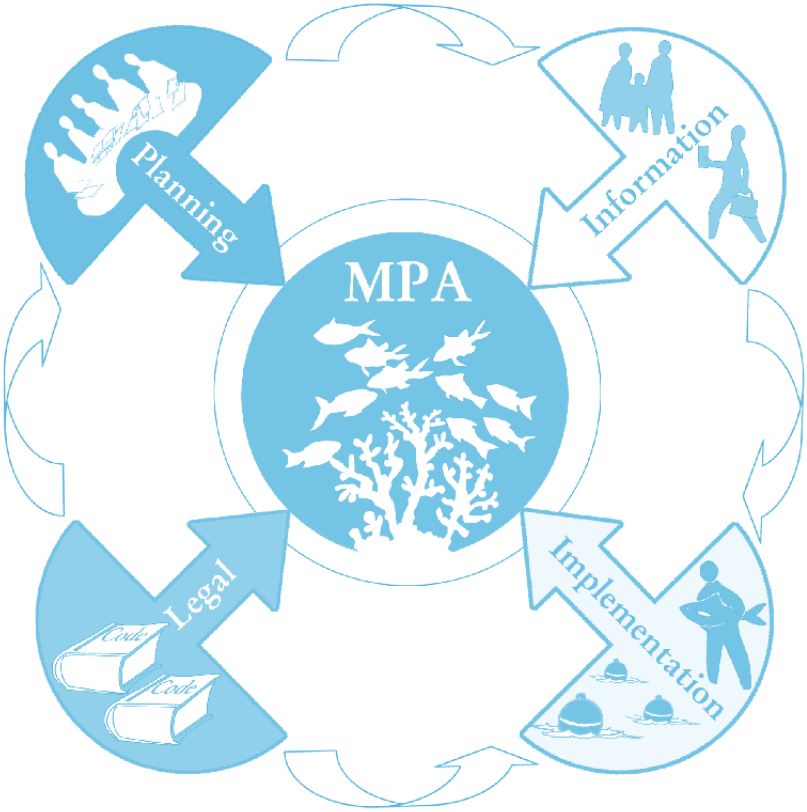
PART 2

Planning and implementing MPAs



5. LEGAL, INSTITUTIONAL AND POLICY FRAMEWORKS FOR MPAs

To be successful, MPAs and MPA networks require supporting legal, institutional and policy frameworks, as well as long-term political commitment. MPAs are tools for achieving defined objectives and are most effective when embedded within integrated marine governance and spatial management frameworks. This integration requires intersectoral coordination. Good governance, including stakeholder participation, is key to successful and equitable management outcomes.

This chapter looks into legal, institutional and policy frameworks and the related requirements for MPA planning and implementation. MPA frameworks must evolve and adapt over time, and the processes by which MPAs are planned and implemented are discussed further in subsequent chapters.

The Code of Conduct for Responsible Fisheries prescribes that states should ensure that appropriate policy, legal and institutional frameworks are in place for fisheries management and biodiversity conservation, as well as processes for the integration of fisheries into coastal area management.

5.1 WHY ARE APPROPRIATE LEGAL, INSTITUTIONAL AND POLICY FRAMEWORKS IMPORTANT FOR MPAs?

An appropriate legal and institutional framework is a necessary foundation for effective policy development and for the use of MPAs as a tool in fisheries management and biodiversity conservation. Unfortunately, in many countries, these frameworks for MPA planning and implementation have focused on conservation issues only, or fisheries management only, but rarely at both in a balanced manner., sometimes leading to variable and unpredictable outcomes. Or, as a relatively new tool, MPAs have sometimes been designated without sufficient reference to the existing institutional and legal context. This exposes them to risk of failure and loss of credibility.

The success of MPAs as a management tool is ultimately a matter of effective implementation. While policy cannot create compliance or make management effective, it is a critical enabler. Institutional arrangements

include both the broad framework of rules and processes that guide societal and economic activities and the entities that operate within this framework (government agencies, institutions, committees, councils, organizations, etc.). The legal framework of laws and regulations defines the rights, responsibilities, options and restrictions applicable to all affected stakeholders, and provides the basis for protection and enforcement of rights and responsibilities.

The effectiveness of policy performance is linked to the quality of the institutions and laws affected by or created under the policy-making process. When appropriate laws and institutions are not in place, it may be difficult to achieve the desired policy goals and MPA objectives. This link between the goals and objectives and the legal and institutional frameworks needs to be clearly understood. Appropriate legislation and institutional structures should be developed to support fisheries management and biodiversity conservation goals and objectives, as well as more-specific MPA objectives, and to enable a range of environmental, economic and social benefits and incentives. The implementation of legislation and allocation of adequate resources for the efficient operation of institutional structures are vital. However, the funding of government agencies, and hence of institutional frameworks, is often decided by political and administrative (budgetary) processes, rather than by legislative provisions. Political will is critical in this context, and no amount of legislation can be effective without political support to the allocation of appropriate levels of resources to sustain implementation.

5.2 WHAT ARE THE MAIN INTERNATIONAL LEGAL FRAMEWORKS RELEVANT TO MPAs?

A number of international instruments relevant to MPA designation and management are in force at national, regional and global levels. While some of these directly discuss, recommend or require the use of MPAs, most do not. The relevance of these instruments lies in their focus on the jurisdictional areas they create and the related rights and responsibilities, the policy objectives of sustainability, and the sustainable use and management of marine resources and habitats.

There are binding instruments ('hard' law) and voluntary agreements ('soft' law). International law of the sea, especially as embodied in UNCLOS, clearly distinguishes between marine areas under national control and those beyond the control of any single country. These are international waters or the 'high seas'[32]

[32] See the Glossary for a definition of 'high seas' as used in these Guidelines.

with reference to the water column,[33] and 'the Area' in relation to the seabed beyond the limits of national jurisdiction. UNCLOS is a detailed and well-accepted convention that comprehensively addresses the use and conservation of the ocean and its resources. Its obligations balance the "freedom of the high seas" (in particular regarding high seas fisheries) with the shared obligation of all countries to protect the oceans against the destruction of ecosystems and the collapse of shared fisheries.

Soft-law instruments include voluntary codes of conduct, non-mandatory provisions and incentive programmes. Voluntary instruments often allow for more wide-ranging recommendations than hard law and can hence provide additional guidance. The WSSD-POI provides important guidance on the conservation and management of marine and coastal areas. Another soft-law international instrument is Agenda 21, adopted at the 1992 United Nations Conference on Environment and Development (UNCED). It constitutes a comprehensive plan of action to be implemented at global, regional, national and local levels by states, international organizations (both intergovernmental and non-governmental) and major stakeholders in every area in which humans affect the environment. Agenda 21 and the Rio Declaration on Environment and Development have been adopted by more than 178 governments. Important soft-law instruments referring directly to fisheries include the CCRF and its related International Plans of Action (IPOAs).

Box 12 lists the main international instruments relevant to MPAs.

Considering the increasingly globalized world, international policy coherence is important in achieving fisheries management, biodiversity conservation and sustainability objectives. International instruments can provide an important support to national policy. At the same time, to become effective, global commitments must be converted into implementable national policies and legislation. They must be reconciled with national priorities and sustainable development goals, taking the local environmental and human dimensions into consideration. Hard law instruments, in particular, require enabling national legislation so that obligations, such as those contained in UNCLOS and the CBD – which otherwise bind states only at the international level – can also be applied to individual juridical persons who are state subjects.

[33] Everything between the air and the seabed. There is a distinction because the actual seabed of the ocean has different laws and regulations as opposed to the water above it.

BOX 12
International instruments relevant to biodiversity conservation, sustainable fisheries and MPAs

A number of international instruments and agreements have been adopted during the last few decades to promote sustainable fisheries and conservation of the environment. Most are voluntary, but some qualify as binding agreements. The more important instruments include:

Hard law:

- United Nations Convention on the Law of the Sea of 10 December 1982 (UNCLOS)
- Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (United Nations Fish Stocks Agreement [UNFSA])
- Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (1995) (FAO Compliance Agreement)
- Convention on Biological Diversity (CBD)
- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 International Convention for the Prevention of Pollution from Ships (MARPOL) and binding resolutions adopted by the International Maritime Organization (IMO)
- The Convention on Wetlands of International Importance (the Ramsar Convention)
- Regional instruments: binding resolutions from regional fishery bodies (RFBs) and regional seas conventions
- Convention on the Protection of the Underwater Cultural Heritage of the United Nations Educational, Scientific and Cultural Organization (UNESCO)
- IMO and its associated instruments

Soft law:

- Code of Conduct for Responsible Fisheries (CCRF) and related IPOAs and other instruments (FAO)

(Box 12 cont.)

- Rio Declaration on Environment and Development and Agenda 21 –UNCED, 1992
- Declaration of the International Conference on Responsible Fishing (Declaration of Cancún), 1992
- World Summit on Sustainable Development (WSSD) and its Plan of Implementation (WSSD-POI) (United Nations), 2002

5.3 WHAT CAN BE DONE TO ADDRESS PROBLEMS IN NATIONAL LEGAL AND INSTITUTIONAL FRAMEWORKS?

Many countries face considerable challenges in implementing MPAs with multiple objectives within appropriately integrated frameworks due to existing legal and institutional regimes. It is not uncommon that one authority has the mandate for designation and management of MPAs for biodiversity conservation purposes and another, a fisheries department, is responsible for fisheries-management-related MPAs. In the European Union, for example, MPAs for marine biodiversity conservation are the responsibility of member states under the Natura 2000 programme, whereas fisheries management in European Union marine waters falls under the Union's Common Fisheries Policy governed from Brussels. This division of responsibilities is often mirrored at the national level; in most countries, fisheries and biodiversity conservation are managed by different departments, which are not necessarily linked (Box 13).

While MPAs have often been designated using existing legal and institutional frameworks, in many countries there is a need to revise existing provisions or develop new legislative and institutional frameworks. Cross-departmental arrangements are needed to ensure that multiple-objective MPAs are implemented effectively, and this should be reflected in the revised or new frameworks. Development of new national legislation should also be undertaken, with a view to coordinating with international, regional, bilateral and other instruments and frameworks addressing MPAs, fisheries management and biodiversity conservation. Moreover, such development should take account of key factors such as expertise/capacity, political/civil service support, other stakeholder support, costs and timing.

Legislative processes can be very costly in both human resource and economic terms. Normally, the specialist services of institutional and legal experts will be needed to determine whether existing laws suffice to impose

BOX 13
Examples of national legislative MPA arrangements

In **Senegal**, MPAs have been covered by forestry legislation (Code Forestier 1998) and have fallen under the responsibility of the National Parks Department of the Ministry of Environment (Direction des Parcs Nationaux/Ministère d'Environnement, de la Protection de la Nature, des Basssins de Rétention et des Lac Artificels). However, more recently created MPAs have instead been designated by presidential decree or by provincial governor approval. In 2009, a new Department for Community Areas (Direction des Aires Communautaires) was created within the Ministry of Maritime Affairs (Ministère de l'Economie Maritime, de la Pêche et des Transports Maritimes). This department will have responsibility for community-managed MPAs. There have also been attempts to establish procedures that would facilitate coordination of MPA designation between the two ministries. Moreover, in 2010, a marine inter-ministerial committee (Comité Interministériel de la Mer) was created that will, among other things, facilitate the development of an ecosystem approach to marine management.

In the **Philippines**, the authority to establish and manage MPAs is held by three jurisdictions: the Department of Environment and Natural Resources, the Department of Agriculture – Bureau of Fisheries and Aquatic Resources, and the local government unit (LGU). Both national government agencies have responsibilities for protecting marine environments, although their mandates may sometimes overlap. The Local Government Code of 1991 contains several important measures that enhance the administrative abilities of the LGU, including political autonomy and the ability to generate and mobilize economic resources through taxes and fees. LGUs possess broad powers to control fishing activities in coastal waters and are able to set conditions for marine resource use by local ordinance, including the establishment of MPAs. LGUs do not require the approval of the national government agencies to establish MPAs.

Sources: Breuil (in press), Decree No 22.02.2010*01656 (Senegal); Eisma-Osorio *et al.*, 2009.

the necessary mandates and to properly empower the relevant agencies, or whether they should be broadly revised, replaced or supplemented. It is important to document and characterize the existing arrangements as a first step, before deciding what kind of measures are needed. Where MPAs are already in operation, information regarding relevant institutional, practical and legal relationships – and analysis of their performance relative to the existing institutions and laws – could prove useful in revealing both the strengths and weaknesses of MPAs and related frameworks.

Legislative and institutional development processes are situation-specific and national law varies from one country to another. Each particular law or institutional mandate depends on a great many factors (social, political, institutional, etc.), as well as on policy goals and objectives. The legal and institutional processes in diverse sectors also tend to differ. For example, national experience with terrestrial protected areas and resource management may have only limited relevance to MPAs. Although the overall policy goals and objectives may be the same or similar (i.e. biodiversity conservation and sustainable resource utilization), the manner in which legal measures apply and are implemented can be completely different for ocean and terrestrial issues.

There are many reasons for this variability, including (i) different rules governing use and ownership of marine resources; (ii) different enforcement needs in oceans; and (iii) different capacities to implement and enforce laws. In addition, within the marine sector, legal and institutional needs may vary greatly depending on the location of MPAs. For many developing countries, in particular, legal and implementation challenges depend on location (how far is the MPA from the country's shoreline?) and capacity (is the country able to effectively regulate, oversee, implement and enforce legislation, particularly in more remote ocean areas?).

In legal and institutional frameworks, it will be essential to determine the extent of the mandate relating to MPA governance (or the division of responsibilities among relevant agencies) in a way that ensures that there are no unintended gaps in overall governance of marine matters, and that there is a basis for determining the mandates of the agencies involved in any areas of overlap. Potential solutions include the setting up of supervisory, advisory or oversight bodies, coordinating commissions, cooperation protocols, joint policy statements, prearranged agreements between various government departments and other stakeholders, or specific MPA authorities. In the United States of America, a national system of MPAs has been established by presidential

BOX 14

The establishment of national coordinating mechanisms for MPAs: examples from Belize and New Zealand

In **Belize**, MPA management previously evolved in a piecemeal manner, leading to contradictory decisions by various government departments. In response, the Coastal Zone Management Authority and Institute requested legislative authority to govern all activities related to MPAs. The Authority suggested that the broad vision and conservation focus of the organization made it the ideal agency to oversee the management of Belize's MPAs. The Fisheries Department, it was argued, had too narrow a vision, focused on fish stocks and economic gain. The issue has now been addressed in a new National Protected Area Policy and System Plan, which includes provisions for establishing a commission that will be responsible for implementing the plan's policies. While there has been a long delay in appointing the commission, in 2009 it was in the final stages of development, and hopes are high that implementation will begin in the near future. Whether this arrangement will be successful in increasing coordination remains to be seen.

In **New Zealand,** a Marine Protected Areas Policy and Implementation Plan was released jointly by the Department of Conservation and the Ministry of Fisheries in 2006. This policy sets out a framework for establishing new MPAs and outlines the mechanisms for coordinating their management. These include the definition of protection standards as a basis for assessing what management tools are needed, as well as processes enabling a multi-agency approach to MPA planning, both in nearshore and offshore areas. Planning for nearshore MPAs will be implemented at a subnational level, while those offshore will be planned and implemented at the national level. Both the nearshore and offshore processes will be designed to allow for constructive engagement with *tangata whenua* (indigenous peoples), other user groups, and the public to ensure that MPA planning is inclusive, without compromising biodiversity protection objectives. Both processes will be underpinned by a commitment to minimize the adverse impacts of new MPAs on existing users of the marine environment and on traditional settlement rights.

Similarly, planning and development of New Zealand's MPA network will involve a range of central and local government agencies and marine users, *tangata whenua*, and those with an interest in the marine environment. The resulting network will be comprehensive – protecting both representative areas

(Box 14 cont.)

and areas that are outstanding or rare. A range of management tools will be used, including marine reserves, Fisheries Act tools, and tools under the Resource Management Act.

Source: Pomeroy and Goetze (forthcoming); Government of New Zealand, 2008.

executive order[34] to ensure comprehensive MPA planning, coordination and support. In France, the law on marine nature parks of 2006 created the French Marine Protected Areas Agency (Agence des aires marines protégées).[35] Examples of national arrangements from Belize and New Zealand are given in Box 14.

National legal provisions must define the governance systems or management approaches available to MPAs. Considering the ongoing trend in many countries of decentralization of natural resource management functions and the emphasis on stakeholder involvement, it is important that legislation has the ability to support community-based MPAs or co-management if the policy context includes the intention to move in this direction.[36] Related issues that must be addressed are human rights protections and the more-specific livelihood concerns of coastal communities or traditional users of the proposed MPA.

In summary, a national legal and institutional framework must include a variety of components. Most particularly, it must: (i) address and develop relevant institutions; (ii) enunciate institutional mandates and how coordination between institutions and agencies will take place; (iii)) define overall governance systems applicable to MPA management; (iv) adopt standards and processes for the designation and planning of MPAs; (v) provide a framework for the rules and regulations that will govern MPA implementation; (vi) enshrine civil protections and human rights, clearly stipulating the requirements and restrictions applicable to MPAs in this respect; (vii) adopt effective enforcement and administrative measures; and (viii) provide a legal basis to enable the MPA

[34] Presidential Executive Order No. 13158 of 26 May 2000.

[35] See www.aires-marines.fr/index.php.

[36] See also Section 5.5, "What are the institutional requirements at the level of individual MPAs?"

BOX 15
Indicators of good legislation and legislative processes for MPAs[a]

- Clear and direct legal authority/mandate;
- Support or acceptance by relevant community and stakeholder groups;
- Clear provisions or understandings regarding integration with the current framework or delimitation between various potentially applicable legal and administrative systems;
- Nature of the legal mandate of each provision or instrument within the framework (binding, non-binding, mandatory, voluntary, etc.);
- Linkage to policy objectives – role in their achievement;
- Role and mechanisms by which scientific analysis and monitoring is integrated as an essential tool for systematic validation of MPA effectiveness in achieving those objectives;
- Capacity (human, financial and practical) to deliver the actions and outcomes necessary to make that connection (i.e. to enforce the law or support other kinds of mandates); and
- Reasonable financial expectations with regard to logistical matters.

Source: Young, 2007.
[a] Whether new legislation or the adaptation/application of existing frameworks or both.

administration to meet its financial and logistical needs. Indicators of excellent legislation are shown in Box 15.

5.4 WHAT ARE THE KEY POLICY FRAMEWORK CONSIDERATIONS AND HOW DO MPAS RELATE TO BROADER SPATIAL MANAGEMENT STRATEGIES?

Management measures, such as MPAs, are more successful when used within a coherent policy framework. An MPA is not an aim in itself, but a tool to achieve policy goals and objectives, and it thus needs to relate to relevant policy frameworks. MPAs with a single objective should be in line with a specific sectoral policy. MPAs with multiple objectives may be embedded in several policy frameworks. Policy coherence then becomes important, and there should be harmonization of policies and plans for MPAs when implemented for fisheries management and biodiversity conservation objectives, or other sectoral purposes.

BOX 16
What are marine spatial management frameworks?

Spatial management frameworks provide a mechanism for strategic marine management that permits a view of the 'big picture' – making it possible to manage current and potential conflicting uses, the cumulative effects of human activities and marine protection. Marine spatial planning is a type of integrated management approach that provides a practical way to more-rational organization of the use of marine space in an open and planned way. It is a "public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process" (UNESCO-IOC, 2010). Marine spatial planning allows for cross-sectoral and holistic approaches to establishing zoning plans and regulations. These plans and regulations can then guide the granting or denial of individual permits for the use of marine space. Spatial management frameworks can be established and implemented at various scales: subnational area, country, subregion or region.

Key characteristics of spatial management frameworks include:

- ecosystem-based: balancing biological, ecological, economic and social goals and objectives for sustainable development;
- integration: cutting across sectors, agencies and levels of government;
- place- or area-based: looking at the allocation and use of space;
- adaptive: learning from experience;
- strategic and anticipatory: focusing on the long term;
- participatory: ensuring that stakeholders are actively involved in the process.

Sources: Ehler and Douvere, 2009; UNESCO-IOC, 2010.

Policy frameworks exist at different scales. In addition to sectoral policies, including fisheries management, there are broader ocean governance and spatial planning and management approaches and strategies that can have cross-sectoral application. Marine spatial management frameworks (Box 16) and integrated coastal zone or area management frameworks (ICM, ICZM, ICAM) are examples of approaches to integrated management (FAO, 1996b). They include mechanisms for managing multiple and potentially competing

uses of designated areas and their resources through ecosystem boundaries and cross-sectoral and institutional approaches.

5.5 WHAT ARE THE INSTITUTIONAL REQUIREMENTS AT THE LEVEL OF INDIVIDUAL MPAs?

Within the broader legal, institutional and policy frameworks, suitable institutional and administrative arrangements are needed for managing and implementing individual MPAs or MPA networks. These arrangements should reflect the objectives of the MPA and be built around partnerships between diverse government departments and stakeholder groups.

MPAs may be managed under a variety of governance systems or management approaches, and the institutional set-up and administrative arrangements will vary from one situation to another. The three general categories of overall approaches are centralized (or government managed), community-based (or locally managed), and collaborative (or co-management). The differences primarily relate to the degree of stakeholder participation in management and administrative arrangements, and the location of management authority and responsibility. In many countries, decentralization of management to local governments and communities is increasing, and the general trend in fisheries and ecosystem management is towards improved and increased involvement of stakeholders. There is general acceptance of the many benefits that shared responsibility and participatory decision-making can generate. Support and compliance are likely to increase if people, individually and as a group, feel they have been informed, have been part of the decision-making process for the MPA, and have been able to actively participate in and influence the process. Disruptions to livelihoods can be minimized and mitigated more easily if those concerned are part of the planning and implementation processes.

MPAs implemented in inshore areas, where local coastal communities are the direct users of the resources, generally have different requirements than MPAs in offshore areas, where users tend to have greater mobility and be less dependent on specific natural resources and areas. Experience shows that it is particularly important in small-scale coastal MPAs to give due attention to community rights and stakeholder participation, and community-based or co-management approaches are likely to be appropriate. As mentioned previously,[37]

[37] See Section 5.1, "Why are appropriate legal, institutional and policy frameworks important for MPAs?"

BOX 17
Great Barrier Reef Marine Park Authority (Australia)

The Great Barrier Reef Marine Park Act of 1975 created the GBRMP and is the key act with respect to the park. It established the GBMRP Authority, which is the main advisor to the Government of Australia on Marine Park control, care and development. The Authority is responsible for park management and provides for regulations, fee collection and enforcement. The act was amended in 2008/09 to improve its integration with other legislation and make it more effective in protecting and managing the Great Barrier Reef in the future. The amendments allow Marine Park management to be guided by such concepts as ecological sustainability, the precautionary principle, and ecosystem-based approaches. The amendments also increase traditional-owner knowledge of and interest in management through the requirement that at least one member of the GBRMP Authority be an indigenous person.

The GBRMP Authority focuses on five major areas: fisheries; tourism and recreation; water quality and coastal development; conservation heritage and indigenous partnerships; and climate change. It has four reef advisory committees (RACs) providing advice on each of these areas with the exception of climate change. The Authority is also advised on Marine Park management issues at the local level by voluntary, community-based committees called local marine advisory committees (LMACs). These community fora – consisting of representative interest groups, government representatives (e.g. of the Queensland Parks and Wildlife and Queensland Department of Primary Industries and Fisheries) and the local community – discuss issues regarding marine resources and their concerns. The LMACs function as advisory bodies and provide a communication mechanism between the community and the Authority.

Source: Government of Australia, Great Barrier Reef Marine Park Authority.

provisions that allow for such governance systems must be reflected in the overarching legal, institutional and policy frameworks for MPAs.

Box 17 describes the Great Barrier Reef Marine Park Authority (GBRMP) in Australia as an example of a legal and institutional set-up for a marine park with protected areas. MPA administrative arrangements and the various

governance systems available to MPAs are discussed further in the context of MPA planning and implementation in Chapters 6 and 7.[38]

5.6 WHAT ABOUT MPAs IN TRANSBOUNDARY AND INTERNATIONAL WATERS?

MPAs in transboundary areas (i.e. across national jurisdictions) have many potential advantages, but face special challenges because responsibilities and authorities are shared by the countries. They offer a unique political option for countries to build confidence through joint fisheries management and biodiversity conservation, and can facilitate collaborative research.

Transboundary collaboration becomes particularly important in designating MPA networks.[39] Globally and regionally, the protected area network approach seems useful, and perhaps even necessary to conserve and sustain all types of ecosystems and biological interactions – without preventing reasonable uses of land or marine areas. The most advanced multinational application of the network approach originated in terrestrial protected areas in the European Union, and the concept has spread more broadly, including to MPAs. For MPAs with biodiversity conservation objectives, an individual country may find it difficult to preserve all relevant ecosystems solely by actions within its own national waters. From a fisheries management perspective, shared fish stocks and related ecosystems and habitats are common, and to make an MPA network effective, it may need to span the waters of several countries. Networks of MPAs could facilitate the management of fisheries on an ecosystem scale.

To allow transboundary MPAs to function, appropriate institutional arrangements are needed. These can be in the form of overarching mechanisms for marine spatial management frameworks, facilitating joint MPA management (Box 18) or through the establishment of specific agreements between states and between the competent authorities in the concerned countries, referring specifically to the MPA. RFBs could play a role in establishing and managing transboundary MPAs.[40] The regional seas conventions of the United Nations Environment Programme (UNEP), designed to promote regional cooperation on marine and coastal environmental issues, are also an important mechanism in the establishment of transboundary MPAs.

[38] See Chapter 6, Section 6.8, "What are the key MPA design considerations?" and Chapter 7, Section 7.1, "What administrative arrangements are needed for MPA implementation?"

[39] See also Chapter 1, Section 1.4, "What is an MPA network?" and Section 1.5, "Why do we need MPA networks?"

[40] See next section and Annex 1 for more information on RFBs.

BOX 18
Benguela Current Commission

The Benguela Current Commission (BCC) was formally established when the Governments of Angola, Namibia and South Africa signed the BCC Interim Agreement in 2006 and 2007, allowing joint management of the marine resources of the Benguela Current Large Marine Ecosystem (BCLME). The three countries will collectively manage transboundary environmental issues such as shared fish stocks and will work together to mitigate the impacts of marine mining and of oil and gas production on the marine environment.

The BCC is headed by a Ministerial Conference supported by a management board, a secretariat and working groups. Committees include Living Marine Resources, Minerals and Oil, Ecosystem Health and Environment, and an Ecosystem Advisory Committee. One important element of the interim agreement is that by 2012 the contracting countries shall strive to bring into force a binding legal instrument that will establish a comprehensive implementation framework for an ecosystem approach to conservation and development of the BCLME. Regional management structures such as the BCC can play a vital role in facilitating joint management of MPAs and interaction with other activities in the transboundary area, such as fisheries, hydrocarbon exploitation and offshore diamond mining.

Sources: Cochrane *et al.*, 2007; BCLME Programme, no date.

5.7 WHAT IS THE INSTITUTIONAL AND LEGAL SITUATION FOR MPAs IN INTERNATIONAL WATERS?

In international waters and other marine areas, MPAs represent an opportunity for the global community to cooperate. However, the creation of MPAs in areas beyond the limits of national jurisdiction is a legally uncertain proposition. If an MPA in such waters is a unilateral or regional creation, it is binding only on the governments, individuals, companies and vessels of (or flagged by) the countries that made the designation. Thus MPAs in these areas can only be functional if they are supported by other countries or mandated in generally agreed international law.

To further compound the matter, non-living resources (i.e. minerals) of the seabed in the Area, or in areas beyond the limits of national jurisdiction, are regulated by the International Seabed Authority (ISA), established under

UNCLOS. The ISA is also empowered to take measures to ensure protection of the marine environment, including flora and fauna, in connection with the various uses of the seabed (see Annex 1 for further information).

Efforts to create high-seas MPAs have taken two tracks. One involves creating high-seas MPAs on an area-by-area basis, relying on existing international law for legal justification and as a basis for calling on all countries to recognize management measures determined by the RFBs, including potential high-seas MPAs. Using this approach, a number of RFBs have identified protected areas (e.g. General Fisheries Commission for the Mediterranean [GFCM], Northeast Atlantic Fisheries Commission [NEAFC], etc.), including limited-take and seasonal-fishing zones and other managed-use/conservation areas. RFBs are critical vehicles for promoting long-term sustainable fisheries where international cooperation is required in conservation and management. However, they do not always y have a mandate that explicitly includes biodiversity conservation; their conventions tend to focus on fisheries management. Nevertheless, an increasing number of RFBs incorporate management according to EAF inclusive of biodiversity conservation, in addition to the precautionary approach, and seek to adopt management measures consistent with EAF principles.[41]

The second track focuses on developing international consensus to adopt one or more new international instruments that will mandate the creation of high-seas MPAs and stipulate the standards by which such areas will be identified, established and managed. This second approach is more focused on the future, seeking a long-term system that will be subject to international law. Its proponents hope that such an instrument will be better able to achieve international goals of conservation and environmental protection.

However, the United Nations Fish Stocks Agreement, which seeks to implement UNCLOS, already mandates that countries must comply with fisheries management rules adopted by RFBs (even RFBs to which a country is not a member), as long as those rules are adopted for fisheries management purposes and "do not discriminate in form or in fact against the fishermen of any State". Accordingly, as long as they are created through or under RFBs and are consistent with the resource management and conservation provisions of UNCLOS, high-seas MPAs can (in the right circumstances) be legally established for the management of living resources of the high seas.

[41] See also Annex 1.

No matter which approach is used, the most important legal elements regarding the international regime for high-seas MPAs appear to be obtaining international acceptance of: (i) the purposes and means for identification and establishment of high-seas MPAs; (ii) a clear statement of the legal rights and duties of countries and stakeholders within each type of MPA in areas beyond the limits of national jurisdiction; and (iii) a body of scientific information and awareness through which open issues relating to MPAs (both within and outside of national waters), the roles and rights of users of marine resources, and national/regional impacts of high-seas MPA protection can be understood.

MPAs and MPA networks in the high seas are discussed further in Annex 1.

KEY CONCLUSIONS AND RECOMMENDATIONS No. 5

Planning and implementation of MPAs and MPA networks must be supported by appropriate legal, institutional and policy structures, including cross-sectoral coordination mechanisms and provisions for stakeholder participation. Most countries have frameworks for fisheries management, as well as for biodiversity conservation or sustainable use of natural resources. However, these existing frameworks may not suffice to meet the needs of designation and management of MPAs with multiple objectives and should be revisited as required. Policy coherence and the use of marine spatial management frameworks are important elements of successful fisheries management and biodiversity conservation.

- Legislation and institutional structures must be in place that support MPA objectives – defined within the framework of national policy goals relevant to fisheries management and biodiversity conservation – and that enable a range of environmental, economic and social benefits and incentives.
- A number of international instruments and agreements, both binding and voluntary, directly or indirectly support the designation of MPAs. These commitments must be reconciled with policies and priorities at local and national levels.
- At the national level, legislation should include standards, processes and other guidance for MPA designation and management. Institutional arrangements should include the necessary provisions for cross-departmental coordination and collaboration, stakeholder consultation and participation, and implementation of decentralized governance systems, as applicable.
- Planning and implementation of MPAs should be embedded in relevant policy and management frameworks. These exist at different scales and for different sectors, and MPAs with multiple objectives may need to be embedded in several frameworks.
- Institutional and administrative arrangements are needed for managing and implementing individual MPAs or MPA networks. These arrangements should be nested within the overall legal, institutional and policy frameworks and should reflect the objectives of the MPA. Arrangements will vary from one situation to another, based on the overall governance system. Nevertheless, independently of the type of governance approach, stakeholder participation in decision-making with regard to MPA planning and implementation is imperative for successful outcomes.

- MPAs in transboundary and international waters pose particular challenges, and special institutional and legal arrangements are often needed. RFBs are critical vehicles for promoting long-term sustainable fisheries where international cooperation is required in fisheries management and conservation.

6. THE MPA PLANNING PROCESS

The purpose of MPAs and MPA networks is to help solve problems and achieve goals and objectives within the policy frameworks and management systems of which they are an integral part. These policy goals and overarching objectives do not necessarily refer explicitly to MPAs but to sustainable fisheries, biodiversity conservation and socio-economic targets. Against this background, the process of setting up an MPA involves a number of choices and decisions: the first would be to define the need for an MPA and the goals it is expected to achieve. The MPA planning process needs to be based on participation, transparency and equity. As mentioned in Chapter 5, good governance is another key to successful MPA management outcomes and this is true already at the planning stage.

This chapter presents the various steps of the planning process, including some key design aspects. Implementation arrangements and information for MPA planning and implementation are discussed in subsequent chapters.

The Code of Conduct for Responsible Fisheries affirms that conservation and management decisions for fisheries should be based on relevant environmental, economic and social factors. Long-term management for sustainable fisheries and ecosystem objectives should be translated into management actions and formulated as fisheries management plans or other management frameworks. Decision-making processes should be transparent and should include stakeholder participation.

6.1 WHAT ARE THE MAIN ENTRY POINTS FOR MPAs INTO FISHERIES AND EAF MANAGEMENT?

The main starting points for MPAs being proposed or considered in a fisheries management context include:

- Initiatives from within the fishery sector: as a management measure within an EAF process (i.e. when evaluating the available management measures), it has been agreed that a suite of management measures, including an MPA or MPA network is the best option for achieving policy and management objectives; or

- Initiatives from outside the fishery sector: as part of a biodiversity conservation initiative or other sectoral plan, it has been decided that an MPA will be designated.
- Spatial management measures already in place under existing frameworks must also be considered. Managers may need to assess such measures to determine: (i) if those in place are meeting their objectives (or if in fact they must adapt the objectives to include broader EAF objectives); (ii) if they should be adapted based on changes in the fishery or ecosystem; or (iii) if they appropriately consider fishery effects or impacts.

The fisheries effects of these decisions must be evaluated and fed into the MPA design process, as well as into the relevant fisheries and EAF management systems and the overarching planning framework. The processes should be iterative and adaptive, with loops and linkages between policies and plans at various levels. Cooperation at different levels and scales is required: between relevant authorities and between these and stakeholders (e.g. fishers and coastal communities).

6.2 HOW DO MPAs RELATE TO OVERARCHING NATIONAL OR SECTORAL POLICY GOALS AND DEVELOPMENT OBJECTIVES?

When deciding to set up an MPA, it should have been concluded that it is a suitable management tool for meeting or contributing to overarching policy goals and development objectives. These goals and objectives may be defined within integrated marine governance and spatial management frameworks,[42] or in legal terms as obligations that a particular sector or industry has to meet. In fisheries, for example, it is common to define overfishing as a problem and sustainable yield as an objective. The legal framework may also define other problems by holding fisheries accountable to other laws that apply to all industry sectors. For example, fisheries are usually subject to environmental laws that protect environmental quality, biodiversity and endangered species. There may also be governmental policies that relate to problem identification and objectives, such as policies that seek industry efficiency or full employment, or refer to environmental protection and biodiversity conservation.

These high-level legal requirements and policy goals must be translated through a series of steps into management decisions and actions applicable to

[42] See also Chapter 5, Section 5.4, "What are the key policy framework considerations and how do MPAs relate to broader spatial management strategies?"

the MPA. Within the framework of the overall policy and legal requirements, clear, specific goals and specific operational objectives – contributing to the overarching goals – should be defined. The planning process will lead to a plan that will guide MPA management.

6.3 WHAT IS THE PROCESS FOR PLANNING AN MPA?

The steps of the planning process are similar to those of an EAF process. Because MPAs should be embedded in broader management frameworks, as mentioned previously, their planning process needs to be couched within and coordinated with these broader plans.

When it has been decided that an MPA is a suitable management measure that will contribute to the overall policy goals and objectives, the planning process follows a number of common steps (see Figure 5), which are discussed in the following sections.

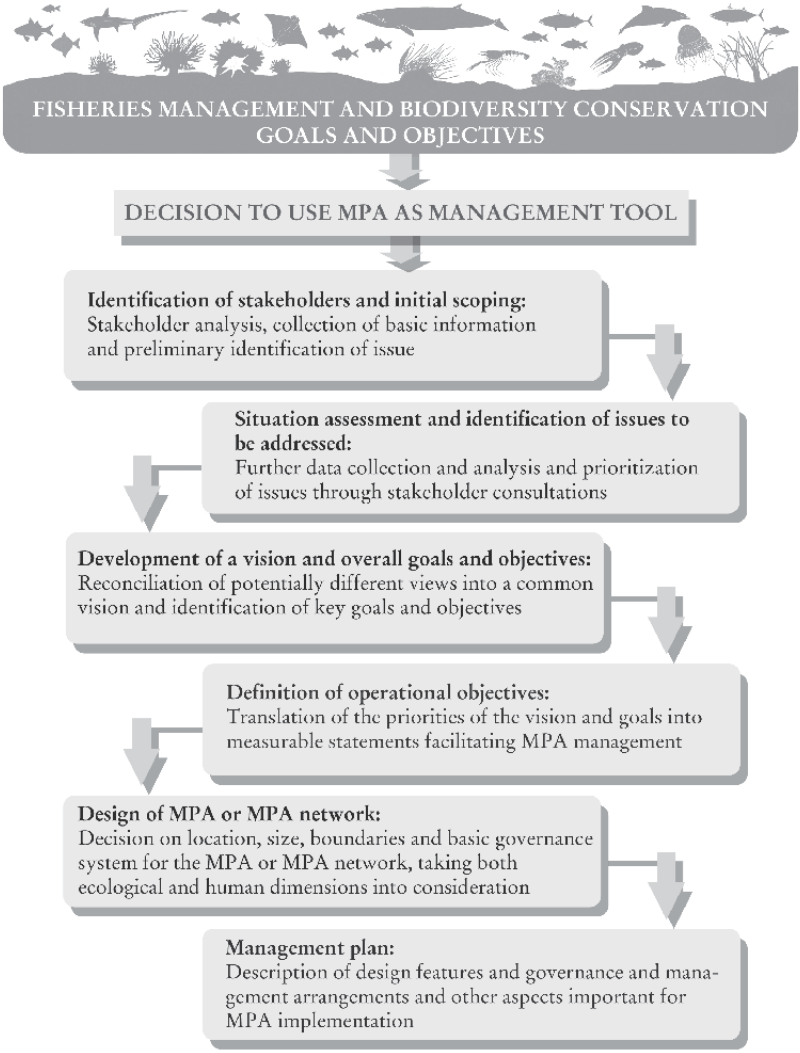
However, the steps are not necessarily always exactly the same in all MPA planning processes – or the process may be less formal. It is also often iterative. MPA management needs to be adaptive,[43] and hence planning outcomes may need to be revisited and plans changed. Depending on overall objectives, local circumstances, related planning frameworks and processes, planned size and location of the MPA, etc., the actual steps and how they are carried out will vary. Nevertheless, the key elements are likely to be same – although perhaps in a different order or framed differently. Box 19 offers an example from the Philippines. MPA implementation is discussed further in Chapter 7.

6.4 WHEN AND HOW SHOULD STAKEHOLDERS BE INVOLVED IN MPA PLANNING?

Early involvement of stakeholders in the MPA planning process is important. The diversity and type of information brought to bear on decisions depends on who has the right to participate in decision-making processes. Consequently, participatory planning arrangements generally increase the amount of information integrated into MPA planning and implementation. Thus participatory processes increase the likelihood that decisions, including with regard to the site and delineation of the MPA, will be based on accurate assessments of socio-economic conditions and environmental dynamics.

[43] See Chapter 7, Section 7.8, "What is adaptive management in the context of MPA implementation?"

FIGURE 5
Common steps of an MPA planning process



BOX 19
MPA planning and implementation in the Philippines

Community-based MPA planning in the Philippines follows a well-established series of steps based on the principles of community organizing (see Figure 6). MPA designation is usually initiated once development or environment specialists become integrated into a coastal community, either by living in the community or by spending considerable time becoming known to community members. The process begins with participatory and scientific surveys of environmental and social conditions. An educational programme for community members using formal and informal methods raises awareness of the importance of marine and fishery resources and management options. From this starting point, community leaders, scientists and resource users conduct baseline surveys of fisheries and ecological conditions using participatory and scientific methods, select a site for the MPA based on the surveys, and work with local authorities to formally declare the MPA.

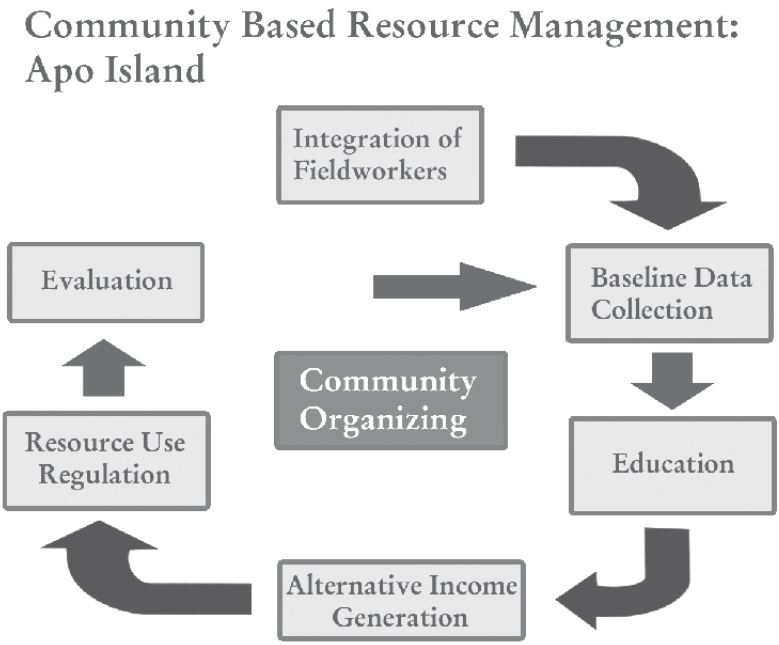
Once an ordinance is passed by municipal authorities, the MPA is usually enforced by community members through government-supported *bantay dagat* (sea guardian) groups. Fishers are deputized to apprehend or report violators of MPA and fisheries rules and regulations. Simultaneously with MPA implementation, development of alternative livelihood activities is common and encourages resource users to organize programmes such as consumer cooperatives, livestock-rearing and ecotourism development. Many, but not all, MPAs are monitored periodically by scientists and residents, which in some cases has resulted in important term-series datasets on MPA effects. Evaluation of MPA management effectiveness and outcomes is an ongoing activity that informs adaptive management of the MPA and alternative livelihood activities. This process has been implemented in hundreds of locations in the Philippines, resulting in a proliferation of MPAs ranging from 4 to 100 hectares in size.

Sources: White, Salamanca and Courtney, 2002; Christie and White, 2007a.

Participatory MPA planning arrangements also tend to enhance the perceived legitimacy of decisions (Box 20).

It is important to be very clear about what one means by stakeholder participation. There are several types of participation, ranging from communication, where there is little direct engagement of stakeholders, to negotiation, where decision-making power is shared among the various

FIGURE 6
General steps for community-based MPA planning in the Philippines



Sources: White, Salamanca and Courtney, 2002; Christie and White, 2007a.

stakeholders. Between these two extremes, other levels of participation are possible. Unfortunately, it is not uncommon that a term that indicates a high level of stakeholder participation is used to describe practices that, in reality, are limited. This often causes frustration from the start – jeopardizing successful MPA management – and should be avoided.

Not all stakeholders have the same stake or level of interest in the MPA and the resources being managed, and thus may be less or more active and have entitlements to diverse roles in the MPA process. A fundamental question is who should be involved. It is important to remember that 'stakeholders' includes not only fishers, but also other community members, resource users, and other sectoral and institutional interests. A stakeholder analysis is usually

BOX 20

Fishers and community participation in planning fish refugia in Viet Nam – the Phu Quoc case study

The seagrass meadows on the eastern shore of Phu Quoc Island – at the southern tip of Viet Nam – were selected as a demonstration site during implementation of the UNEP/GEF South China Sea Project. This was owing to their high species diversity, large extent and the possibility of extending the boundaries of an existing land-based national park to include part of the seagrass beds. After initiation of the demonstration project, it was suggested that the possibility of establishing fisheries refugia in the area be evaluated, as imposing a no-take zone would conflict with the traditional usufruct rights of the Ham Ninh commune.

In 2006, the fisheries refugia concept (an area with specific management measures to protect fish during critical life stages)[1] was introduced to the Phu Quoc archipelago as a potential means of improving the management of fish stock and habitat links at Ham Ninh. The concept was well received by the Kien Giang Department of Science and Technology and Department of Fisheries, as well as by commune representatives.

Subsequent consultations were undertaken with commune fishers, fish traders and women involved in inshore gleaning and processing. However, few or no data on the distribution and abundance of fish eggs and larvae were available for identification of spawning locations or important nursery locations for fish stocks. This problem was largely overcome by the active involvement of local fishers in all consultations and exercises to identify refugia sites. The level of acceptance by commune fishers of the refugia concept was such that they ultimately led activities to identify specific spawning and nursery areas, in consultation with local fisheries, Environment Department staff, and army border officials.

This consultative process provided enough interaction between all sectors that management issues and solutions could often be discussed and agreed at sea, aboard small fishing vessels. Such dialogue was necessary to enable the sharing of ideas and perspectives required to identify solutions to problems of food source and income for the local community.

Source: Pernetta and Paterson, (forthcoming).

[1] See Glossary.

conducted to identify and differentiate stakeholders and help define who should be involved. Important attributes for stakeholder analysis in the context of MPAs and fisheries include:

- the various stakeholders related to the fishery resource and marine area;
- the group/coalition to which they belong or can reasonably be associated with;
- the kind and level of interest (and concerns) they have in the fishery resource and the marine area;
- the importance and influence that each stakeholder has on the fishery resources or its management;
- stakeholders' positions towards the use or conservation of fishery resources and marine habitats.

It is crucial that this process of stakeholder selection is transparent and that all who believe themselves stakeholders are allowed to argue their case for entitlement.

For the effective continuation of the MPA planning process, it may be advisable to identify a few individuals who can represent the interests of larger stakeholder groups. Support and capacity-building of the poorer or marginalized groups of stakeholders may be needed to ensure that they are able to take part effectively in the planning process (and subsequent implementation). Group formation, training and community organizational development are important tools in this respect.

A reliable stakeholder analysis requires research to provide information about stakeholders. It will typically include a socio-economic assessment to learn about the social, cultural, economic and political conditions of individuals, households, groups, communities and organizations, as well as about the power relationships between various stakeholders and stakeholder groups.

Together with the stakeholder assessment and analysis, a preliminary collection of basic information on the fishery system and the marine area is needed in the early stages. This scoping exercise should include bioecological, socio-economic and institutional aspects, and should take note of particular issues, problems and opportunities relevant to the designation of an MPA. The stakeholder analysis and scoping results will provide the basis for a more-detailed situation assessment and for identifying the issues to be addressed.

6.5 HOW ARE THE ISSUES TO BE ADDRESSED BY MPAs IDENTIFIED AND PRIORITIZED?

Working closely with stakeholders, the initial scoping exercise needs to be expanded into a more-detailed situation assessment and an MPA profile. This profile should cover a number of aspects and be compiled in close collaboration with the stakeholders.[44] This will assist in identifying the issues that the MPA is expected to address and resolve.

When taking a holistic and integrated approach to MPA planning, the process of identifying and agreeing on pertinent issues is likely to be complex. With a broad range of stakeholders and views on what aspects are important, prioritization becomes a critical element of the process. Several methods and approaches can help – as well as in the subsequent steps of defining goals and objectives. These include the hierarchical tree or framework approach, cost–benefit analyses, risk assessments and distributional impact reviews (Box 21). All these approaches are complementary, and the various methods can be used to calculate inputs for, or in combination with, more general analytical frameworks for decision-making assistance.[45]

6.6 WHAT IS A VISION AND WHAT ARE USEFUL MPA GOALS AND OBJECTIVES?

A vision is a description of the ideal state of the fishery and the marine area that stakeholders aspire to and arises directly from the planning process that concluded that an MPA is one of the tools to be used for addressing the main issues identified (see Chapter 2 and Section 6.1). This vision encompasses both biological and ecological status and takes account of socio-economic circumstances and governance arrangements, and constitutes a basis for the formulation of goals and objectives. The interests and objectives of different groups and the issues that have been identified in the stakeholder analysis and in the participatory situation assessment should be shared, recognizing that the perceptions and aspirations of the groups may sometimes appear difficult to reconcile and may require repeated facilitation and negotiation. Particularly if planning takes place in a poverty context or in situations where food security is a concern, it is important that the goals and objectives of MPAs reflect a

[44] The types and sources of information for MPA planning and implementation are discussed in Chapter 8.

[45] See also Chapter 8 and FAO, 2003a, 2009a, as well as the related FAO Fisheries Technical Papers (FAO 2002, 2003b, 2008b). Information on the Australian ESD framework is available at www.fisheries-esd.com/

BOX 21
Tools for analysis and prioritization

Various analytical frameworks can assist in the decision-making and prioritization process when selecting what issues an MPA should address and what the goals and objectives should be:

- *hierarchal or problem tree* is often used as part of participatory planning and helps define root causes by clustering identified problems and issues. The hierarchical tree framework, developed in Australia within the concept of ecologically sustainable development (ESD), starts with the two main concerns for such development – human and bioecological well-being – and adds a third main component related to governance and the ability to achieve.
- *analysis* is used to determine the economic efficiency of various options from among which decision-makers must choose. Simply put, future costs and benefits are estimated for each option and the sum of their net present values (NPV) calculated. The alternative with the highest NPV is the preferred choice. A considerable challenge in this process is to measure the costs and benefits. While it may be feasible to put values on economic costs and benefits – such as changes in income and fishing expenditures – social and ecological costs and benefits are more difficult to express in monetary terms.
- *assessments* are essentially used to determine whether the probability of a particular hazard or threat, combined with the magnitude of its impact or cost in case it does occur, is considered acceptable or not when compared with some standard or benchmark. In the context of ESD in Australia, a risk matrix has been developed categorizing 'likelihood' and 'consequences' of hazards into six levels. By multiplying the likelihood score by the consequences score, risk ratings for the various scenarios are arrived at. These then guide decisions on what actions different issues may require.
- *impact reviews* examine not only total costs and benefits (as in cost–benefit analysis), but who will benefit and who will not, as well as the temporal and spatial distribution of costs and benefits. This is an important aspect of equity and is particularly relevant when planning MPAs in a poverty context, where certain community groups may be highly vulnerable.

Source: FAO, 2008b.

balance between the needs and realities of sustainable exploitation, biodiversity conservation and socio-economic requirements.

The vision provides a framework for defining goals and objectives. A goal – or broad purpose – is a statement of what the MPA is ultimately trying to achieve within the context of broader goals defined at the sectoral (e.g. within an EAF) or intersectoral level. A useful goal has these characteristics:

- a brief and clear definition of the desired long-term vision or conditions that will result from effective management of the MPA;
- typically phrased as a broad mission statement; and
- simple to understand and to communicate.

Most MPAs have biological, socio-economic and governance goals and objectives. In some cases, they are also put in place to achieve cultural goals. Examples of potential goals of MPAs are listed in Box 22. In Box 23, an

BOX 22
General goals for MPAs in the context of fisheries

MPAs should contribute to some of the following goals.

Biological/ecological goals:

- sustaining or protection of fishery resources;
- protection of biological diversity;
- protection of individual species;
- protection of habitat;
- restoration of degraded areas.

Social and economic goals:

- fostering of food security;
- improvement of livelihoods;
- non-monetary benefits to society;
- equitable distribution of benefits from the MPA;
- maximum compatibility between management and local cultures;
- enhanced environmental awareness and knowledge.

Governance goals:

- maintenance of effective management structures and strategies;
- maintenance of effective legal structures and management strategies;
- effective stakeholder participation and representation;
- enhanced management plan compliance by resource users;
- management and reduction of resource-use conflicts.

Source: Based on Pomeroy, Parks and Watson, 2004.

BOX 23
Goals and objectives of the Prince Edward Islands MPA in South Africa

The process of developing the plan for the Prince Edward Islands MPA began in June 2004 with an announcement by the Marine and Coastal Management branch of the Department of Environment Affairs and Tourism (DEAT) that they intended to declare one of the largest MPAs in the world around the Prince Edward Islands. Following this announcement, DEAT, with support from WWF-South Africa, put together a process to develop a spatial marine biodiversity conservation plan that would inform delineation of the proposed MPA. This plan was developed with extensive consultation with stakeholders, including the fishing industry and interested civil-society groups. Proposed regulations were also developed through a series of workshops and consultations with all stakeholders. The stated objectives of the Prince Edward Islands MPA were to:

- contribute to a national and global representative system of MPAs by providing protection for unique species, habitats and ecosystems;
- serve as a scientific reference point that can inform future management of the area;
- contribute to recovery of the overexploited Patagonian toothfish (*Dissostichus eleginoides)*;
- reduce incidental mortality of seabirds, particularly albatrosses and petrels, in the Patagonian toothfish fishery, and control the bycatch of fish and marine species other than Patagonian toothfish in the commercial fishery.

Within the framework of these objectives, three broad focal areas were identified: biophysical, socio-economic and governance. These focal areas relate to diverse goals: maintain biodiversity; contribute towards the long-term viability of marine fisheries, and recovery of the stocks of the Patagonian toothfish; promote ecotourism; and ensure that appropriate and effective legal structures are developed for protecting the biodiversity of the MPA and the activities that benefit from it.

Source: Japp and Currie Potgieter, (forthcoming).

example is provided of the definition of goals and objectives in consultation with stakeholders of the Prince Edward Islands MPA in South Africa.

Because MPAs will have multisectoral effects, multiple goals should be considered even when the original initiative to designate an MPA has emerged from one particular concern. For example, when setting up an MPA for biodiversity conservation, its harmonization with relevant fisheries policies and legislation, and its potential contribution to sustainable fisheries should also be explored. If the effects on fisheries are internalized in the planning and design process, instead of being dealt with as an externality, the outcomes are likely to be more useful. Setting clear goals and objectives helps ensure more-effective management and facilitates the monitoring of progress. When the specific MPA objectives are set, decisions on the site, scale and other design aspects of the MPA should follow. These decisions should be goal- and objective-driven.

Poorly designed or articulated goals and objectives can be a serious problem and can jeopardize the desired outcomes. Adequate time and resources must be allocated to this process before moving on to the design and more-operational aspects of MPA planning.

6.7 HOW ARE THE OPERATIONAL OBJECTIVES FOR AN MPA SET?

The vision and broadly defined goals of MPAs must be translated into specific objectives, with direct and practical meaning, that can be used in MPA implementation and performance evaluation. An operational objective is a measurable statement of what must be accomplished to achieve a related goal. Attaining a goal is typically associated with the achievement of two or more corresponding operational objectives. A useful operational objective is SMART:

S – specific and easily understood;
M – meaningful and written in terms of what will be accomplished, not how to go about it;
A – agreed, with stakeholders' responsibilities defined;
R – realistic and relevant; and
T – time-bound, that is, defined within a limited time period.

As with the identified issues, in a participatory process more potential objectives may be identified initially than can realistically be assigned to the MPA, and it could be necessary to prioritize. This is a process that requires effective participation and negotiation.

6.8 WHAT ARE THE KEY MPA DESIGN CONSIDERATIONS?

To achieve the assigned goals and objectives, the MPA needs to be designed and decisions made on management measures – where the MPA will be located, how large it will be, the borders, and the activities allowed within it. Decisions must also be made with regard to governance, and the preferred management approach must be supported by the overall policy and legislative framework.

There may be several options for achieving the same objective. In order to enable stakeholders to make informed decisions on which of the possible options may best serve the goals and their interests, information on their potential effects and outcomes should be gathered and made available.

Design considerations are discussed in the following paragraphs with regard to site selection, the amount of area needed for the MPA and governance options. These features will be documented in the management plan, together with implementation and management arrangements. These aspects are discussed further in Chapter 7 of this document.

How is the site for an MPA selected?

The selection of sites for MPAs and their delineation depend on objectives, spatial information – biological, ecological and socio-economic – and legal and institutional frameworks. Objectives define what is to be protected by MPAs, spatial information determines where MPAs should be located, including the specification of MPA boundaries, and legal and institutional frameworks determine if there is the authority to establish and enforce MPAs in the locations selected as a priority for protection.

The site-selection process may involve sophisticated models or it may rely on the judgements of local people, based on fishing experience and traditional ecological knowledge. It will often be useful to develop a set of site-selection criteria based on objectives, available information and legal frameworks. These criteria can be used to identify priority areas in which to establish the MPAs. They can help ensure objectivity in the selection of sites and boundaries. Depending on the MPA objectives, criteria could include, for example, social acceptance, aesthetics, accessibility, importance to fisheries, nature of threats, representativeness, uniqueness and vulnerability.[46]

[46] See Salm, Clark and Siirila, 2004, for examples of criteria and a discussion of the site-selection process.

BOX 24
Outline of zoning provisions in the Great Barrier Reef

- *use zone/general use 'A' zone*: least restrictive of all the zones; it provides for all reasonable uses, including shipping and trawling. Prohibited activities include mining, oil drilling, commercial spear-fishing and scuba spear-fishing.
- *protection zone/general use 'B' zone*: provides for all reasonable uses, including most commercial and recreational activities. Shipping and trawling are prohibited, as well as those activities not allowed in general use 'A' zone.
- *park zone/marine national park (MNP) 'A' zone*: provides for appreciation and recreational use, including limited line fishing (one line/hook per person). Spear-fishing and collecting are prohibited, as well as those activities not allowed in general use 'B' zone.
- *zone/marine national park 'buffer' zone*: similar to and adjacent to MNP 'B' zones, but allows pelagic trolling. All those activities not allowed in MNP 'A' zone are also prohibited.
- *park zone/marine national park 'B' zone*: provides for appreciation and enjoyment of areas in their relatively undisturbed state. It is a 'look, but don't take' zone, in which all forms of extraction (including fishing) are prohibited.
- *research zone*: set aside exclusively for research. Entry and use for other reasons are prohibited.
- *zone*: provides for preservation in an undisturbed state. All entry is prohibited, except in an emergency, with the exception of permitted scientific research that cannot be conducted elsewhere.

Source:. Day, 2002, p.143, Table 1.

Zoning is an important component of overall MPA management. Zones within an MPA can be used to permit or restrict diverse uses in different areas of the MPA or an MPA network. They can assist in reducing user conflicts and providing greater protection for ecologically sensitive areas, while allowing access to other areas for extractive purposes or tourism. In a multi-use MPA, a preliminary zoning plan to accommodate the various uses should be developed. As consultations with stakeholders are held, this may subsequently

be amended to reflect user-group expectations and needs. The selection of an MPA site is usually a compromise between longer-term biological and ecological considerations, and the more immediate needs of people and their current use of the resources.

Climate change may undermine the robustness of MPAs in terms of sustaining populations and protecting habitat and biodiversity. As the distribution of organisms responds to climate change, MPAs that were once positioned strategically based on historical distributions of organisms may no longer be in the optimal place. A network of MPAs with the potential to afford protection as the climate changes – and biological distributions respond – may be more effective in this context than depending too heavily on a single MPA. Longer-term changes in conditions, especially if difficult to forecast, also call for adaptive management and flexibility in implementation processes.[47]

How much is enough area for MPAs?

When considering MPAs for fisheries management purposes, there is no 'one size fits all' or percentage-share answer for the appropriate size or scale or number of MPAs. The adequate size or number will depend on the management objectives and approach taken, as well as on the characteristics of the ecosystems or species being managed. The area needed for protecting a specific life stage of a targeted fish species will necessarily be different from that required to address the protection of specific vulnerable habitats, and the size and location of an MPA designed to protect new recruits will differ from one for protecting spawning concentrations.

In general, it may be said that the size of the MPA should be larger when the fish or the habitat to protect are more or less uniformly distributed across an area, when fish are highly mobile, and when no other (or limited other) effective fisheries management measures are applied to the area. Conversely, the protected area can be smaller if the fish are geographically concentrated (assuming the MPA is placed where they are concentrated) and are relatively sedentary, or other effective fisheries management measures are in force. Of course, if the goal of the MPA is to protect biodiversity, other considerations may apply.

The following are the main questions to ask when defining the size necessary for an effective MPA for fisheries management purposes. ANNEX 2

[47] See also Chapter 7, Section 7.8, "What is adaptive management in the context of MPA implementation?" and Chapter 1, Section 1.5, "Why do we need MPA networks?" in Part 1.

offers further information on MPA size considerations from a fish-population sustainability perspective. The first and primary question is:

- *What needs to be protected and what are the main threats?* (e.g. fish may need protection from fishing, or habitats from fishing gear impact or from other human activities).

If the MPA is designed to protect a particular life stage, the following questions should be considered. They are phrased in terms of the life stage of a single species. In the more-typical case of an MPA to protect a multispecies community through multiple life stages, it will be necessary to ask the same questions, but taking into account the life histories and distribution of the full range of species in the community. In that case, it would probably be more practical to select some key, representative species that together can be taken to represent the community as a whole in terms of life history and distribution and to answer the questions for the representative species combined:

- If the aim is to provide direct protection of fish from fishing, *what life stage or stages should be protected?* (e.g. spawning aggregations, juveniles or recruits).
- *What percentage of the total potential production or biomass at each life stage needs to be protected?* (percentage population protection [PPP]). A key reference point needs to be considered, based on the required spawning per recruit (SPR) ratio, in order to achieve the objectives required (e.g. 30–50 percent for MSY or depending on the degree of precaution, multispecies reasons, economic considerations etc.).
- *What other management measures are already in place to protect this life stage?* (e.g. fishing input, output or technical measures, closed seasons, habitat protection, other MPAs).
- Based on recent trends in recruitment, *how much additional PPP is required, above that offered by existing management measures, to achieve the percentage of protection required for this life stage?* If data, information and analytical expertise are available, this question could be answered through a variety of stock-assessment methods. In the absence of these requirements, an approximate answer may still be possible. If recruitment has been very low in recent years because of fishing or other human activities that can be spatially regulated, it is likely that current PPP is far short of the required percentage and that close to the full target percentage needs additional protection. If recruitment has been lower than usual, but years of average

recruitment are still being observed, an additional 10–20 percent of PPP may be required (i.e. boosting from the likely 20–25 percent [based on recent recruitments] to the required 35–40 percent PPP).

- *Is an MPA the most efficient way to achieve this additional protection?* This is a complex question that requires consideration of a number of aspects discussed in Chapters 3 and 4 in Part 1.
- Having decided that an MPA is the required tool and having estimated the additional PPP required from the MPA, *how much of the total area of occurrence of the species or community needs to be protected by an MPA or network of MPAs?* This requires knowledge of the spatial distribution and mobility patterns of the species or community and should also take into account effort redistribution.[48]

Finally, distribution of the species or species groups in question must be examined:

- *Is the life stage (or community) distributed evenly across the area?* If distribution is even, the percentage area to be protected is equal to PPP required. If the species or community is concentrated in some areas, as is typical of most marine species, which site or sites can be considered for MPAs, and how big would the MPAs at those sites need to be to include the required PPP?
- *Will it be most efficient to have a single MPA to provide the required protection or would it be more efficient to have a network of smaller MPAs?* This is a very important question. Considering only the PPP required, unless the community and the species making it up are very evenly distributed across their entire range, it will almost certainly be a more-efficient use of space to have a network of MPAs offering the required protection by focusing on areas of concentration and essential habitat. In the final decision on how to design the network to provide the required protection, consideration also must be given to other factors discussed elsewhere in the Guidelines (e.g. impacts on stakeholders, spillover, effectiveness of governance and management, capacity for enforcement, robustness to change, etc.).

[48] See also Chapter 4, Section 4.5 "How are MPAs likely to affect fishers' behaviour, fishing effort and fishing capacity?"

What are the main governance systems available for MPAs?

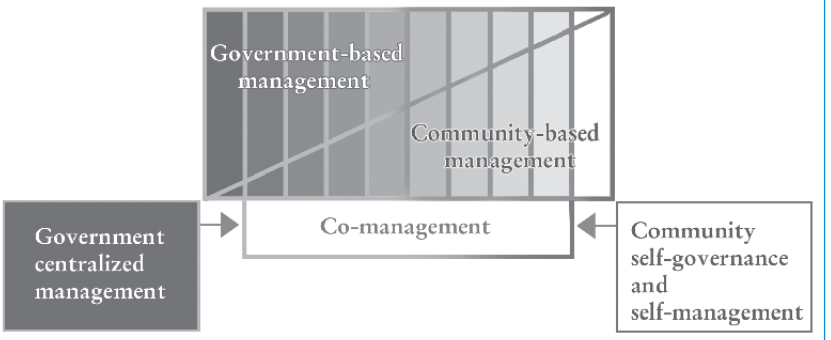
A range of governance systems – or management approaches – is available for MPA implementation, representing varied levels of resource-user and community involvement: centralized, community-based, traditional or co-management. Depending on local circumstances, existing overarching policy and legal frameworks and the objectives of the MPA, one or another of these approaches may be best suited to MPA management. The choice of governance system is fundamental for MPA management and implementation, and the planning process should establish what the appropriate arrangements are.

There has been a growing trend towards increased decentralization of governance in general, as well as in fisheries management. Management responsibilities, or management rights, are increasingly shared among the central and local levels of government, communities and other stakeholders. Co-management systems are gaining in popularity, in particular in the small-scale fisheries sector. These systems represent combinations of government-led or -supported natural resources management approaches – often from the provincial, district or local level – with community-based systems.

Co-management arrangements can take many forms, with varying degrees of responsibility assigned to the participating parties. Classification of co-management systems requires a simplification of complex realities, as there is a continuum of possibilities, covering the sharing of diverse forms of power. Conceptually, one can distinguish cases in which the decision-making authority remains with the government, but resource users are involved in implementing management decisions. Other arrangements include the delegation of decision-making powers to resource users and other stakeholders.

If the delegation of authority to users is complete, it may become a community-based management system with minimal or no involvement by the government (see Figure 7). Commonly, however, governments continue to have a role; at least functions such as research and enforcement, in particular with regard to legal sanctions, will generally remain with government authorities. It is important to ensure that the various government agencies concerned are sufficiently involved in the process – both at central and local levels. At a minimum, the agencies responsible for fisheries management and biodiversity conservation, as well as MCS authorities, should collaborate in the co-management process, with a clear definition of the responsibilities of each party.

FIGURE 7
Continuum of co-management arrangements



Source: Pomeroy and Berkes (1997, 466, Figure 1).

It is worth noting that a co-management system can evolve without a corresponding *de jure* (i.e. legally enshrined user and management rights). However, it is likely to be more effective if the community or co-management group has legally protected, exclusive rights. There is growing agreement among policy-makers, fishery managers and researchers that ensuring that fishers have well-defined and secure rights is at the core of good fisheries governance. When designating MPAs for co-management, user and management rights with regard to the MPA and its fishery resources must be clearly defined.

6.9 WHAT IS AN MPA MANAGEMENT PLAN?

The MPA management plan should document the chosen design features and governance and management options. As mentioned previously,[49] MPAs are most effective when embedded within integrated ocean governance and spatial management frameworks. This means that management plans for MPAs should be part of broader fisheries management and biodiversity conservation plans and clearly in line with relevant policies. Sometimes a separate MPA management plan may not be needed; the plan can be integrated into overall marine or

[49] See Chapter 5, Section 5.4, "What are the key policy framework considerations and how do MPAs relate to broader spatial management strategies?"

ecosystem management plans. However, for MPAs that are relatively large, include zoning, and are near shore and associated with coastal communities (and for which management is thus relatively complex and demanding), special management arrangements and plans tend to be needed.

When the main features of the management plan have been drafted, it may be worthwhile to take stock of what has been accomplished so far, assess the coherence of the plan and identify possible implementation challenges. MPA management plans should also describe the relevant implementation and administrative arrangements and responsibilities. The next chapter will discuss key elements of an MPA management plan and its administrative arrangements, as well as other implementation aspects.

KEY CONCLUSIONS AND RECOMMENDATIONS No. 6

Planning of MPAs and MPA networks should be done through integrated and participatory decision-making processes, based on good governance principles. Clear, specific goals and operational objectives should be defined within the framework of the overall policy framework and overarching goals.

- The MPA planning process is similar to an EAF process. It is flexible and depends on the case-specific circumstances, but generally covers the following steps:
- *Identification of stakeholders and scoping:* Participation of stakeholders is key to successful MPA planning and implementation. They should be identified and involved from the beginning of the process.
- *Situation assessment and identification of issues:* The issues to be addressed by MPA management must be identified and prioritized based on bioecological, social and economic information and through negotiation with stakeholder groups.
- *Development of a vision and overall goals and objectives:* Developing an MPA vision is a useful way to reconcile divergent views and create a common understanding of priorities to help define goals and objectives.
- *Definition of operational objectives:* Based on the goals, specific operational objectives having direct and practical meaning should be formulated to support MPA implementation and performance evaluation.
- *Design of MPA:* Key design features to consider in the MPA planning process include:
  - selection of MPA sites and a decision on how much area needs to be protected;
  - definition of the type of governance system that will apply to the MPA (centralized, community-based, traditional or co-management);
- *Preparation of management plan:* The MPA management plan documents the chosen design features and governance and management options. It also describes the relevant implementation and administrative arrangements and responsibilities.

7. MPA IMPLEMENTATION

The MPA or MPA network planning process, discussed in the previous chapter, establishes the framework for MPA implementation. This framework is documented in the management plan, and complemented by the details of implementation, administrative arrangements and responsibilities. An implementation start-up period will probably be needed, as well as continuous monitoring and the flexibility to adjust plans and decisions if outcomes are not satisfactory.

Closely linked to the MPA planning process presented in Chapter 6, this chapter discusses implementation and administrative arrangements and the operationalization of MPA management plans. The information needed for MPA planning and implementation is discussed in the next chapter.

The Code of Conduct for Responsible Fisheries urges states to ensure that effective legal and administrative systems are in place for fishery resource conservation and management. Decision-making processes should be transparent and resource users involved in implementation processes. Procedures and mechanisms for conflict resolution should be established.

7.1 WHAT ADMINISTRATIVE ARRANGEMENTS ARE NEEDED FOR MPA IMPLEMENTATION?

Implementation and administrative arrangements should be included in the overall management plan. Provisions are needed for staff and general administration, including facilities and equipment, budget and finance. Moreover, the following implementation and administrative functions should be covered (see also subsequent sections):

- defining, interpreting and implementing rules and regulations that apply to the MPA;
- ensuring compliance and enforcement;
- implementing activities that support MPA management, such as capacity-building and incentives;
- providing and communicating information on the MPA;
- addressing and mitigating conflicts, as required;

- promoting management effectiveness and carrying out monitoring and performance evaluation;
- ensuring that experiences and lessons learned inform decisions and practices through adaptive management mechanisms;
- resourcing MPA implementation and ensuring sustainability.

Implementation and administrative arrangements may be finalized in the first year of operation (if funds are available), or set up incrementally over a fixed period of years. The first year of operation may involve only the managers or several staff performing a range of functions, including collection of information to supplement the initial MPA profile,[50] community organization and education, general office management and setting up administrative routines. When implementing an MPA under community-based or co-management arrangements in a coastal area with communities that may lack experience with this type of engagement, particular attention should be paid to capacity and organizational development, so that stakeholders can participate effectively in MPA management and administration as required.[51]

Analogous to the need to integrate MPAs within broader policy and management frameworks, MPA administration should also be coordinated within relevant overarching fisheries management and biodiversity conservation or other spatial management implementation systems. In some cases, when MPAs are used as a specific management tool within a broader system, they will not require their own administrative support. Monitoring, enforcement and communication functions can be performed as part of the overall implementation of, for example, an EAF management plan.[52]

An advisory or management committee should be established to provide advice on management. The advisory committee can serve a number of functions including advising on the development of rules and regulations, approving work plans and budgets, and evaluating progress. The advisory committee can be composed of people from the local community, local leaders, government agencies and elected officials. Advisory committees may be more active in management decision-making in MPAs with co-management or community-based management.

[50] See Chapter 8, Section 8.1, "What is the basic information needed for MPA planning and implementation and how it is it generally collected?"

[51] See also Section 7.4, "What do capacity-building and incentives mean in the context of MPA implementation?"

[52] Or there may be no need for a specific MPA management plan; see also Chapter 6, Section 6.9, "What is an MPA management plan?"

The number of staff members depends on the circumstances of the particular MPA. Staff should be well trained. Managing MPAs effectively calls for an understanding of the resource being protected, the people in the area, an ability to work and communicate with local people and visitors, and competence in specialized areas. Staff also need a minimum of equipment to perform their tasks, such as boats, binoculars, radio communications, computers, etc.

7.2 WHAT ARE THE KEY CONSIDERATIONS WHEN DRAFTING RULES AND REGULATIONS FOR MPAs?

Within the overall legislative framework discussed in Chapter 5, the rules and regulations applying to an MPA should accurately reflect decisions made when deciding on management options and establishing the management plan. The rules and regulations should:

- accurately interpret management decisions and relate to the management context;
- be legally defensible within the jurisdiction in which they apply;
- be enforceable, so that violators can be apprehended and prosecuted;
- specify a penalty schedule that is fair in terms of the severity of violations, yet adequate to serve as a deterrent;
- be subject to public comment prior to being finalized.

Ideally, decisions should be well documented and rules and regulations unambiguous. Interpreting MPA decisions and drafting rules and regulations usually require the services of legal professionals, but stakeholders should be consulted throughout the drafting process. One option is to establish rules and regulations through a management board or with advice from an advisory committee with representation drawn from all stakeholder groups.

7.3 WHAT ABOUT COMPLIANCE WITH AND ENFORCEMENT OF MPA MANAGEMENT RULES AND REGULATIONS?

The FAO Technical Guidelines on Fisheries Management series explains the need for effective MCS systems to allow for full and expedient implementation of fisheries conservation and management plans.[53] For MPAs, the situation is the same: rules and regulations must be followed and their compliance enforced to protect the designated area according to the established management plan. Compliance with this plan, and its agreements and decisions, is essential to

[53] See Cochrane and Garcia, 2009, Ch. 14.

the effectiveness of the whole management programme and to achieving the agreed objectives.

MCS can take many forms and will vary according to local contexts and situations. There needs to be an enforcement mechanism that specifies who is responsible, the means of enforcement, and the penalties for non-compliance. While national and local governments have responsibility for law enforcement, under community-based and co-management agreements, fishers and other stakeholders sometimes play an extended role in the enforcement of rules and regulations. Resource users may also decide to self-enforce MPA rules and regulations when they believe that they benefit from compliance. Ideally, self-enforcement should be formally empowered by agreement with the responsible government agencies, so that it is legitimate, rather than a form of vigilantism.

MCS systems are in place in most countries and should be used for MPAs, although complementary systems may be required. Application of technology can play a critical role in enforcement of fisheries and spatial management rules and regulations. For example, vessel monitoring systems (VMS) can be used to monitor the position of fishing vessels. VMS units are placed on fishing vessels, and the unit interfaces with a GPS system equipped with a transmitter, which reports vessel positions via satellite to officials charged with fishing vessel operations. The unit can be configured so that it cannot be tampered with by the vessel's crew and so it reports automatically on schedule. VMS officials can remotely check or query the systems for positions at any time. The units are also capable of reporting additional data, such as amount of catch, although such information needs to be entered into the system by vessel crew. It is increasingly common for fisheries management rules and regulations to require VMS, although it is usually applied only to large-scale fisheries.

When and where applicable, VMS can be a powerful tool to enforce MPAs, as it is difficult for vessels to enter an MPA without being detected. However, the system requires a certain level of capacity to function effectively for enforcement. For example, data transmitted must be analysed and acted on, and it may not be suitable for small-scale fisheries in developing countries, where there are large numbers of fishers widely dispersed in sometimes remote places, and fisheries management authorities have limited capacity. Moreover, in many developing countries, small-scale fishers are often among the poorer groups of society, and MPA management enforcement needs to be seen in this context. Still, VMS use for small-scale fisheries is increasing, sometimes with the notion of safety-at-sea.

Enforcement is more than the presence of police – or other authorized people – arresting or fining violators. It involves the application of a broad range of approaches by various institutions and stakeholders to change or modify behaviour. When widespread compliance is achieved, resource users and stakeholders have reached an adequate level of knowledge and a positive attitude on the issues, and usually behave within the bounds of socially accepted practices and legal requirements.

7.4 WHAT DO CAPACITY-BUILDING AND INCENTIVES MEAN IN THE CONTEXT OF MPA IMPLEMENTATION?

To support MPA management – and compliance with the established rules and regulations – there are a number of key mechanisms that should be considered as part of implementation. These include capacity-building and incentives.

Capacity-building may be a prerequisite for effective stakeholder participation. Stakeholders' interactions are improved when each can appreciate the other's use of the MPA – and understand the ecosystem, the fisheries, the social and economic dynamics, etc. With a higher number and broadening range of stakeholders, the potential differences in ability to participate in management also increase. Capacity-building should be facilitated to empower all stakeholders to effectively play their role in the management of the MPA. The implementation of MPAs with multiple objectives may involve changes in the responsibilities and priorities of fisheries departments, ministries of environment and other agencies, and may require appropriate training of staff affected by these changes. This could include enhancing knowledge and understanding of fisheries measures and objectives for biodiversity conservation managers, or of biodiversity conservation considerations for fisheries officials.

Technical training in monitoring, evaluation and adaptive management is particularly helpful to local resource users and managers in developing countries and should be done on a regular basis. Training programmes and long-term funding support must be generated so that interdisciplinary capacity can continue to be built.

Another critical factor for successful stakeholder participation in MPA implementation is organizational development. Early core-group formation can facilitate planning and implementing support to and capacity-building for diverse stakeholder groups. It also helps participation through representation: various interest groups may take part in meetings and committees through their representatives.

In the context of EAF, the use of positive incentives is generally promoted and this is an important implementation mechanism for MPAs as well. A major focus of conventional fisheries management in the past has been to establish sets of rules and regulations, with negative incentives (penalties) for failing to comply. Positive incentives, on the other hand, are designed to induce desired behaviour, potentially decreasing the reliance on finding and punishing rule-breakers. Positive incentives are part of compliance and can be of an institutional, legal, economic or social character. The type of instrument that should be used in each case will depend on the local situation and the objectives that have been set.[54]

Considering that there are potentially significant distributional implications from the benefits and costs of an MPA,[55] there may be stakeholders for whom the value of the MPA may be or appear negative, at least in the short term. Such participants cannot be expected to participate and comply with MPA management decisions without there being some considerations that these individuals can factor into their decision-making to induce support for the MPA. Incentives and support, for example in the form of development and poverty-reduction programmes, are generally required. Particularly when implementing MPAs in a poverty context, combining management with supplementary or alternative livelihood opportunities that provide benefits in the short run is essential in addressing any economic disruptions to the individual, household or community (Box 25). Thus suitable incentives can be vital to participation and to the long-term sustainability of the MPA.

Creation of successful alternative livelihood programmes is challenging and may create controversies if perceived as inequitable, for example if benefiting only some families. Identification of successful alternative livelihoods will require economic and social feasibility studies, participation by the affected individuals or communities, and analysis of the biological and ecological consequences. MPA programmes and community members should focus on products that make use of the skills and social norms of fishing community

[54] Incentives are discussed in more detail in FAO, 2008b and 2009a.

[55] See Chapter 4, Section 4.2, "What are the key socio-economic challenges when establishing MPAs close to fishery-dependent coastal communities?"

BOX 25
Alternative livelihoods in Samoa

In Samoa, the government Fisheries Extension Programme has assisted communities in developing recognized village fisheries management plans for various locally managed marine areas (see also Box 33). As most subsistence fishers require seafood for their families on a daily basis (more than 40 percent of all Samoan households fish), and up to 22 percent of households receive income from fishing, it is unreasonable to expect fishing communities to adopt conservation measures that will reduce catches, even if only at the start, without offering alternatives and incentives. Accordingly, the Samoan extension programme includes the promotion and development of sources of seafood alternative to those from the present heavy and destructive exploitation of nearshore reefs and lagoons. These alternatives include the promotion of village-level aquaculture and the restocking of depleted species of molluscs in village areas; and new types of fish and shellfish options, through tilapia farming and hatchery-reared giant clams.

Source: Friedman and Kinch, (forthcoming).

members. Under the Coral Reefs and Livelihoods Initiative (CORALI),[56] further development and piloting has taken place of an approach to sustainable livelihoods enhancement and diversification (SLED). Lessons learned from CORALI regarding the steps of the SLED approach are summarized in Box 26.

7.5 WHY ARE INFORMATION AND COMMUNICATION IMPORTANT IN MPA IMPLEMENTATION?

Closely related to capacity-building is the need to ensure that relevant information is communicated to those concerned in a timely, accessible and comprehensible way. 'Relevant information' is information that stakeholders

[56] CORALI is a collaborative programme under two projects: Management of Climate Change Impacts on Coral Reefs and Coastal Ecosystems in Tsunami-affected Areas of the Andaman Sea and South Asia (IUCN/Foreign Affairs of Finland/International Coral Reef Action Network [ICRAN]/IMM Ltd), and Institutional Strengthening and Capacity Development for the Long-term Management and Conservation of MCPAs Encompassing Coral Reefs in South Asia (UNEP/EU/South Asia Cooperative Environment Programme [SACEP]/ICRAN/ IMM Ltd).

BOX 26
Sustainable livelihoods enhancement and diversification

An important activity of the Coral Reefs and Livelihoods Initiative (CORALI) has been development and testing of a systematic approach to SLED. A review of past global experience identified a number of lessons. These have been sorted according to the three main steps in the SLED process – discovery, direction and doing:

Discovery phase (understanding the complexity of livelihoods and their relationship with natural resources, the wider economy and society, and developing a vision)

- understanding how people's livelihoods have evolved;
- recognizing and responding to the complexity of people's lives;
- recognizing the different needs of diverse stakeholder groups;
- recognizing the importance of context;
- recognizing the interdependence of livelihood components;
- recognizing that people can be powerful change agents themselves; and
- engaging in meaningful participation.

Direction phase (understanding and analysing the opportunities for achieving the visions developed during the discovery phase)

- developing a shared understanding of the need for change;
- understanding what helps people decide to change;
- understanding what is important to people about their livelihoods;
- sharing a vision of the future; and
- understanding the options for change.

Doing (developing people's capabilities and adaptive capacity, together with networks to support the plans for sustainable livelihood development)

- understanding local power relationships;
- building shared leadership and partnership;
- understanding and matching needs to the market;
- developing a plan for the future, turning visions into reality;
- enhancing existing livelihoods where possible;
- building on existing diversity;
- building on people's strengths;
- building innovative capacity and continuing livelihood development;
- catering for a diversity of skill levels;
- adopting multi-pronged and multi-agency approaches;

(Box 26 cont.)

- sequencing support for interventions;
- raising awareness in government and NGOs, and facilitating support;
- building the capacity of service providers and creating an enabling environment;
- working through local institutions;
- clustering support;
- building entrepreneurial capacity early; and
- targeting service provision.

Sources: IMM Ltd, 2008a, 2008b.

need in order to understand and participate in decisions regarding MPA management and implementation.[57] A good communication strategy – outlining means and processes for information-sharing with stakeholders, politicians and other groups at various stages of MPA planning and implementation – is essential for successful MPA management. Communication on MPAs is important for several reasons and at several levels:

- informing resource users and others that might enter MPAs (such as vessel traffic that transits MPAs) about rules and regulations that specify prohibited activities, including processes to obtain permits and user fees;
- explaining to stakeholders the importance and rationale for MPAs as spatial management tools, and for what purposes (biodiversity conservation, fisheries management or other);
- engaging stakeholders in the management of the MPA, as appropriate and required;
- enhancing literacy on ocean issues, including fisheries, using MPAs to illustrate important messages; and
- raising public awareness and promoting political support for MPA implementation, both at central and local levels.

Communication should promote internal discussion within stakeholder groups and organizations. Discussion allows different viewpoints to be aired and discussed, trust and credibility to be created, and group cohesion to be strengthened. This can be accomplished by building on a common focus or

[57] Information for MPA planning and implementation is discussed further in Chapter 8.

issue and holding meetings that foster contact and trust and allow bridges to be built among stakeholders. Moreover, political commitment is required to support MPA planning and continued implementation over time. The MPA communication strategy needs to take this into consideration.

7.6 WHAT RESOLUTION MECHANISMS ARE AVAILABLE IN THE CASE OF CONFLICT IN IMPLEMENTING MPAs?

Controversy and conflict are associated with almost all MPAs because, as mentioned previously, they commonly reallocate resources (access and wealth) within and among groups.[58] Conflicts can occur 'inside' the MPA, that is, between resource users directly involved in the MPA and its management, or 'outside' the MPA, between direct and indirect stakeholders. Attitudes of all stakeholders towards the MPA must be understood and monitored, as they will shift over time. An understanding of the basis for diverging views and conflicts is needed, whether due to data and facts, needs and interests, values, or relationships. The willingness to compromise – and attitudes towards various approaches for conflict management – should be assessed, so that serious conflicts can be responded to early in the MPA planning and design process. Conflicts may provide an opportunity to refine and improve MPA design, as long as they are acknowledged and responded to appropriately.

In spite of the best intentions, initially benign disagreements between stakeholders may escalate into conflicts that hamper MPA implementation. Conflict-resolution mechanisms can use formal and informal processes for resolving disputes. The means for appropriate conflict resolution are context-specific and must be culturally relevant. Dispute settlement procedures should be agreed in advance and could form part of the documentation and formal agreements governing MPA administration and be included in implementation and administrative plans.

Conflict-resolution mechanisms permit information exchange, clarification of resource use rights, and adjudication of disputes related to decision-making, resource use, monitoring and enforcement. Critical questions in the design of these mechanisms include "Who may participate?" and "Who adjudicates?" Other important design issues include the frequency and location of conflict-resolution activities. Readily accessible and low-cost mechanisms enhance regime performance directly by mitigating social conflict and thereby minimizing resource overexploitation and dissipation of MPA benefits.

[58] See Chapter 4 in Part 1.

Conflicts among MPA stakeholders contribute to the high rate of MPA failure.[59] Focusing primarily on biological evaluation criteria may result in an MPA being classified as a success, when, in fact, the reality is much more complex. Any particular MPA may initially be both a biological 'success' – resulting in increased fish abundance and diversity and improved habitat – and a social 'failure' – lacking broad participation in management and producing an inequitable distribution of economic benefits and social conflicts. Short-term biological gains will likely disappear unless these social issues and conflicts are addressed.

Box 27 gives an example of successful conflict resolution in Saint Lucia. ANNEX 4 includes more information on voluntary conflict resolution through conflict management.[60]

7.7 HOW ARE MPAs MONITORED AND WHAT IS MANAGEMENT EFFECTIVENESS?

Monitoring and evaluation systems are needed to ensure that MPA goals and objectives are achieved. Accordingly, MPA monitoring systems track changes in the state of MPA-associated bioecological and socio-economic variables. Monitoring is also needed to assess management's efficiency in achieving the intended results, using process-based indicators that focus on administrative structures and the procedures used. This should allow managers and decision-makers to evaluate to what degree the MPA is meeting its objectives (management effectiveness) and how good the applied procedures are in achieving the planned outcomes (management efficiency).

'Management effectiveness' is thus the degree to which management actions are achieving the defined goals and objectives. By assessing management effectiveness, managers can learn if changes are needed to improve future outcomes. Such changes would be based on diagnosis of specific issues, learning and adaptation.[61] To assess management effectiveness, continuous monitoring, feedback and evaluation of information relative to the objectives are required.

Monitoring systems vary in what they measure and who does the measuring, as well as where, when and how measurements are made. Participatory MPA

[59] See White, Salamanca and Courtney, 2002; Pollnac, Crawford and Gorospe, 2001; Christie *et al.*, 2003; and Christie *et al.*, 2009.

[60] For more information, see Christie, 2004.

[61] See the following section "What is adaptive management in the context of MPA implementation?"

BOX 27
Conflict in the Soufriere Marine Management Area, Saint Lucia, the Caribbean

In the town of Soufriere in Saint Lucia, resource-use conflicts among fishers, tourist divers, yachters, hoteliers and other local people were common. The conflicts involved tourist divers cutting pot lines to protect coral reef fish, and yachtsmen anchoring near traditional fishing grounds and access to beaches. The major conflicts were solved through a public consultation process, which in 1994 led to the establishment of the Soufriere Marine Management Area, a zoned MPA. The Soufriere Regional Development Foundation, the Fisheries Department and the Caribbean Natural Resources Institute worked together with the goal of getting an agreement that would let the coastal activities coexist in harmony. Interest groups were conducted by professionals through a negotiation, conflict-resolution and participatory planning exercise, so that everyone could feel empowered and negotiate on an equal footing. The process involved broad-based consultations, together with meetings with a more targeted focus. The interest groups were represented by teams of three to six people. The benefits to the major user groups included improved definition of use rights through zoning, developments in the protection of the coral reef habitat, and an increase in reef fish populations.

Source: Brown, 1997.

monitoring, which involves resource users and other non-scientists in data collection and analysis, provides a mechanism for increasing awareness, improving resource management and empowering communities. It can also promote transparency of MPA management and implementation processes.

Carefully designed monitoring systems generally include robust performance indicators and baseline data, and sometimes control sites. Well-defined indicators and baseline data are fundamental in tracking MPA performance and they permit management adjustments as required. Indicators that can be used in monitoring the *biological and ecological effects* of MPAs include measures of relative change in fish density, catch rates, fish community composition and other similar quantities. These indicators can be used as the basis for providing advice on possible other fisheries management measures.

Measures of relative change in income, wealth or wealth disparity among specific groups or subgroups (e.g. fishers and divers, line fishers and net fishers) can be useful indicators of the distributive *socio-economic and distributional effects* of an MPA establishment. The effect of MPAs on economic equity may also be measured using indicators that track the net economic effect on populations of particular concern, such as women, minorities, poor people, the elderly or traditional cultures. The geographical distribution (e.g. local versus national) of costs and benefits can also offer information on economic equity. In addition to providing a basis for mitigating disparities in benefits that may be considered unfair, such information can also facilitate early identification of potential conflicts.

The monitoring system needs to measure the effects of creating an MPA, both within and outside its boundaries. This is particularly important from a fisheries perspective, as the establishment of an MPA could shift fishing pressure from one species group to another, thereby increasing the mortality of that second species group and competition for its capture. Fishing effort could also be shifted from the area of the MPA to areas outside the MPA,[62] with both bioecological and socio-economic consequences.

Thus the MPA monitoring system should include indicators that permit following such potential developments closely, and with provisions for introducing changes in management or mitigating actions as required. Recent work (Babcock and McCall, in review; McGilliard *et al.*, 2010; see Box 28) has explored the potential of using the annual density ratio of fish outside a no-take marine reserve to those inside the reserve in a control rule (or pre-agreed way to determine the appropriate regulations) to determine the direction and magnitude of change in allowable fishing effort or catches in the following year, with relatively promising results. This kind of methodology, based on using simple indicators to direct fisheries management measures, may well find much greater application in the near future, in particular when data are limited.

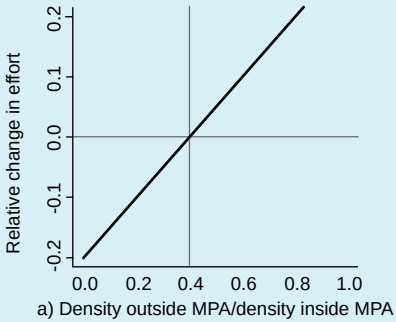
Pomeroy, Parks and Watson (2004) provide excellent practical guidance on MPA monitoring and evaluation. FAO (2003a) discusses the need for solid monitoring systems, including regular reviews and measures that provide information on the performance of the various components of an EAF policy and management system. It provides information on defining

[62] See also Chapter 4, Section 4.5, "How are MPAs likely to affect fishers' behaviour, fishing effort and fishing capacity?" in Part 1.

BOX 28

Fishery management control rules based on the ratios of fish density inside versus outside no-take marine reserves

McGilliard *et al*. (2010) used management strategy evaluation (testing management strategies in a simulated fishery) to evaluate the performance of the density ratio control rule (Figure 1a). Their study found the parameters of the control rule that maximized cumulative catch (over 100 years) for each



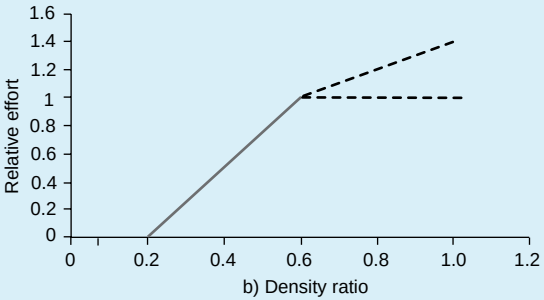


Figure 1. Examples of density ratio control rules: (a) The ratio of the density outside to inside the marine protected area (the "density ratio"; x-axis) determines the direction and relative amount of change in fishing effort in the following year. The x-intercept and slope of the rule can be modified to optimize long-term catches for a particular biological scenario. The vertical grey line shows the x-intercept of the density ratio control rule. (b) The density ratio is defined the same way, but the control rule specifies effort relative to effort in the previous year. If the density ratio is above the target (60 percent) effort is allowed to increase.

(Box 28 cont.)

scenario. They found that it is possible to design a density ratio control rule that performs well for a variety of assumptions about biology and initial stock status. Species with especially long or unusual movement patterns were an exception and would need to be managed under a different parameterization of the density ratio control rule. Babcock and McCall (in press) conducted a management strategy evaluation based on the biology and fisheries for five species in the California nearshore fishery, applying the density ratio control rule from the year that the marine reserves were established (Figure 1b). In the long term, the control rules performed well by increasing total biomass and maintaining yield for all species and several scenarios about fleet distribution and fish biology, except in some scenarios with high levels of movement of adult fish.

Advantages of using density ratio control rules are that no historical catches or stock assessments are required, the control rules are driven by monitoring data, and they allow the management system to respond appropriately to environmental fluctuation. In addition, density ratio control rules can be applied at a more local spatial scale than is common for stock assessment-based control rules. However, density ratio control rules are only effective for species that tend to accumulate density in marine reserves, and the method would be most effective for protected areas that have been established long enough for fish density to build up.

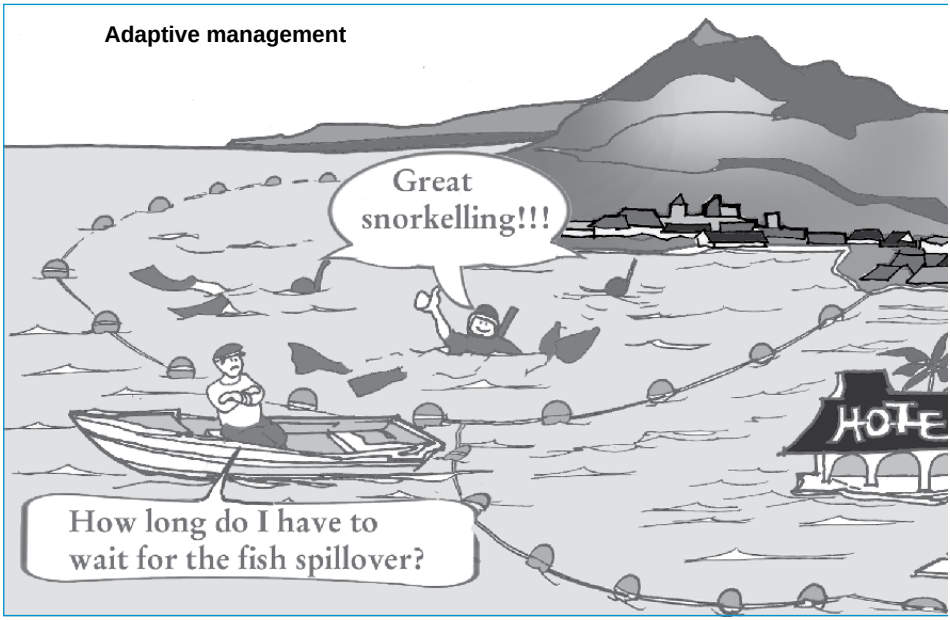
Source: Babcock and McCall (in review) and McGillard *et al.*, 2010.

indicators within the framework of a sustainable development reference system.[63]

7.8 WHAT IS ADAPTIVE MANAGEMENT IN THE CONTEXT OF MPA IMPLEMENTATION?

Adaptive management is a fundamental concept underlying the evaluation of management effectiveness; it can also be applied to other types of systems.

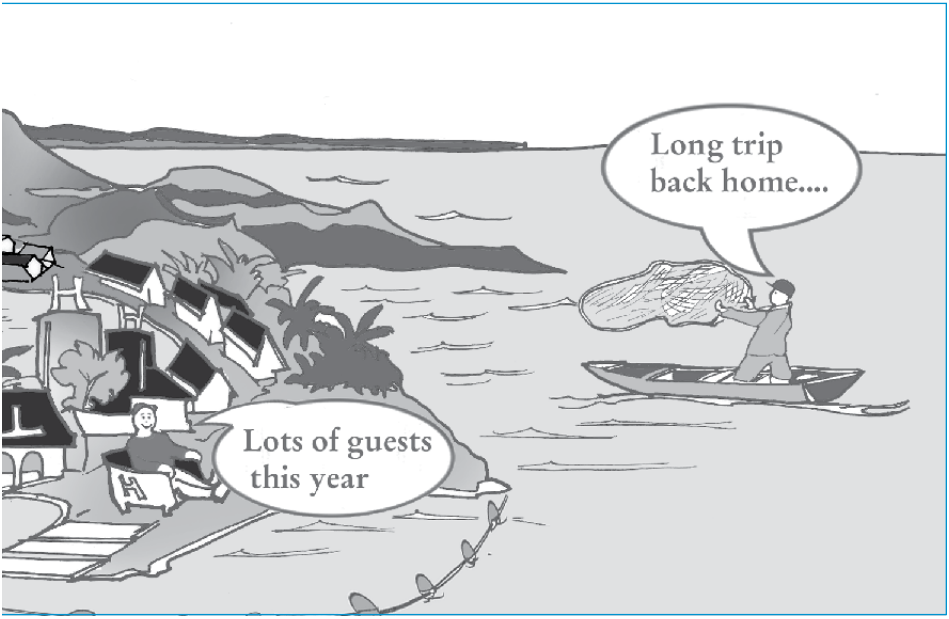
[63] See also FAO, 1999.



Management efficiency (referring to administrative structures and procedures)[64] can be improved through the application of adaptive management approaches. This type of management is a cyclical process of systematically testing assumptions, generating learning by evaluating the results of such testing, and further revising and improving management practices. In an MPA, the results of adaptive management accelerate progress towards achievement of the goals and objectives.

Marine and coastal systems and the communities that rely on them are ever-changing. MPAs will be maximally effective when the management that takes place within them is responsive to changing conditions. Such changes are not only environmental, but also include those related to the human dimension (social, political, economic and governance). In addition, the scope of changes relevant to the effective implementation of MPAs includes those occurring at the MPA site, as well as to the context in which the MPAs exist. Adaptive

[64] See also the previous section in this document on "How are MPAs monitored and what is management effectiveness?"



management is participatory, involving fishers and other stakeholders as partners with managers in the process, and relies on traditional and local knowledge along with scientific data. It is particularly important in times of change, be it climatic change or resource depletion, and allows for a flexible yet structured management approach.

Adaptive management is necessary to the full spectrum – from top-down government processes (such as legislatively mandated periodic review of MPA boundaries, zones and management regimes), to more bottom up and informal amendments made by primary stakeholders and stewards. It is especially important in information-limited situations, where the need for management action may be great, but the cost of formal scientific information is often prohibitive. All good fishers learn from their successes and failures. For example, a fisher will try a new fishing method, monitor the results, and see how the results compare to what was predicted to happen. Based on the new information, the fisher may accept the fishing method, may adapt the fishing method to improve on it, or may reject it. This learning and adaptation is the basis of adaptive management, which goes one step further: it relies on

systematic feedback learning and the progressive accumulation of knowledge for improved management. FAO (2003a) also discusses the need for adaptive management.

7.9 HOW CAN LONG-TERM POLITICAL COMMITMENT AND SUSTAINABLE RESOURCING FOR MPAs BE ADDRESSED?

Sustainable MPAs require long-term political commitment from the relevant authorities and financial support. Such support is often linked to the degree of awareness among politicians and decision-makers, both at central and local levels, as well as in the communities concerned and in civil society. And it is needed over the long term, independently of electoral cycles or difficult circumstances.

Political commitment is often a precondition for financial support. Although MPAs should be implemented as part of a broader management system and thus possibly share some overhead costs with it, they will require financial resources for specific operations and facilities related to planning, implementation, coordination, monitoring, enforcement, etc.

Funding for fisheries management historically came primarily from governments. However, other sources may also be available. In some cases, the fishing industry pays some management costs, either directly (e.g. industry-funded research or enforcement projects) or through 'user fees' collected by government. In addition, particularly in developing countries, the costs of fisheries management and MPAs are often paid by donors – interested in promoting stewardship, wise use of marine ecosystems and sustainable livelihoods for people dependent on the industry. The donors may include charitable trusts, development organizations and biodiversity-conservation-oriented NGOs. However, this type of funding is often channelled through projects that are limited in time, and alternative sources may be needed to ensure sustainable long-term funding.

Innovative financing mechanisms are emerging for marine conservation and management generally, and to support MPA planning and operations specifically, especially as government budgets are increasingly stretched thin. Such financing mechanisms include PES initiatives (Box 29). PES systems and the associated market incentives have the potential to achieve significantly better and more cost-effective conservation and management outcomes than currently result from projects that seek to isolate and protect coastal areas from human encroachment. By clarifying the linkages between ecological function,

BOX 29
Payment for environmental services

Payment for environmental services (PES) is an emerging policy approach used predominately in the agriculture sector and in the context of land use. It is a market-based economic instrument that can involve both the private sector and the government. It strives to give environmental services an economic value that reflects the real social, environmental and economic benefits generated in order to encourage an increase in their production, in contrast to a situation in which providers of environmental services tend not to be compensated and users do not pay. One reason for the political interest in PES is that many of the providers of environmental services are poor population groups – farmers – and the approach may offer an avenue for combining ecosystem/biodiversity conservation with poverty reduction.

Source: FAO, 2009a, based on FAO, 2007b.

ecosystem service delivery and market incentives, PES systems can become a standard tool for financing MPA planning, as well as MPA implementation.

Financing mechanisms should be assessed as part of the MPA planning process, with a sustainable financing strategy included in the management plan. Too much dependence on external sources will affect sustainability. Thus MPA management should consider how to go about generating revenues, and several sources may be required.[65]

[65] For more information on sustainable resourcing of MPAs, see Spergel and Moye, 2004.

KEY CONCLUSIONS AND RECOMMENDATIONS No. 7

Successful MPA and MPA network management requires comprehensive implementation structures and administrative arrangements, reflecting objectives and the chosen governance approach and management system.

The MPA management plan should include details of these structures and arrangements, and cover all operational elements for effective and efficient MPA management. Provisions are needed for staff and general administration, and the following implementation and administrative functions should be covered:

- *Rules and regulations:* These are needed to implement MPA objectives and management decisions and should be established within the overall legal framework. The developing and interpreting of rules and regulations generally requires legal professionals and should involve stakeholders as well.
- *Compliance and enforcement:* Compliance with MPA rules and regulations needs to be supported through a robust system for MCS and enforcement. Such a system can include a variety of measures, ranging from self-enforcement to more technical solutions (such as VMS).
- *Other implementation mechanisms:* Capacity-building and incentives such as organizational development, technical training and support to supplementary or alternative livelihood opportunities favour compliance and successful MPA management outcomes. Consultation and participation in planning are essential in obtaining a high level of compliance.
- *Communication:* Resource users and others must be informed about the MPA and its management plan. Such communication is essential in obtaining compliance with MPA rules and regulations.
- *Conflict-resolution mechanisms:* Conflicts between stakeholders may arise, and mechanisms must be in place from the beginning to deal with this eventuality. Appropriate solutions are context-specific and should be culturally relevant.
- *Management effectiveness and monitoring systems:* Monitoring, feedback and evaluation of information relative to the objectives should be in place to support effective MPA management. Appropriate systems are needed that track progress towards the achievement of goals and objectives and allow managers to assess the effectiveness and efficiency of management. Robust performance indicators and baseline data are fundamental in arriving at

insights into the changes in environmental and socio-economic systems resulting from MPAs.

- *Effective adaptive management:* by learning from experience and adapting decisions and practices accordingly, MPA management can be improved. Adaptive management is an essential approach that must be incorporated into MPA implementation.
- *Political commitment and sustainable resourcing:* sustaining of MPAs may require substantial financial support. The three main sources of funding are government funds, user fees (e.g. PES) or other systems of private-sector financing and external funding (e.g. donor funding through international cooperation mechanisms). The MPA must be designed from the start with thoughts on and plans for resourcing.

8. INFORMATION FOR MPAs

In order to plan and implement an MPA or MPA network, relevant information is needed. Considering the holistic and integrated approach that should be taken to MPA planning and implementation – and the cross-sectoral outcomes and desirable multiple objectives characteristic of MPAs – a wide range of data and information sources must be considered. However, information gathering and research should be well defined and specific to objectives, decisions to be made and activities to be carried out; only essential information should be sought. This applies to biological and ecological information and is equally important for social science research and data collection, as this area often includes particularly time-consuming, costly and intrusive processes.
This chapter focuses on fisheries-related information needs, sources and methods in the planning and implementation process, with a view to contributing to reconciled fisheries management and biodiversity conservation outcomes.[66]

The Code of Conduct for Responsible Fisheries states that conservation and management decisions for fisheries should be based on the best scientific evidence available, also taking into account traditional knowledge of the resources and their habitat, as well as relevant environmental, social and economic factors. The absence of adequate information should not be a reason for failing to protect fishery resources and their environment.

8.1 WHAT IS THE BASIC INFORMATION NEEDED FOR MPA PLANNING AND IMPLEMENTATION AND HOW IT IS IT GENERALLY COLLECTED?

The information needs of an MPA are similar to those of an EAF, but with more emphasis on spatial information. It is understood that some desirable information will be lacking in most situations, and in many a great deal will be missing. This does not preclude using MPAs as a management tool. Good judgement, often informed by experience elsewhere, may still allow MPAs to be a useful option, particularly compared with others for which desirable information may also be lacking. In general, more and better information

[66] For an overview of information and knowledge-sharing and their current and potential role in supporting the implementation of the Code of Conduct for Responsible Fisheries, see FAO, 2009b.

leads to better management. However, good judgement based on whatever information is available will usually be better for fisheries, ecosystems and the marine environment than inaction and a deteriorating situation while more information is being gathered.

As part of the MPA planning process, information needs to be collected on fisheries, the ecosystem and marine environment, resource-use activities and people in order to create an MPA socioecological profile. This profile will serve as the basis for planning and as a baseline for future monitoring and evaluation. The MPA profile should include at least four assessment components:

- *Biological and ecological assessment:* for example, types of habitats and locations, biodiversity and productivity, environmental conditions, sea-bottom quality and morphology, fish-stock assessment data, fish distribution patterns and seasonal changes, timing of spawning, life history stages;
- *Social assessment:* for example, attitudes, perceptions, beliefs and values of various stakeholder groups, resource-use patterns, relationships among user groups, differences of opinion, value of the MPA and related resources, demographic characteristics and socio-economic trends, likely impacts of the MPA on stakeholders, informal/traditional marine governance systems, people's attitudes and willingness to participate in an MPA;
- *Financial and economic assessment:* for example, financial, value chain and cost–benefit analyses, economic impact assessments, distributional impact reviews;
- *Institutional and governance assessment:* for example, identification of organizations/stakeholders and their roles, review of governance structures, including mechanisms for facilitating participation, assessments of relevant policy and cross-sectoral coordination frameworks, legal structures.

The information and analysis of each component should be content-rich and comprehensive. At the same time, the MPA profile needs to include an overall integrated review, combining and comparing information from all components. This holistic review, which should be a synthetic summary and analysis of the profile, will be a key reference document. More information on the assessments needed for each of the components listed is given in the following sections.

In addition to collecting and analysing contextual information, the assessments should include a preliminary identification of existing and potential

problems, needs and opportunities relevant to the MPA and its planning process. An implementation feasibility assessment, including the identification of challenges and opportunities in ensuring management effectiveness and efficiency, should be an integral part of the MPA profile. Special efforts should also be made to identify potential externalities, that is, the effects of MPA designation and management imposed on third parties. Knowing what can be expected, increases the possibility of adequately addressing the issues – and internalizing externalities – and this is likely to contribute to successful MPA outcomes. Adequate stakeholder participation is crucial in these 'issue investigation' processes.[67]

To the extent possible, the data collected and the methods used should be standardized and comparable. It is particularly important to consider standardization early in the process, when data on baseline conditions are collected, to ensure that they can be used for monitoring throughout MPA implementation. In addition to collecting baseline and feasibility information, MPA programmes should initiate collection of management effectiveness data very shortly after MPA initiation to enable adaptive management. Various standard methods and databases exist on MPA management effectiveness.[68]

While some information used in the MPA profile comes from secondary sources, other information will come from scientific studies by experts and from participatory research with resource users and other community members. Scientific information is important for the MPA profile, and the best available scientific information should be used to assist in planning and decision-making. However, the traditional, local and indigenous knowledge (Box 30) of resource users and other community members (including women, youth and elders) also constitutes critical information for planning and implementation.

The two types of information are thus usually complementary, and a significant amount of information can and should come from the community. The type of information collected by scientists often differs from that obtained from resource users, and the tools and methods for collecting the information are also different. A number of tools and methods are available that involve the extensive participation of local community members in gathering and analysing information and in obtaining traditional, local and indigenous knowledge (see

[67] See also Chapter 6, Sections 6.4 and 6.5, "When and how should stakeholders be involved in MPA planning?" and "How are the issues to be addressed by MPAs identified and prioritized?"

[68] The World Bank has developed a scorecard approach for self-assessment of MPA progress (World Bank, 2004).

BOX 30
Traditional ecological knowledge, local knowledge and indigenous knowledge

Traditional ecological knowledge may be defined as "a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes, 1999, p. 8). Traditional ecological knowledge is both cumulative and dynamic, building on experience and adapting to change. It is an attribute of societies with historical continuity in resource use in a particular environment. Practical knowledge that does not have such historical and multigenerational character, but is more recent, is usually referred to as local knowledge. Another concept is indigenous knowledge. This is more broadly defined as the local knowledge held by indigenous peoples or local knowledge unique to a given culture or society.

This collective knowledge, based on centuries of resource use or much more recent interactions with the environment, can promote more-effective MPA design by bringing information not captured by formal science into the decision-making process. In particular, local knowledge may help contextualize general scientific understandings of natural and social phenomena.

Sources: Berkes, 1999; Christie and White, 2007b.

also Box 31). The best approach to combining local and traditional knowledge with scientific knowledge may be through managers and fishers working together to 'co-produce' knowledge.[69]

8.2 WHAT BIOLOGICAL AND ECOLOGICAL INFORMATION AND DATA COLLECTION ARE NEEDED FOR MPA?

Bioecological information is critical in bringing together fisheries management and broader biodiversity conservation with a view to furthering the ultimate aim of enhancing both. At a minimum, baseline information is desirable on the types of habitats (and their locations) in the area, biodiversity and productivity, environmental condition (water quality, intactness of benthos, etc.) and trends in these general parameters. A full range of methods can be used to derive

[69] See Berkes, 2009, pp. 52–74.

this information from the domains of fisheries biology, general ecology, oceanography and marine biology.

It is important for both fisheries management and biodiversity conservation purposes to have a good description of the sea-bottom quality (soft, hard, mixed) and morphology. A strong linkage exists between the types of seabed and the presence of ecosystems or species of fauna and flora (fixed, sedentary or migratory). Specialized fisheries target specific sea-bottom types, and MPA selection should consider important sea-bottom areas or types needing protection.

From a fisheries management perspective, detailed fisheries information is necessary. Stock assessments (which could include multispecies assessments) can be used to determine the fishery resource species in need of greater protection (i.e. through a reduction in fish mortality).To assess whether MPAs are an appropriate tool to protect these species, one needs to know where they are concentrated. This information can be gathered from fishing vessel logbooks, for example, if catch locations are recorded accurately with sufficient spatial resolution. Placing observers on fishing vessels is a way to overcome the shortcomings of fishing vessel logbooks. Scientific surveys can also be conducted to identify areas where fish concentrate. It may be necessary to conduct seasonal surveys to take account of seasonal distribution patterns.

An important source of information on the spatial and temporal distributions of fishery resource species may be traditional, local and indigenous knowledge, available with fishers – and other resource users – who do not use logbooks. Systematic methodologies for making this information useful for planning include rapid or participatory rural appraisal (RRA/PRA) and participatory mapping. The creation of participatory maps of resource use and habitat distribution is helpful. Participatory approaches and methods that have generally been used for collecting social information have also begun to be applied in the biological fields and have proven effective (see Box 31).

In addition to information on the movement of juvenile and adult fish, information on the timing of spawning, duration of planktonic life history stages (i.e. egg and larval) and currents can be used to model the dispersion from spawning grounds to settlement areas of young juveniles. Knowledge of significant habitats in the lifecycles of fish resources is likely to be important. Such information is particularly useful in the design of MPA networks.[70]

If MPAs are to be used to reduce bycatch and protect habitat and biodiversity, areas and seasons where bycatch is high must be known, as well as the location

[70] See also Section 8.6, "What knowledge and information are needed to design an MPA network?"

of biodiversity hotspots and habitats of particular concern. Information on bycatch is usually obtained during fishing operations, either from logbooks, observers or traditional, indigenous or local knowledge.

8.3 WHAT SOCIAL INFORMATION ON COASTAL COMMUNITIES IS REQUIRED FOR MPAs?

All types of biodiversity conservation, fisheries and ecosystem management affect people, and people react differently depending on their background, situation and individuality. MPAs may have objectives that relate to particular segments of society – such as providing livelihoods to disadvantaged groups – or that aim to protect habitats for more-general benefits to society at large. Regardless, policy-makers are usually concerned with who is affected and how, because acceptance of management decisions usually depends on a general sense of fairness and equity. This requires a good understanding of coastal peoples and communities.

Fishers, fishing households and fishing communities worldwide are not homogeneous. It is critical to recognize that each location has its unique social and ecological context, which should influence MPA design, management and outcomes. This often makes it difficult to transfer lessons from one location to another and to understand behaviour and the incentives that drive behaviour. That said, however, social science has identified some generalities about coastal people and communities that may affect MPA planning and implementation, and that are important to consider. Coastal communities in many locations around the world face a growing degree of insecurity as a result of poverty and their high dependence on natural resources. This vulnerability is often compounded by declining resources, high population growth, few alternative livelihoods, limited access to land, economic and political marginalization, unsustainable land-use practices and development, competition and conflict over resources, health burdens and civil strife.

MPA planning and implementation should seek to understand: the diversity of coastal people and communities, especially in relation to their livelihood strategies; the means by which households adapt to reduce their risks; the incentives that drive the decisions of resource users; and the sources of vulnerability to stresses and shocks. Key social science information for MPA planning and implementation (Christie *et al.,* 2003) includes:

- attitudes, perceptions, beliefs and values of diverse stakeholder groups in relation to the MPA and resource use, as well as their willingness to participate in an MPA;

- use patterns, uses of the marine environment, users of the environment, and relationships among user groups;
- differences in opinion between users and government, or between diverse stakeholder groups;
- value of the MPA and the related resources (for livelihoods, food security, income, traditions);
- demographic characteristics and socio-economic trends;
- likely impacts of the MPA on the stakeholders and communities concerned;
- informal/traditional marine governance systems being used or used in the past.

Social scientists use existing sources of demographic data (such as the results of government censuses), as well as conducting their own surveys to collect community profile data. The community profile is an important component of the MPA profile (see Section 8.1) and usually characterizes cultural (race, religion, ethnic background, etc.), educational, gender, age and other aspects of fishers, fishery workers and their communities. Information on fishers that actually fish in candidate areas for protection, compared with fishers that do not, is particularly of interest. Broader information profiling entire communities affected by fisheries management, their dependence on fisheries, and alternative livelihoods available to them is also essential. In some cases, such information is used to prepare a social impact assessment for fisheries management alternatives.[71] Box 31 gives an overview of methods for collecting social information and inputs into community profiles. Many of these tools are also useful for gathering bioecological, economic and institutional information, discussed in various subsections of this chapter.

8.4 WHAT ARE THE KEY MPA FINANCIAL AND ECONOMIC INFORMATION NEEDS?

Fisheries management measures usually change the costs of and income from fishing. Financial analyses of fishing operations and an understanding of how the MPA may change costs and income, as well as the consequences of these changes, should be part of the information fed into the planning and design process. For example, if MPAs divert fishing from areas where fish

[71] The United States National Marine Fisheries Service has issued Guidance for Social Impact Assessment, revised 19 March 2001 (also available at www.st.nmfs.gov/st1/econ/cia/sia_appendix2g.pdf).

BOX 31
Participatory information collection methods and human dimension tools

A number of tools and methods can be used to gather and analyse information relevant to the human dimension. Many of these methods are participatory and particularly suited to obtaining traditional, local and indigenous knowledge:

- *Rapid/participatory rural appraisals (RRA/PRA)* involve learning directly from individuals or groups of people. RRA or PRA entails tapping local knowledge and gaining information and insight from local people using a range of interactive tools and methods. These tools and methods are broad, varied and may include secondary data review, workshops, interviews, participatory mapping techniques, diagrams and graphics.
- *Asset mapping* is an important information acquisition and dissemination process that provides a shared community view of the important assets of the entire community. The mapping highlights the interconnections among assets and how to access them. This information would guide planning and decision-making on the location and boundaries of MPAs, as well as on issues of access, and could be used to devise strategies for building assets to sustain and enhance community development.
- *Social mapping* is a visualization technique that allows stakeholders to draw maps illustrating their human relationships and their interrelationships with the natural resources and other features of a particular location. The social map reflects perceptions, attitudes, beliefs and values among stakeholders, the output of which is easily understood and shared by various parties. This information can serve as the basis for discussions and decision-making.
- *Institutional analysis* is the investigation of how formal and informal rules (institutions) shape human behaviour. Institutional analysis focuses on how individuals and groups construct institutions, how institutions operate by patterns of interaction, how they are linked and the outcomes they generate. Without institutional analysis, a clear understanding of the complex interactions and relationships among factors within MPAs is not likely to be achieved. Social mapping is a technique that can also be used when undertaking an institutional analysis.
- *Social impact assessment (SIA)* is a tool to identify and assess the social consequences that are likely to result from a specific action prior

(Box 31 cont.)

to decision-making. The SIA identifies key social and cultural issues of the interested and affected stakeholders. This is achieved by collecting qualitative and quantitative social, economic and cultural data that are used to describe and analyse all reasonable alternatives to the action. It is ultimately concerned with recognizing the most socially beneficial course of action.

- *Conflict management and negotiation* is used to apply skills that can help people express their differences and solve their problems for mutually beneficial outcomes. Due to the fact that conflicts are inevitable in multistakeholder situations, conflict management is used to reach solutions in the least disruptive or harmful manner.
- *Participatory monitoring and evaluation (PM&E)* involves the assessment of change in processes that involve many people or groups, each of whom is affecting or affected by the impacts being assessed. By implementing PM&E during policy and planning cycles, a greater efficiency of information exchange can be attained, which facilitates consensus-building. This process is important, as it promotes transparency and accountability while ensuring that stakeholders and beneficiaries are fully engaged in the initiative.

concentrate to areas of lower concentration, the CPUE is likely to be lower, which translates into a higher cost per unit of catch, or overall reduced catch and income. Economic information can be used to model the redistribution of fishing effort in response to MPAs.[72] The redistribution of fishing effort displaced from MPAs is a key factor in determining the effectiveness of MPAs and their economic impact. MPAs may also change the costs of transit from fishing grounds to ports. It is likely that not only the harvest sector is affected by an MPA.

Fish processing and marketing activities that depend on a certain supply of fish may also be affected by changes in fishing activities. To better understand the full economic effects of a proposed MPA, an economic analysis of the value chain is needed. Such assessments should also cover the impact on communities in a broader sense with regard to food security, employment and local revenue generation. These aspects are closely related to some of the social

[72] See also Annex 3.

dimensions discussed, and may be included in a socio-economic assessment when preparing community (and overall MPA) profiles.

Cost and benefit assessments were mentioned in the context of prioritizing issues and setting objectives. Cost–benefit analysis is a tool for comparing, over time, the benefits of proposed projects with their costs in order to help users identify the alternative offering the maximum net benefit (benefits minus costs). The more the benefits exceed the costs, the more society will benefit from the project activity or policy decision. An analysis of the impact of an MPA on society as a whole, expressed in economic terms, would include negative and positive externalities. These assessments are also called economic impact assessments and can be conducted at the level of diverse societal subsets and for various stakeholder groups. Such distributional impact reviews provide knowledge of the distributional effects of the MPA and of the various design features and governance and management options.[73]

While financial, value chain and cost–benefit analyses, economic impact assessments and distributional impact reviews can provide important – sometimes vital – information to MPA planning and implementation, it should be recognized that they can be complex exercises. Often the skills of an economist would be required, but the data needed may not be available. In financial and economic analyses, costs and benefits must be expressed in monetary terms. For many aspects of an MPA, it may be difficult to assign such values, because there are no market prices for the costs and benefits. They have different values to different individuals and societies and they occur over a wide range of time scales.

However, approaches have been developed for assessing and valuing diverse types of ecosystem services and for environmental accounting. Other economic valuation methods are also available, for example for discounting values over time and for calculating shadow prices (i.e. the true economic price of a good or service).[74] Despite the available methods and frameworks, some costs and benefits may remain difficult to assess objectively. Still, identifying likely costs and benefits constitutes an important thought process, and lack of

[73] See Chapter 6, Section 6.5, "How are the issues to be addressed by MPAs identified and prioritized?" and Box 21.
[74] See Glossary.

precise data should not prevent managers and decision-makers from assessing costs and benefits as part of MPA planning and implementation processes.[75]

8.5 WHAT INFORMATION IS NEEDED TO UNDERTAKE AN INSTITUTIONAL ASSESSMENT FOR MPAs?

The importance of appropriate institutional, legal and policy frameworks for MPAs was discussed in Chapter 5. Thus, when planning MPAs, it is necessary to investigate what the existing institutional set-up looks like and what changes may be required at national and local (MPA-related) levels. Such assessments are crucial to development of the management plan and to creating an enabling environment for MPA management. Some key elements of an institutional assessment include (Pomeroy and Riviera-Guieb, 2006, Section 7.4.7):

- Identification of the resource user groups, government agencies and other organizations and stakeholders involved in resource management, an analysis of their roles in management, and evaluation of the existing level of stakeholder involvement in managing resources;[76]
- Identification of the relationships among stakeholder groups and of the existing political and economic power structures in the society/community;
- Identification of relevant governance systems, including existing property rights and tenure arrangements (formal and informal), decentralization policies and responsibilities at various levels of government (village, municipal, district, provincial, regional, national, international) and community (customary, traditional), as well as existing mechanisms for stakeholder participation.

The assessment should also look into overarching policy frameworks and the mechanisms available for achieving the cross-institutional collaboration and coordination required by the MPA. Similarly, the legal framework must be reviewed and understood. Equally important is understanding of customary resource management systems and the – perhaps informal – rules that govern

[75] More on cost–benefit analysis in an EAF context can be found in FAO, 2008b. Moreover, the Canadian Government's guidelines are a good example of conducting cost–benefit analyses at the government level (available at www.tbs-sct.gc.ca/fin/sigs/revolving_funds/bcag/bca2_e.asp).

[76] This process is closely related to the stakeholder analysis discussed in Chapter 6, Section 6.4, "When and how should stakeholders be involved in MPA planning?", but focuses more on larger institutional setups than on groups of individuals.

resource utilization. Effective MPA management can only be achieved if rules, regulations and responsibilities are rooted in the legal system and in customary practice, as applicable. A solely legal basis for MPA establishment will not ensure its success in many parts of the world.

8.6 WHAT KNOWLEDGE AND INFORMATION ARE NEEDED TO DESIGN AN MPA NETWORK?

In MPA networks, connectivity is important, and information on how fish move and how eggs and larvae are dispersed is needed. While restricting extractive activities such as fishing in an MPA will not, *per se*, ensure that connectivity is protected, there is evidence that the integrity of marine community interactions is heavily reliant on the preservation of established demographic patterns. These patterns include, in particular, the distribution of age classes and life stages across the fish population.

When adequate information is available, hydrographic models can be applied to predict passive drift and spatial connectivity within a fish population. Genetic studies can also be used to evaluate spatial connectivity (how animals in one place relate to animals in another place). Invariably this research will tend to highlight that some marine communities are more spatially connected than others and protection can be assigned based on key elements of that marine community network.

This can entail identifying the highly interactive, the isolated and the connecting marine communities. The highly interactive communities will have strong connections – such as larval exchange or migration of juveniles or adults – with the neighbouring marine communities, while the isolated communities, most likely as a result of isolating water currents, will be only rarely connected. Other communities are able to act as 'stepping stones', connecting one cluster of marine species communities to another. By understanding the role each marine community plays in maintaining the function of a healthy marine system, the MPA planner can select areas to be protected that adequately represent the core ecosystem functions of the region. The principles of comprehensiveness, adequacy and representativeness (CAR)[77] are also applied to the MPA network, but with an additional focus on connectivity function.

In an optimal situation, the MPA network is designed when the roles and connections between fish populations and marine communities have been

[77] See Chapter 1, Section 1.4, "What is an MPA network?" for an explanation of the CAR principles.

clarified and a comprehensive list of species and their associated ranges has been compiled for each life cycle stage. However, detailed data are often not available and approximations will have to be used. Expert opinion can be useful, as can traditional, indigenous and local knowledge, substituting or complementing insufficient scientific data. A key consideration is the distance between and size of MPAs. The minimum distance ideally should allow a significant number of individuals to connect the neighbouring reserves.

In an MPA network in the Philippines, it was decided that community-based MPAs should be separated by no more than 5 km from one another and be no smaller than 20 hectares in area, with one of five MPAs no smaller than 50 hectares. These recommendations were based on an assessment of the genetic connectivity of one fish species, the longevity of the planktonic phase of key commercial fish, and social feasibility.[78] Other considerations, such as associations with habitats (i.e. rocky shorelines for mussels), will determine what configurations are possible. The dispersal success for passive larvae tends to diminish rapidly with distance, so reserves large enough to retain local recruits will be important.

In addition to bioecological data, information regarding the social connections between human communities and governance opportunities and challenges is equally essential.[79] Social network analysis that identifies communication linkages between community members is helpful. In short, MPA networks should be conceptualized as socioecological constructs and, as such, require multidisciplinary information.

8.7 HOW CAN TOOLS SUCH AS GEOGRAPHIC INFORMATION SYSTEMS, SCENARIO DEVELOPMENT AND MODELLING HELP MPA PLANNING AND IMPLEMENTATION?

In order to manage the complex issues affecting MPAs, managers often turn to technology for help in understanding and analysing the resources at their disposal and the context in which planning takes place. 'Decision-support tools' are defined as interactive, computer-based systems that arrange and present spatial data to support informed, objective and, in some cases, participatory decision-making. Such tools – for example, geographic information systems (Box 32) and remote sensing – are increasingly used to map and analyse resources within

[78] 'Social feasibility' is the possibility of putting MPAs in place based on the issues in local communities (support, fishing, etc.).

[79] That is, whether fisheries operate under different rules, jurisdictions, etc. in different areas, or whether tribes or indigenous groups govern their own areas, etc.

BOX 32
Geographic information systems

A geographic information system (GIS) is a computer system capable of capturing, storing, manipulating, analysing and displaying data that describe the geography of a particular place. Put more simply, a GIS combines layers of information about a place to provide a better understanding of it. What layers of information are used and combined depends on the purpose. Remote sensing is a technique of gathering information at a distance on terrestrial and oceanographic features. Remotely sensed data can include aerial photographs, satellite imagery, acoustic data and radar imagery. The use of remotely sensed data is increasing, owing to recent advances in GIS and image-processing capabilities. Information is now available for most personal computers.

and around the MPA. Scenario development and modelling are other tools that can help decision-makers in MPA planning and implementation.

These tools can enhance the objectivity and rigour of MPA planning and implementation, but decision-makers and managers should realize that even such high-tech processes are value-laden. The choice of tool used, of information to be input, of data layers, and the way the results are evaluated are all subjective decisions. As in Delphic processes (such as planning supported by expert opinion or participation of stakeholders), human beings ultimately decide what information to include and how the outputs are used in decision-making. These choices are influenced by the particular value systems and opinions of the individual. This subjectivity should be acknowledged and not masked by suggesting that computer-enabled processes are somehow more scientific, and thus more 'truthful', than processes using lower technologies. They do, however, frequently assist in analysing and presenting abundant and complex information in a more easily understood manner.

GIS, with the application of decision-support tools, can help evaluate a suite of proposed management actions or outcomes based on assigned criteria. The tools can be applied to support siting, zoning or monitoring, and the inclusion of cultural and social information is important. GIS can also be used in a participatory process and thus facilitate consultations and collaboration with stakeholders. The computer-based software Marxan has been widely used to identify networks of reserve sites that would meet biodiversity targets, while minimizing costs to resource users such as fishers. A comparative review of

methodologies and computerized tools for the selection of candidate MPAs was published in 2004 by the Department of Fisheries and Oceans, Canada, and is available online.[80] Marzone,[81] a newer iteration of Marxan, helps planners evaluate zoning options within MPAs.

Scenario development[82] can help planners communicate the plausible futures that users and other stakeholders will face if certain management actions are taken. Such scenarios – which are essentially data-driven stories of how conditions will change in the future – allow decision-makers to make informed choices, and allow the public to understand the types of trade-offs being made in the process of implementing MPAs.

Modelling is used to consistently and concisely express hypotheses about the state and dynamics of systems, and to test them against available information. Many types of models are used as the basis for fisheries management, such as stock assessment models that include risk assessment and bioeconomic models. Ecosystem models are also increasingly available (FAO, 2008a; Cochrane and Garcia, 2009, Ch. 13). Another class of models addresses the choices made by fishers and other resource users. Understanding how resource users may respond to area-based management such as an MPA is key, not only to impact assessment, but also to MPA design. Closing or restricting access to a particular area such as an MPA will mostly cause resource users to displace their activities to a second-choice fishing area.

Models may differ in terms of the form of equations used to describe the dynamics of the system or the parameters of the equations. An important role of research is to gather additional information and improve understanding, so that the number of plausible models is reduced.[83]

8.8 HOW DO WE COPE WITH INFORMATION-DEFICIENT SITUATIONS WHEN PLANNING AND IMPLEMENTING MPAs?

Over the past century, much progress has been made in the scientific study of fisheries, marine ecology, oceanography, social dynamics and institutions. Yet despite the accumulation of a great deal of scientific data, there are many situations in which there is little scientific information, especially for multispecies small-scale fisheries in tropical seas. In small-scale fisheries,

[80] Available at www.dfo-mpo.gc.ca/csas/csas/publications/resdocs-docrech/2004/2004_082_e.htm

[81] University of Melbourne, Australia (available at http://eshowcase.unimelb.edu.au/packages/marzone).

[82] For more information on this tool, see Peterson, Cumming and Carpenter, 2003.

[83] See Annex 3 for more information on models.

BOX 33
Locally-Managed Marine Area Network

The Locally-Managed Marine Area Network comprises a group of practitioners involved in various marine conservation projects in Asia and the Pacific that have joined together to increase the success of their efforts. It is a learning and information exchange. An LMMA is a nearshore area managed by local communities or resource-owning groups. Participating projects use a common LMMA strategy and work together to achieve goals. The Network is interested in learning under which conditions an LMMA strategy works, or doesn't work, and why. Through their Web site, members share knowledge, skills, resources and information in order to collectively learn how to improve marine management activities and increase conservation impact.

Source: LMMA Network(www.lmmanetwork.org/home).

landings are often widely distributed and the number of operators high, and data may not be available or may be difficult to collect. There is a growing appreciation that small-scale fisheries assessment and management approaches must be fundamentally different from those used in large-scale industrial fisheries (Garcia *et al.*, 2008). While fisheries management can be based on extensive research, sophisticated models and large amounts of data, these approaches are not always possible or appropriate, and it is evident that in many situations fisheries assessment and management systems are required that can work with much lower inputs of data and information.[84]

The same is true for MPAs, and fisheries management and biodiversity conservation are commonly needed in situations where information is limited. These circumstances are incorporated into UNCLOS and other international agreements, which state that management should be based on the best available scientific information, but should not be delayed due to inadequate information. These are also principles of the CCRF.

One challenge faced by management officials is to look beyond conventional scientific methods and learn how to access other information. Traditional, indigenous and local knowledge and participatory data collection

[84] See Garcia *et al.*, 2008, for a discussion of approaches to addressing assessment and management needs in small-scale fisheries; also Cochrane and Garcia, 2009, Chapters 3 and 13.

methods may be particularly useful in these situations – or studies on similar fisheries in other locations, with a suitable safety margin. Improved availability and user-friendliness of information systems can facilitate this process. Social and professional networking can also play an important role in this respect. Web-based networks are available for some of these aspects, for example the LMMA network (Box 33). With the generally increasing popularity of Internet networking, this type of structure for information- and experience-sharing could develop further in the future.

8.9 IS THERE A NEED FOR MORE RESEARCH ON MPAs?

A long list of potential research topics related to MPAs and fisheries merits attention:

- biological and ecological aspects (e.g. larval dispersion patterns and juvenile and adult movements for specific species);
- linkages in and between marine communities;
- effects of a fishery target species on other species in the ecosystem;
- socio-economic issues (e.g. changes in fishers' behaviour regarding fishing patterns and displacement of effort triggered by diverse types of MPAs or combinations of management measures, ecosystem service valuation methods and other aspects of cost–benefit analyses); and
- governance (e.g. best practices for stakeholder involvement and co-management systems, and for intersectoral coordination and collaboration).

For some types of research, an experimental design of MPAs of different sizes, different spacing (in a network) or in different habitats and ecosystems would ideally need to be set up to thoroughly test how well various methods work in achieving diverse targets and objectives. However, it is difficult to find areas that are similar enough to serve as replicate samples. Moreover, the response time for the variables being tested is likely to be long (several years). There is generally resistance to this type of experiment because of the possibility of undesirable outcomes (both for the marine environment and for people). Thus it is difficult to set up experimental MPAs and, consequently, data from systematic evaluations of the performance of existing MPAs are needed.

All MPA management systems must include robust and standardized monitoring processes, allowing for comparison, to assess how well objectives are being achieved. Certain research topics can be incorporated

into such systems, but this often requires careful planning from the outset. For comparisons over time, data from baseline surveys – that is, of the status before the MPA was established – play a key role. There may be other issues that are better investigated by comparing MPAs, and some (e.g. related to the behaviour and biology of fish species) can be dealt with outside the context of MPAs. Yet other topics may lend themselves to a modelling approach. Many of the models currently used in fisheries management, such as stock assessment or bioeconomic models, are also of interest to MPA management, as are the more recent ecosystem models.[85]

Some research topics and their eventual results apply to a broader spectrum of MPAs, while others may be site- and situation-specific. In particular, site-specific research should be closely linked to the monitoring of management performance and fed into adaptive management processes. Documentation and publication of research results will contribute to global aggregate knowledge on how to successfully use MPAs and should be strongly encouraged.

[85] See also Chapter 6 and Annex 3.

KEY CONCLUSIONS AND RECOMMENDATIONS No. 8

As part of MPA and MPA network planning and implementation, information needs to be collected on bioecological, social, financial and economic, institutional and governance aspects of the MPA. Assessments should also identify existing and potential problems, needs and opportunities relevant to the MPA and its planning and implementation processes. Multidisciplinary information and analyses are required.

- Key bioecological information includes ecological data (habitats, biodiversity, environmental conditions, etc.) and fisheries data (stock assessments, spatial distribution and mobility, characteristics during various life stages, etc.). Depending on the objectives of the MPA, areas and seasons with high bycatch levels and the location of biodiversity hotspots and habitats of concern may also be needed. For small-scale fisheries, comprehensive scientific data may not be available and greater use of local knowledge and alternative assessment methods should be explored.
- All management is about people, and social information providing a good understanding of coastal communities and other resource users is key to successful MPA outcomes. Community profiles should be used, including data on demographic, cultural and social aspects that are important to MPA planning and implementation.
- MPAs have economic and distributional impacts and these effects must be understood. Financial, value chain and cost–benefit analyses, economic impact assessments and distributional impact reviews are important tools.
- Appropriate institutional, legal and policy frameworks are fundamental to successful MPA implementation. The relevant frameworks should be assessed and their implications for MPA planning and implementation understood.
- For MPA networks, connectivity has to be considered. Knowledge is required of the spatial dynamics of life cycles and interactions among organisms, as well as of the social connections between human communities and governance support.
- Computer-based technologies can assist in planning and implementing MPAs. GIS, decision-support tools, scenario development and modelling are other methods that can help decision-makers.

- Lack of (scientific) information should not unreasonably delay the designation of MPAs. Flexible approaches should be applied to data gathering through the use of multiple information sources, including traditional, local and indigenous knowledge.

9. LESSONS LEARNED AND FUTURE DIRECTIONS

MPAs and MPA networks have become increasingly popular as a tool for protecting biodiversity and habitats and for preserving sites with particular importance. Spatial management, including MPA-type measures, has a long history in fisheries, and fisheries management is evolving into EAF, paying increased attention to ecosystem linkages and overall health. The question is how to use MPAs more effectively to fulfil multiple objectives in an integrated spatial management approach for the benefit of the marine environment and sustainable livelihoods. Further attention to the reconciliation of fisheries management and biodiversity conservation will be important as more-extensive use of MPAs take place.

The accumulated experience so far with MPAs and MPA networks provides valuable lessons that should make MPAs more effective in the future. This section summarizes some key conclusions and looks into future opportunities and challenges in planning and implementing MPAs in support of both biodiversity conservation and sustainable fisheries – providing benefits to those who depend on marine resources for their livelihoods and to society overall.

9.1 WHAT ARE THE KEY LESSONS ON MPAS AND FISHERIES?

The cumulative global experience of MPA planning and implementation continues to grow. Some important conclusions to date on how MPAs work in relation to fishery resources, fisheries and fishers, and in bridging fisheries management and biodiversity conservation include:

- MPAs and MPA networks are tools among many other fisheries management and biodiversity conservation measures. As such, they have strengths and weaknesses and should not be considered a 'magic bullet'. They are effective for management when planned and implemented under the right circumstances and through appropriate processes. Both the opportunities and the limitations they represent should be respected.
- There are various entry points into MPAs – from a biodiversity conservation or a fisheries management perspective – but MPAs will

have multisectoral effects whether they have been designed with multiple objectives or not. To ensure that externalities are capitalized on or mitigated, depending on the particular situation, MPAs must be embedded within broader policy and spatial management frameworks, and appropriate cross-sectoral coordination and collaboration established at all levels (national, regional and local).

- When designed appropriately, it is likely that there will be benefits for fishery resources inside and close to MPAs (as a result of spillover) – in terms of abundance, biomass and size of resource species. In general, conservation benefits are likely to be greater for more sedentary species, and fisheries benefits should be greater for species with intermediate mobility. MPAs can also play an important role in the protection of habitats and critical life stages, and in reducing bycatch.
- However, the exclusive use of MPAs to control or reduce fish mortality, that is, as a fisheries management tool to sustain fish populations, is likely to result in overall lower yield potential and higher costs of fishing. MPAs should be combined with other management measures that control fishing effort outside the protected area, or fishing effort will probably be displaced with potentially negative consequences. Hence, MPAs must be an integral part of overall fisheries management plans and should not be viewed as a stand-alone fisheries management tool unless they are the only viable option, such as in situations where the capacity to implement other forms of management is lacking.
- Because MPAs decrease the fishing area, they are likely to mean – at least in the short term – lower yields for fishers in those situations in which they cannot fish efficiently elsewhere. Benefits from changes in the fishery resource thanks to MPAs may be realized only in the longer term. Coastal communities adjacent to MPAs, especially those with a high economic dependence on the fishery, could thus face a disproportionate impact as a result of aggregate reduction in fishing revenue. Efforts should be made to minimize disruptions to lives and livelihoods through impact assessment, identification of alternative livelihoods and strategies to address the disruptions.
- The socio-economic impacts of MPAs can be positive and negative, direct and indirect, affecting sectors and stakeholders adjacent to and beyond the MPA site(s). MPAs have distributional effects and different

stakeholder groups are affected in different ways. Stakeholder involvement in planning and implementation is crucial for the success, in particular, of coastal MPAs. People, individually and as a group, should be made to feel that they have been part of the decision-making process and have been able to actively participate in and influence it. Without this, it will be difficult to obtain support and compliance.

- Appropriately designed MPA networks typically have several benefits over single MPAs. A network may be more flexible with regard to the distribution of social and economic costs and benefits among various stakeholders (fishers), while still achieving fisheries management and biodiversity conservation objectives. A network is also likely to provide higher resilience to catastrophic events and other changes in the environment, such as climate change.
- MPAs imply a long-term management undertaking, and political commitment and sustainable resourcing are required. Adequate support in terms of manpower and other resources must be planned from the outset and could include multiple funding sources.

9.2 WHAT IS THE FUTURE OF MPAs?

The current trend towards greater emphasis on MPAs as a fisheries management and biodiversity conservation tool will continue, within the framework of EAF and in the context of the international commitments made to conservation and sustainable development. In order to make the most of the contribution of this spatial management measure to achieving healthy marine ecosystems and sustainable fisheries, and meeting broader societal objectives – including poverty reduction and food security where these are a major concern – there are both opportunities and challenges.

MPAs and opportunities in an increasingly integrated world

Many developments support MPAs as an opportunity for improved fisheries management and biodiversity conservation. At the same time, as the world becomes more globalized and integrated, the need to decentralize decision-making and allow those directly concerned to assume increased responsibility is also recognized. These and other opportunities related to MPAs in an increasingly integrated world include:

- *Integrated marine spatial management:* MPAs as a tool for fisheries management and biodiversity conservation must be integrated within broader spatial management to balance diverse environmental and

societal values and needs. An MPA is a management tool that, if wisely planned and implemented, constitutes an opportunity to support cross-sectoral approaches and to bridge fisheries management and biodiversity conservation objectives.

- *Decentralization policies and co-management:* Current trends of devolution of power to local levels of government and communities, for example through fisheries and ecosystem co-management arrangements, support stakeholder involvement in MPA planning and implementation. This is an important development that MPAs can both benefit from and contribute to: experiences from MPA management can inform policy on decentralization and shared responsibilities.
- *MPA networks:* The move towards designating MPA networks – rather than single MPAs – constitutes an opportunity for a more flexible approach to management through MPAs. As with single MPAs, careful holistic, integrated and participatory planning of MPA networks is required for successful outcomes.
- *Sustainability of MPAs:* Sustaining of MPAs requires sound management to achieve objectives and to have ongoing communication with and engagement of stakeholders in order to engender political will and support, and ensure sustainable financing. The currently increasing general recognition of the value of the environment and of ecosystem services constitutes an opportunity to explore innovative approaches to financing, such as PES schemes.
- *Research and new technologies:* Much has been learned about the response of marine ecosystems within and near MPAs, but careful long-term monitoring and well-designed and applied research are necessary to enhance the understanding of results and outcomes. This applies, in particular, to the broader spatial scales of fisheries and ecosystems and to their social and economic impacts. New technologies, such as VMS, GIS and systems for information-sharing, constitute an opportunity to apply new approaches to MPA planning and implementation.

MPAs and challenges in a changing context

Marine management and the use of MPAs will be influenced by a number of ongoing developments, including increased economic globalization, trends in political and governance systems, and climate change. MPAs should be

adaptable to such changes and planned with sufficient flexibility. A number of challenges must be addressed in this respect:

- *Competition for resources: The* increasing demands on resources and space – including, for example, from expanding aquaculture and recreational fisheries – render intersectoral coordination urgent. While MPAs constitute a tool for managing resources in a spatial context, they will not reduce the demand for resources, but MPAs should contribute to a more-efficient use of existing resources and coordination among resource users.
- *Legal, institutional and policy frameworks:* To work effectively as a management tool for multiple objectives and to create cross-sectoral benefits, MPAs must be supported by the appropriate institutional structures. Today, however, these are still often lacking. Coordination and collaboration among government agencies and with stakeholders is required if the necessary legal, institutional and policy arrangements are to be developed.
- *Ocean governance:* More attention is being paid to ocean governance due to recognition of the value of the marine environment and the ecosystems our oceans represent, and of the spatial and natural resources they contain. It is important that the development of ocean governance and the future use of the oceans are equitable in two senses: there needs to be balance between bioecological and socio-economic needs, that is, both environmental sustainability and people's livelihoods must be considered, and there has to a fair distribution of costs and benefits among diverse groups of people. These are challenging principles that must be taken into account when planning and implementing MPAs.
- *High seas management:* An important part of the changing ocean governance scene relates to international waters and the high seas. The designation of MPAs in the high seas for both fisheries management and biodiversity conservation purposes poses new management challenges and may require innovative solutions with regard to legal and institutional structures. Existing RFBs already play an important role, which may need to be adjusted and expanded.
- *Food security and poverty reduction:* In situations in which MPAs will negatively affect food security, poverty and livelihoods – in the short run – the identification and development of alternative or supplementary livelihood activities must be undertaken. This can

constitute an important challenge, particularly in areas where the dependence on current marine resource patterns is high. Both affected resource users and relevant (cross-sectoral) government departments should be engaged in this process to ensure that alternative or supplementary livelihoods are sustainable. Moreover, the scope and objectives of MPAs must reflect a balance between scientific and social and economic needs and realities.

- *Social buy-in and compliance:* Only meaningful public and stakeholder participation can ensure compliance and long-term sustainable support. This is valid for coastal MPAs, where nearby communities have a direct stake in the MPA, as well as for the high seas, where the global community at large – through its governments, representative organizations and international fishing companies – must acknowledge and support the necessity of conservation and sustainable fisheries management measures. Ensuring participation and stakeholder buy-in is a critical challenge for future MPAs.
- *Climate change:* Climate change is an issue that is highly relevant to MPAs and that may undermine their robustness in terms of sustaining populations and protecting habitat and biodiversity. As the distribution of biota[86] responds to climate change, MPAs once strategically positioned based on historical distributions may no longer be in the right place. A network of MPAs – with the potential of affording protection as the climate changes and biological distributions respond – may be more effective than dependence on a single MPA. Nevertheless, longer-term changes in conditions are difficult to forecast, and this challenge also calls for adaptive management and flexibility in the implementation process.
- *Large MPAs:* MPAs are now being declared across wide stretches of open ocean, such as the Papahānaumokuākea Marine National Monument (Northwestern Hawaiian Islands Marine National Monument, 2006), which covers 362 000 km^2; the Phoenix Islands Protected Area (PIPA), encompassing 184 700 km^2 (2006); or the Micronesia Challenge, which aims to conserve 30 percent of nearshore resources by 2020.[87] Such large MPAs will constitute

[86] The total complement of animals and plants in a particular area.

[87] This commitment includes the Federated States of Micronesia, the Republic of the Marshall Islands, the Republic of Palau, the Territory of Guam and the Commonwealth of the Northern Marianas Islands.

specific challenges in assessing socio-economic situations and trade-offs, MCS requirements and in assuring effective management.

The increasing acceptance and application of MPAs in many parts of the world is an integral part of global efforts to safeguard our oceans. However, designating MPAs without due consideration of their consequences and practical feasibility will only create 'paper parks', without benefits to the environment or humanity, and even with potential costs in the form of, for example, lost livelihoods and income. Thus they must not be seen as a panacea that will cure all problems: both the environment and fisheries require holistic thinking and actions targeted at specific problems and their underlying causes. At the same time, MPAs constitute a great opportunity, but as with many worthwhile endeavours, considerable time, effort and perseverance will be required to make MPAs and MPA networks fulfil their potential.