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IDENTIFYING SPECIFIC ELEMENTS FOR INTEGRATING THE TRADITIONAL, SCIENTIFIC, TECHNICAL AND TECHNOLOGICAL KNOWLEDGE OF INDIGENOUS AND LOCAL COMMUNITIES, AND SOCIAL AND CULTURAL CRITERIA AND OTHER ASPECTS FOR THE APPLICATION OF SCIENTIFIC CRITERIA FOR IDENTIFICATION OF ECOLOGICALLY OR BIOLOGICALLY SIGNIFICANT AREAS (EBSAS) AS WELL AS THE ESTABLISHMENT AND MANAGEMENT OF MARINE PROTECTED AREAS

Note by the Executive Secretary

1. Recalling paragraph 27 of decision IX/20, the Conference of the Parties to the Convention, in paragraph 47 of decision X/29, requested the Executive Secretary to undertake, subject to availability of financial resources, a study, within a context of Article 8(j) and related provisions, to identify specific elements for integrating the traditional, scientific, technical and technological knowledge of indigenous and local communities, consistent with Article 8(j) of the Convention, and social and cultural criteria and other aspects for the application of scientific criteria in annex I to decision IX/20 for the identification of ecologically or biologically significant areas as well as the establishment and management of marine protected areas, and make the report available at the eleventh meeting of the Conference of the Parties to the Convention and transmit the findings to the relevant United Nations General Assembly processes, including the Ad Hoc Open-ended Informal Working Group.

2. Pursuant to this request, a study was prepared by the Secretariat of the Convention on Biological Diversity to identify specific elements for integrating the traditional, scientific, technical and technological knowledge of indigenous and local communities, and social and cultural criteria and other aspects for the application of scientific criteria for the identification of ecologically or biologically significant areas as well as the establishment and management of marine protected areas, through commissioning an independent consultancy.

3. The draft study was circulated for peer-review through notification SCBD/STTM/DC/RH/VA/78671 (2012-012), dated on 23 January 2012, and comments were taken into account when finalizing the report.

* UNEP/CBD/SBSTTA/16/1.

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EXECUTIVE SUMMARY

Social conditions often determine the long-term biological viability of conservation initiatives. Because humans and their needs, including the needs of future generations, are important for the conservation and management of marine resources, the application of social and cultural criteria in addition to ecological criteria is an essential part of the identification and eventual management of EBSAs by States and competent intergovernmental organizations, particularly in areas with pre-existing human populations and uses.

Social and cultural criteria for the identification ecologically or biologically significant areas as well as the establishment and management of marine protected areas

A review of existing sets of social, cultural and economic criteria used internationally, regionally, nationally and sub-nationally was undertaken, and a consideration of these can provide a basis for further debate and for the eventual development of socio-cultural criteria for EBSAs to be used alongside the already-existing scientific criteria.

Common cultural criteria currently in use incorporate the following aspects:

- **Current cultural and traditional use**: This category includes areas that have traditional uses by indigenous and local communities, as well as areas that are important for maintaining or restoring productivity, diversity and/or integrity of resources and places used for traditional and cultural activities, including sustainable economic uses.
- **Current customary management areas and systems**: This category includes areas and resources being managed by indigenous or local communities using their local and/or traditional knowledge.
- **Cultural value other than direct use**: This category includes sacred sites, and areas that have religious, historic, artistic or other cultural value.
- **Cultural heritage**: This category includes areas that have important historical and archaeological sites.

Common socio-economic criteria currently in use incorporate the following aspects:

- **Social, human or economic dependency**: This category includes areas that provide important ecosystem services for individuals and communities, and upon which the survival, livelihoods and well-being of people are dependent on. Providing for access to, and sustainable uses of, such areas for fishing, recreation and traditional subsistence or food production activities is important.
- **Social importance**: This category includes areas that have existing or potential value to local or international communities because of cultural, educational, aesthetic or recreational qualities. The maintenance or restoration of these values through management is important.
- **Economic importance**: This category includes areas that have existing or potential economic value and/or uses, and may provide economic benefits for communities through opportunities to engage in small-scale fishing, tourism or other economic activity. This category may also include areas whose protection, maintenance or restoration makes a direct economic contribution to fisheries (breeding or nursery areas, or an areas that are the source of economically important species) or to recreation, tourism or other economic activity.
- **Social acceptability**: This category includes areas that have a high degree of support from indigenous and local communities, as well as from stakeholders.
- **Compatibility**: This category includes areas that have existing uses and management regimes that are generally compatible with the goals of the proposed conservation/management action. The category may also include areas that may help resolve conflicts between natural

resource values and human activities, or which may provide for resolution of conflicts between users.

- **Conflicts of interest**: This category considers the degree to which the proposed conservation or management action would affect the activities of local residents, and cause social or economic hardship on communities.

Experiences in applying social and cultural criteria

In applying scientific, social and cultural criteria, the following considerations should be kept in mind:

- Positive experience in co-management and/or community-driven marine management can be found in many cases where communities' rights to their resources have been recognized, and where marine managed areas provide for sustainable uses that benefit community livelihoods and well-being.
- Recognition of the importance of local and traditional knowledge and the need for building on pre-existing systems of traditional resource management is likely to increase community ownership of conservation and management initiatives, and thus their sustainability in the long term.
- There is a need to build meaningful and equal partnerships between scientists, managers and members of indigenous and local communities in research leading to identification of EBSAs and in monitoring and managing such areas. These partnerships should seek to apply both science and traditional ecological knowledge.
- While all efforts must be undertaken to protect and conserve resources, it is important to also take into account the livelihoods and well-being of communities that have traditionally depended on those resources, and to ensure that socio-cultural benefits of EBSAs (and not only the costs) flow back to communities.

Traditional, scientific, technical and technological knowledge of indigenous and local communities on marine and coastal biodiversity

Indigenous and local communities possess traditional knowledge, innovations and practices that have global importance for conservation and sustainable use of marine biodiversity and resources. Thus, the argument could be made that traditional knowledge has an important role to play in identifying EBSAs, both inshore and offshore. In particular, traditional ecological knowledge can provide:

- **Location-specific knowledge** about species, habitats and ecological interactions, including knowledge about migratory species in support of CBD EBSA criterions 2 and 3, as well as information about important habitats such as juvenile habitats or spawning aggregations. Traditional ecological knowledge (TEK) can also be used to validate regional or global models of species distribution or climate change.
- **Increased knowledge of environmental linkages** between various ecological processes, multiple species and abiotic factors that influence species biology, including trophic structures, migration movements, as well as the behaviour of species.
- **Local capacity-building and power sharing** through creation of research programmes where indigenous peoples and/or community members are equal partners with scientists.

Where traditional knowledge is collected for the purpose of applying either ecological or socio-cultural criteria, the prior informed consent of the knowledge holders should be obtained, and the knowledge utilized through mutually agreed terms.

The knowledge and practices of indigenous and local communities are not only important for identifying areas that meet EBSAs criteria, but have also resulted in traditional marine management systems and

strategies that have significance for considering how biodiversity in the world ocean, including in areas beyond national jurisdiction, is managed. The concepts of significance include:

- The recognition of the interconnectedness of all things, including the understanding that people are integral parts of natural systems and that management must be undertaken in a holistic manner.
- The concepts of stewardship and intergenerational responsibility in providing for sustainable use of marine resources, while recognizing that providing benefits for people is vital for conservation success.
- The need for marine resources management to employ multiple tools and approaches, and to be sustainable, adaptive and to enhance community resilience and self-sufficiency in a time of change.

(a) It should also be kept in mind that enhancing and building upon traditional marine management strategies in the context of national and international policies relating to biodiversity conservation, marine protected areas and fisheries management is likely to provide benefits for both communities and biodiversity.

I. BACKGROUND AND INTRODUCTION

This study has been undertaken, with the financial support from the Government of Japan through Japan Biodiversity Fund, in response to decision X/29, paragraph 47, of the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD) which, recalling decision IX/20, paragraph 27, requested the Executive Secretary to undertake, subject to availability of financial resources, a study[1], within a context of Article 8(j) and related provisions, to identify specific elements for integrating the traditional, scientific, technical and technological knowledge of indigenous and local communities, consistent with Article 8(j) of the Convention, and social and cultural criteria and other aspects for the application of scientific criteria in annex I to decision IX/20 for the identification of ecologically or biologically significant areas as well as the establishment and management of marine protected areas, and make the report available at the eleventh meeting of the Conference of the Parties to the Convention and transmit the findings to the relevant United Nations General Assembly processes, including the Ad Hoc Open-ended Informal Working Group.

Paragraph 27 of decision IX/20 similarly called on Parties to integrate the traditional, scientific, technical and technological knowledge of indigenous and local communities, consistent with Article 8(j) of the Convention, and to ensure the integration of social and cultural criteria and other aspects for the identification of marine areas in need of protection as well as the establishment and management of marine protected areas.

These requests by the CBD COP follow the adoption of scientific criteria for the identification of ecologically and biologically significant areas (EBSAs) (decision IX/20, annex I). These scientific criteria have provided the necessary tools for countries to move forward, collectively and in a systematic manner, in identifying priority ocean areas for subsequent management and/or protection. These guidelines were primarily intended to be applied in open-ocean and deep-sea habitats in areas beyond the national jurisdiction, but they are also envisaged to have applicability in areas under national jurisdiction. In fact, many countries have already adopted similar criteria, mainly for identification of MPA sites, and the CBD criteria were based on an extensive review of such existing criteria. The application of the scientific EBSA criteria is seen as a first step in a longer process that will eventually lead to the identification and

[1] This document was written in collaboration with the Traditional Knowledge Initiative of the United Nations University, Institute of Advanced Studies. Review comments from the governments of New Zealand and Canada, as well as from the United Nations Division on Ocean Affairs and law of the sea (DOALOS) and the International Collective in Support of Fishworkers were taken into account.

enhanced management of EBSAs by States and competent intergovernmental organizations. For these two later steps to be successful, they will need to take into account factors other than science, including importantly, social, cultural, economic and practical considerations.

This approach acknowledges that a strong linkage seems to exist between biological and social success, with social conditions often determining long-term biological success (Christie, 2004). Research in coastal areas has shown that it is possible for marine protected areas (MPAs) to be successful in restoring fish populations, while at the same time having been subject to frequent criticism for their failure in terms of the humans involved, particularly where universal advocacy neglects local context and need (Agardy, 2003). Thus, it is possible for MPAs to be a biological "successes" but social "failures" (Christie, 2004). In the past, some MPAs have been drivers of social and economic marginalization and conflict, even though they might have provided for an increase in fish abundance and diversity. If the conflict relating to the MPA becomes high, it may result in a breakdown of the entire policy approach in a way where biological objectives are also undermined (Hauck and Kroese, 2006). Learning from these experiences, it is important that scientific and technical measures, such as EBSAs, be compatible with human diversity and behavioural variation.

At the same time, COP decisions X/29 and IX 20 acknowledge the importance of the traditional, scientific, technical and technological knowledge of indigenous and local communities in identifying EBSAs in both coastal and deeper ocean areas. In the preamble of the CBD there is a broad recognition of the contribution that traditional knowledge can make to the conservation and sustainable use of biological diversity, and the need to ensure the equitable sharing of benefits arising from the utilization of traditional knowledge. For this reason, the CBD Parties undertook, in Article 8(j) to respect, preserve and maintain traditional knowledge relevant to the conservation and sustainable use of biological diversity, and to promote its wider application. In this context, the present study will endeavour to show that knowledge held by indigenous and local communities is not only important for identifying areas that are potential EBSAs, but has also resulted in traditional marine management systems and strategies that have often evolved through centuries, if not longer, of close relationship with natural resources to become effective, sustainable and culturally appropriate.

It has been long acknowledged that for conservation and management measures to be successful, they will require the early involvement of all stakeholders, as well as indigenous and local communities, in the design and management processes. This will provide for ownership and ensure that that everyone's voice will be heard and that all specific interests are taken into account. Many coastal areas are characterized by growing intensity and diversity of multiple uses within the same area, with each user group and sector of society perceiving such ecosystems to be valuable in different ways, often leading to conflicts. Thus, an understanding of social and cultural complexity and heterogeneity is important for successful management of human activities in marine areas.

In this context it is also important to note that indigenous peoples are considered to be rights-holders with a special status that goes beyond that of a stakeholder. This is recognized in the United Nations Declaration on the Rights of Indigenous Peoples, which also recognizes that "respect for indigenous knowledge, cultures and practices contributes to sustainable and equitable development and proper management of the environment".

The importance placed on social and cultural criteria is based on the fact that in many places of the world, humans are an integral component of seascapes, rather than intruders on marine systems (McCay and Jones, 2011). In the rapid expansion and development of modern protected areas, there has often been a disregarding of pre-existing community use of lands designed for "protection". This has resulted in a low degree of community consultation prior to protected area creation, reflecting perhaps a previous and exclusionary protected area model, where local people were often seen as inimical to conservation, resulting in considerable social and economic disruption and hardship (Wild and McLeod, 2008). For example, proposals to establish MPAs on traditional fishing grounds can negatively affect communities

through intensified regulatory control resulting in economic losses and social marginalization, as well as competition from highly capitalized industries, such as tourism. More recent thinking in regards to MPAs has come to view communities as important custodians of ecosystem and species diversity, and part of the solution rather than the problem. In keeping with such thinking, the integration of different tools and approaches that take into account local interests and rights to sustainable harvest resources, and will thus provide for mixed uses, have been shown to have the best chances of success (McCay and Jones, 2011).

Related to the above is the conflict that may develop when global policies adopted by international environmental instruments, such as the CBD, are implemented locally through top-down approaches. For example, international MPA targets (such as the 10% target for effective conservation of marine and coastal ecosystems) may, if implemented without due regard for local socio-cultural conditions and pre-existing systems of management and use, have the unintended consequence of disempowering communities from managing their marine resources. While both top-down and bottom-up approaches are required to provide for conservation and sustainable use of the entire ocean and its biodiversity, it should be kept in mind that, in accordance with the principles of the ecosystem approach, management is generally most effective when undertaken by those whose daily lives depend on the resource in question, and who have the most to gain or lose from the decisions made. The case study below highlights the conflict that can sometimes take place between global policies for conservation and local rights to sustainably harvest resources.

CASE STUDY: Local conservation action and global discourse in sea turtle conservation

For ecologists and sea turtle experts, the most important features impacting their conservation are their long distance migrations. This reality of their ecology underlies decisions and policies made, with expert assistance, at the international and national level. These policies, and the beliefs that underlie then, in turn, have an impact on local people living with sea turtles. This raises questions about the appropriate scale at which conservation should take place, and the rights of local people to use and manage resources.

In Ostional Wildlife Refuge in Costa Rica, there is a legalized commercial harvest of olive ridley sea turtle eggs, which is one of the only documented cases of commercial consumptive uses of sea turtles that appears to fulfil the objectives of both sustainable use and community-based conservation. Sea turtles arrive on the small stretch of beach as part of a mass nesting phenomenon (*arribadas*) where hundreds of thousands of turtles emerge over several days to lay their eggs on the beach. This happens approximately once a month, throughout the year, with an estimated 20,000 to 130,000 turtles nesting in each *arribada*. The legalized harvest of turtle eggs is run by a community cooperative, with an average of 17% of eggs laid collected during *arribadas*. From a biological perspective, the harvest is believed to be sustainable, and data suggest no overall decline in nesting numbers. The cooperative also undertakes turtle protection efforts like beach guarding and cleaning. The community derives substantial monetary benefits from the harvest project, which has a high degree of community participation in its management. Profits are reinvested into community development and an equitable approach to profit distribution is promoted. Individual and collective stakes in the project are high enough to discourage illegal harvesting and encourage community self-policing. On the national level, one of the arguments for allowing the harvest was to saturate the national market with legal eggs from Ostional, and thus discourage illegal harvesting elsewhere. It should be noted that this harvest is an exception to Costa Rica's otherwise strong non-extraction policy related to sea turtles, and that eco-tourism related to turtles provides the country with substantial income.

The Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) identifies eliminating use as a key measure for achieving the convention's objectives. Costa Rica is signatory to IAC and houses the current secretariat. While States Parties and turtle conservation NGOs have representation in IAC, local communities do not, and thus have no formal means of accessing IAC decision-making. It is likely that the Ostional harvest would not fit under IAC exections to sea turtle

use, given that it is not a subsistence hargest. At the same time, there are calls from international sea turtle conservation NGOs to end the Ostional egg harvest and replace it with ecotourism. According to sea turtle experts, the global distribution and migration of turtles overrides local rights for harvest, and that such a harvest detracts from conservation efforts elsewhere in the country.

The case study, while still unresolved, highlights the tensions that can exist between international environmental policy and the reality of local communities. Giving preference to international policy decisions may sometimes lead to the marginalization of local people in determining, managing and participating in locally meaningful conservation, and reflects unequal power in conservation.

Adapted from Campbell, 2007.

This study will begin by looking at the traditional, scientific, technical and technological knowledge of indigenous and local communities on marine and coastal biodiversity (chapter 2). Specifically, the nature of traditional ecological knowledge and its application will be discussed, as will a number of marine management strategies that have their basis on this knowledge. The chapter also discusses the relevance of both traditional ecological knowledge and management systems in the deep and open oceans beyond national jurisdiction. Chapter 3 will look at existing social and cultural criteria that can be used alongside the scientific EBSA criteria to identify areas for enhanced conservation and management, and will also provide some examples of how such criteria have been applied in collaboration with communities. Finally, chapter 4 provides conclusions and possible elements for integrating the traditional, scientific, technical and technological knowledge of indigenous and local communities, consistent with Article 8(j) of the Convention, and social and cultural criteria into the activity of identifying EBSAs the establishment and management of marine protected areas. Throughout, the study will attempt to maintain a focus on human well-being as a way to enhance more scientific and technical approaches to marine resources management and as a way to provide for long-term sustainability of marine management (Coulthard et al, 2011; McGregor, 2008).

II. TRADITIONAL, SCIENTIFIC, TECHNICAL AND TECHNOLOGICAL KNOWLEDGE OF INDIGENOUS AND LOCAL COMMUNITIES ON MARINE AND COASTAL BIODIVERSITY

In many parts of the world, indigenous people have long been the custodians of the marine and coastal environment, and have sustainably used resources in these areas in accordance with their cultural traditions. They often have in place pre-existing systems of resource management that have evolved as a result of historical and sustained interaction with the resources that they depend on. These systems of resource management are often embedded in a set of beliefs and ways of seeing the world that have evolved over time, and while different from "Western" perceptions, are no less valid strategies for observing, understanding and interacting with the natural world around them.

This chapter provides an overview of the knowledge, innovations and practices of indigenous and local communities as they apply to the management of marine biodiversity and resources. The topics covered include the nature of traditional knowledge and its application to the management of marine resources and biodiversity, and an overview of the types of marine and coastal management systems that have, and continue to be applied in many parts of the world. These systems include the ecosystem approach, area-based protection, fisheries management and adapting to change. In addition, the chapter discussed the role of traditional knowledge in the management of deep and open oceans, including areas beyond national jurisdiction.

A. Traditional, scientific, technical and technological knowledge of indigenous and local communities

Traditional ecological knowledge (TEK) represents multiple bodies of knowledge accumulated through many generations of close interactions between people and the natural world (Drew, 2005). It is acquired

through extensive observation of an area and/or species. This may include knowledge passed down in an oral tradition, or shared among users of a resource. Traditional knowledge has an empirical basis and is used to understand and predict environmental events upon which the livelihood or even survival of the individual or the group depends (Huntington, 2000). In the context of the CBD, the term "traditional knowledge" is employed to mean "the knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biodiversity" (CBD, 1997). Other, complementary definitions can also be found in the literature. For example, Berkes et al, 2000, provides the following, often cited definition for TEK: "Traditional ecological knowledge is 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 their environment" (Berkes et al, 2000).

TEK is different from local knowledge in that local knowledge does not necessarily imply that the information was accumulated through many generations, only that it was acquired through close association with a particular environment. Both TEK and local knowledge are site-specific and generally accumulated through trial and error over many years (Drew, 2005).

While TEK has contributed to a number of scientific studies, its potential has not been fully explored in this context. TEK can, in particular, strengthen research by supplying information that is locality-specific, including environmental linkages occurring in those localities (Drew, 2005). For example, local ecological knowledge possessed by Inuit communities contributed to a study of marine birds in the Arctic, and provided information relevant to their conservation and management (Gilchrist et al, 2005). Traditional ecological knowledge has similarly contributed to studies of Beluga whales (Huntington, 2000), polar bears (van de Velde et al, 2003), whales (Hay, 2000) and sea turtles (Jit, 2007). Many of these migratory marine species are also of considerable interest in the application of the CBD's scientific criteria for identification of EBSAs. In addition, TEK has proven to be important in climate change research by providing local observations that are generally lacking in large-scale climate models, as demonstrated by the Arctic Climate Impact Assessment (see case study below).

CASE STUDY – Arctic Climate Impact Assessment

The Arctic Climate Impact Assessment (ACIA) was an international project of the Arctic Council and the International Arctic Science Committee (IASC), to evaluate and synthesize knowledge on climate variability, climate change, and increased ultraviolet radiation and their consequences. The results of the assessment were released at the ACIA International Scientific Symposium held in Reykjavik, Iceland in November 2004[2].

The 1042-page scientific report provides and assessment of climate change as it relates to Arctic climate and various Arctic ecosystems. Importantly, it also includes a chapter on indigenous perspectives of the changing Arctic (chapter 3). This chapter compiles knowledge gathered by existing projects and studies on indigenous knowledge and climate changes. The chapter presents a number of illustrative case studies, the formats of which vary greatly and reflect the type of material gathered and the way in which the study was conducted. A map-based standardized summary of observations by different communities in the Arctic is also presented.

The case studies of indigenous observations and perspectives offer great insights not only in terms of the nature and extent of environmental change, but also in terms of the significance of such change for those peoples whose cultures are built on an intimate connection with the arctic landscape. The case studies each attempt to convey the sense of how climate change is seen, not in the form of aggregate statistics or general trends, but in specific terms for particular individuals and communities. The case studies provide the basis for a discussion of resilience, or protecting options to increase the capacity

[2] http://www.acia.uaf.edu/

of arctic societies to deal with future change and a review of further research needs.

In this context, the reports notes that in making use of indigenous knowledge, several of its characteristics should be kept in mind. It is typically qualitative rather than quantitative, does not explicitly address uncertainty, and is more likely to be based on observations over a long period than on comparisons of observations taken at the same time in different locations. Identifying mechanisms of change can be particularly difficult. It is also important to note that indigenous knowledge refers to the variety of knowledge systems in the various cultures of the Arctic and is not merely another discipline or method for studying arctic climate.

For more information, please see http://www.acia.uaf.edu/

To acquire TEK, researchers must develop mutually respectful relationships with the knowledge holders and enter into a dialogue on the terms set by them (Drew, 2005). Guidance on how to take into account traditional knowledge, innovations and practices can be found in the Akwė: Kon voluntary guidelines for the conduct of cultural, environmental and social impact assessments (www.cbd.int/doc/publications/akwe-brochure-en.pdf). These guidelines provide information on paying due regard to the ownership of and the need for protection and safeguarding of traditional knowledge, innovations and practices. For example, in the event of disclosure of secret or sacred knowledge, prior informed consent and proper protection measures should be ensured. Use of knowledge should be undertaken on mutually agreed terms. The case study below, from Northern Australia, provides an example of collecting a combination of traditional knowledge and scientific information using modern technology, while respecting intellectual property and cultural protocols.

CASE STUDY: I-Tracker network and the collection of scientific and cultural data for land and sea management

I-Tracker, short for 'Indigenous Tracker', supports indigenous land and sea managers across north Australia to undertake natural and cultural resource monitoring, management and research activities. It is guided by principles which ensure that I-Tracker activities respect traditional owner authority and cultural protocols and protects indigenous intellectual property and data ownership rights.

Indigenous land and sea managers use "field tough" computers with standardized data collection applications to collect, share and manage information about natural and cultural resources and research activities. The types of data collected include marine wildlife, foreign fishing vessels, marine debris and ghost nets, bio-security and marine pests, customs surveillance, weeds and feral animals, fire management, biodiversity surveys as well as cultural site protection and mapping, and visitor management. These data inform best practice in land and sea management, which incorporates the application of western science techniques and utilises the detailed body of environmental knowledge and the inter-connected spiritual and cultural relationships indigenous Australians have with their traditional land and sea country.

I-Tracker also provides technical support and training, and networking opportunities. Research partnerships with leading scientist ensure that I-Tracker is scientifically robust and bring together indigenous and scientific knowledge and expertise. By facilitating the sharing of locally collected data between indigenous and non-indigenous managers across north Australia, I-Tracker is helping to improve land and sea management at regional, national and international scales.

Written by Rod Kennett, North Australian Indigenous Land and Sea Management Alliance (NAILSMA). For further information see http://www.nailsma.org.au/projects/i-tracker.html

Traditional ecological knowledge is acquired through trial and error, and actions that have allowed for optimal completion of a task are passed from generation to generation. For example, techniques and

fishing grounds that were fruitful would become part of the body of knowledge and passed along, perhaps through centuries, while those that were not would fade from memory. Furthermore, because TEK is created in an iterative fashion, it can reflect modern changes in peoples' environment or culture (Drew, 2005). While it is possible for holders of TEK to engage in unsustainable practices, the idea that resources are finite has long provided the basis for traditional tenure and management systems in places such as the Pacific Islands. This is likely due to the trial and error nature of TEK, which would have provided for learning from cases where resources were exploited to excess, creating with it an understanding of sustainable limits to harvesting. In Pacific Islands, traditional conservation measures, when applied judiciously, serve the purposes for which they were designed (Johannes, 1978). However, where traditional conservation rules have been either weakened or forcibly abolished, marine resources have been subsequently overexploited.

Traditional ecological knowledge can provide an invaluable contribution to resource management, and can be particularly important in areas where formally recorded data area lacking (Johannes, 1981) and where indigenous cultures are still largely extant (Drew, 2005; Hickey and Johannes, 2002). In these places, community support for conservation plans that incorporate customary ecological practices tends to be greater than for those that are based only on scientific methodologies (Drew, 2005). The use of TEK is also central to its strengthening. Not only are communities more comfortable and trusting in their own knowledge sets contextualised within their own belief systems, but, by-and-large, TEK often represents the only area-specific knowledge on the environment in many countries. The incorporation of TEK has been found to assist in empowering communities with their own knowledge systems, promoting ownership of resource management initiatives and, as a result, these approaches are found to be more sustainable in the long-term. The mobilisation and use of TEK also assists with inter-generational transmission of this knowledge (Vierros et al, 2010).

In many modern management contexts, including modern fisheries, TEK may work best when blended with science. However, solid examples of the blending of knowledge systems for successful management are relatively few, although they do exist. This may have to do with continued inertia in favour of established scientific practices, and the need to describe TEK in scientific terms. It may also be due to the difficulty of accessing TEK, which is rarely written down and must in most cases be documented as a project on its own prior to its incorporation into another scientific undertaking. This obstacle is exacerbated by the need to use social science methods to gather biological data, so that TEK research and application becomes a multidisciplinary undertaking (Huntington, 2000). Drew (2005) provides three major advantages for integrating TEK into research programmes:

1. **Location-specific knowledge**. In remote or poorly studied areas, traditional and local knowledge may be the only source of biological information, and can provide detail about species and interactions not recorded in the scientific literature. TEK can also be used to validate global models of species distribution or climate change, and is particularly useful in the marine environment for providing information about species presence and distribution, specific areas such as juvenile habitats or spawning aggregations, as well as information about climate-related phenomena.
2. **Increased knowledge of environmental linkages**. Many indigenous peoples view their environment in a holistic fashion and may thus be aware of linkages between various ecological processes, multiple species and abiotic factors that influence species biology. Examples include knowledge of trophic structures and migration movements of fishes and other marine species, as well as the behaviour of species, which have been accumulated due to a long association with a particular place.
3. **Local capacity-building and power sharing**. For cultural reasons, the discourse of scientific research is predominantly a one-way transfer of knowledge and power from the scientists to the community. Developing local capacity through training, education and cultural empowerment can

help reduce these inequities. Creating a research programme where indigenous peoples and/or community members are equal partners with scientists is critical to the overall intellectual development within the host country, and results in a feeling of ownership of the research project by the community.

Importantly from the point of view of application of scientific EBSA criteria, TEK has been used to collect information about habitats used by migratory species (for example, Stacey et al, 2007), as well as the location of spawning aggregations, some of which have subsequently gained protected area status in countries such as Belize (Heyman et al, 2001; Sala et al, 2001), Palau (Johannes et al, 1999) and the Solomon Islands (Aswani and Hamilton, 2004). In conclusion, the world is too big for scientists to sample intensively, and the knowledge of local people is necessary for identifying areas of special concern (Drew, 2005).

B. Ecosystem approach and indigenous people's holistic understanding of the marine and coastal environment

The Convention on Biological Diversity (CBD) describes the ecosystem approach as "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way" (decision V/6 of the CBD Conference of the Parties). Importantly, the ecosystem approach description also acknowledges that humans and their cultural diversity are an integral component of ecosystems. The ecosystem approach in resource management arose from the need to move from single species management and primarily sectoral approaches to a more integrated approach, so as to better manage multiple impacts on environments holistically while maximising long-term economic, social and cultural benefits. The ecosystem approach is central to the implementation of a number of international and regional agreements, such as the CBD, United Nations Convention on the Law of the Sea (UNCLOS) and the Food and Agricultural Organization (FAO) Code of Conduct for Responsible Fisheries.

While the ecosystem approach is still a new concept in resource management, and particularly in the context of the marine and coastal environment, it is intrinsic to most indigenous approaches. In the traditional territory of the Yolngu people in Blue Mud Bay, Australia, much of daily life and activities occur in the context of the flow of water, from freshwater rivers which flow into the increasingly salty water of the sea, and the seasonal cycles of rain and storms. These, in turn, affect the life cycles of species, both on sea and on land, that provide food for the aboriginal communities of Blue Mud Bay. The environments of the land and sea, their seasonality, flows and the animal and human communities that hey support are all interrelated, and viewed in a holistic manner by the inhabitants of the area (Barber, 2005). This understanding of the intricate and intertwined relationships in a geographical area is the basis of the ecosystem approach.

A similar understanding of water flows, the ecosystems and species they support, as well as the human communities that depend on them, is the basis for the native Hawaiian concept of "*ahupua'a*". However, this concept was also extended into a management approach which demonstrates all the basic elements of the ecosystem approach, as described in the case study below.

CASE STUDY: Ahupua'a in Hawaii as an expression of the ecosystem approach

In ancient Hawaii, *ahupua'a* were sections of land that extended from the mountain summits down through fertile valleys to the outer edge of the reef and into the deep sea. The *konohiki*, or caretakers, managed the land and consulted with *kahuna*, who were experts in different specialties. Within the ahupua'a, a wise conservation system was practised to prevent exploitation of the land and sea while allowing the people to use what they needed for sustenance.

Ahupua'a contained nearly everything Hawaiians required for survival. Fresh water was managed carefully for drinking, bathing, and irrigation of wetland taro. Wild and cultivated plants provided

food, clothing, shelter, household goods, canoes, weapons and countless other products. Land and sea creatures offered food, bones, teeth, skin and feathers for tools, crafts and ornamentation.

The ancient *ahupua'a*, the basic self-sustaining unit, extended elements of Hawaiian spirituality into the natural landscape. Amid a belief system that emphasised the interrelationship of elements and beings, the *ahupua'a* contained those interrelationships in the activities of daily and seasonal life.

Figure 1: Depiction of *ahupua'a* as a watershed management unit (HawaiiHistory.com)

Adapted from www.hawaiihistory.com

As noted by Ruddle and Hickey (2008), and demonstrated in the Hawaiian *ahupua'a* concept, the basic ideas contained in the ecosystem approach are inherent in most traditional systems of management that acknowledge ecological relationships. In the Pacific, these include not only *ahupua'a*, but also the Yap *tabinau*, the Fijian *vanua*, the Marovo (Solomon Islands) *puava* and the Cook Islands *tapere*. Each of them are management units that run from the mountaintop to the sea, and take into account connections between ecosystems, species and their human inhabitants.

In Japan, the concept and practice of *satoumi* provides yet another expression of the ecosystem approach that has its roots in traditional ecological knowledge. Like the previous approaches, *satoumi* is centered on providing benefits to both people and biodiversity. In Japanese, "Sato" means the area where people live, while "Umi" means the sea. When *satoumi* is restored in coastal waters, marine productivity and biodiversity are enhanced through the involvement of, and in harmony with, people (Yanagi, 2008). Achievement of satoumi relies on a long cultural heritage of fisheries knowledge and management, and an understanding of the interactions within and between ecosystems and human communities in the coastal zone. The figure describing *satoumi* is very similar to that depicting the Hawaiian *ahupua'a* above. The only difference is that Japan's coastline is highly developed with a large amount of urban area.

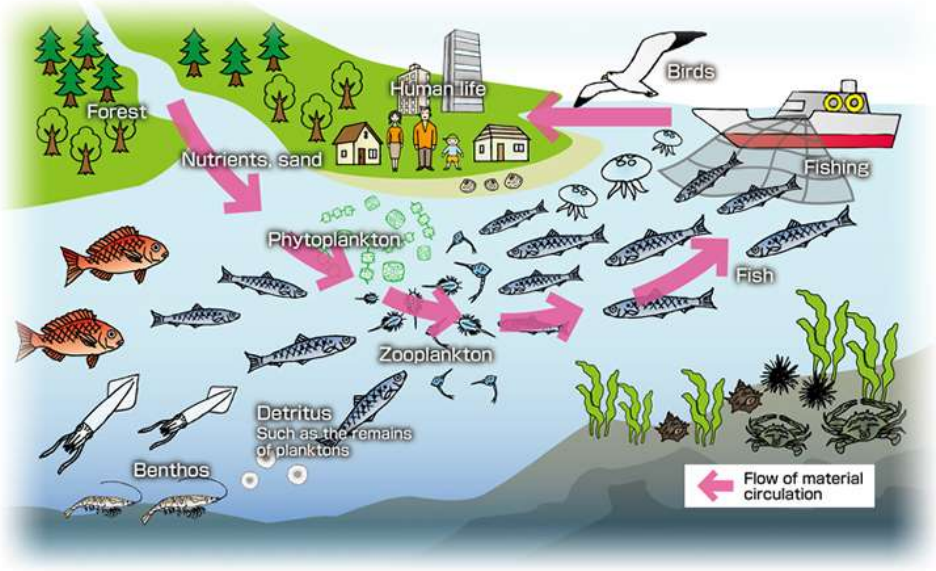


Figure 2: Depiction of *satoumi*, including connections between land and sea (Ministry of Environment, Japan).

Unlike many other management practices based on traditional cultural heritage, *satoumi* been incorporated into Japanese national policies, including the Strategy for an Environmental Nation in the 21st Century (2007), the Third National Biodiversity Strategy of Japan (2007), and the Basic Plan on Ocean Policy (2008). The concept is being put into practice through a program of the Japanese Ministry of Environment, which supports the efforts of local governments, residents, non-profit organizations and universities to undertake diverse activities that include planting eelgrass to restore coastal ecosystems, re-planting of forest in watershed areas, sustainable cultivation of oysters, public education, and working with fishing communities to revive traditional fishing methods. The Japanese experience provides an example of how traditional knowledge can be combined with science for modern day practice in sustainable use.

The holistic worldview encompassing the environment, species and people and their interactions discussed above underlie most of the systems and tools for marine management described in the next sections. These systems of management were not compartmentalized (as is done in this study), but the knowledge, beliefs and practices that contributed to resource management pervaded all facets of life, including arts, cultural and social systems, where all things and events were inherently connected (Hickey, 2006).

C. Traditional area-based management

1. Marine tenure

In a similar way in which the land and sea in many Pacific island countries are divided into management units such as *ahupua'a*, *vanua* and *tapere*, marine tenure is commonly implemented. Customary marine tenure systems have been documented throughout the world (Hviding 1996), but have reached the highest level of development in the Western Pacific (Ruddle and Akimichi, 1984), including Japan (Ruddle, 1985), Melanesia (Hickey and Johannes, 2002), Polynesia (Hoffman, 2002), Micronesia (Johannes, 1981), Indonesia (Harkes and Novaczek, 2002) and Australia (Johannes and McFarlane, 1948). Customary tenure systems range from relatively simple communally-owned marine areas, from which outsiders are excluded, to complex and overlapping systems of individual and family rights to space, species, gear and even specific techniques to using gear (Cinner, 2005). This has an important consequence in that each area of the coast has customary owners, with associated rights that limit entry

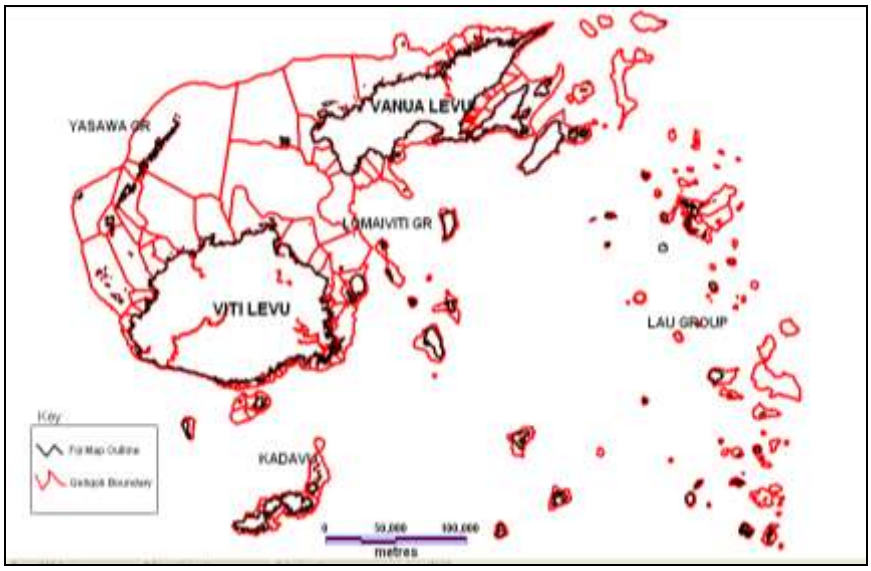
and resource use by outsiders. Thus, unlike in fisheries in northern countries and in the majority of the ocean, areas of coast in countries with customary marine tenure are not open access, but are strictly regulated (Ruddle and Hickey, 2008). Customary marine tenure also provides the legal and cultural foundation for many traditional marine management practices in the Pacific (Cinner, 2005).

In some countries, customary tenure systems are recognised in national law, while in others their recognition is informal (Cinner, 2005; Vierros et al, 2010). Perhaps one of the most highly developed legal systems for recognizing customary marine tenure can be found in Fiji, as described in the case study below.

CASE STUDY: Customary marine tenure in Fiji

In Fiji, coastal areas belonging to certain community or clan are called *qoliqoli* (pronounced "ng-go-li, ng-go-li"). Qoliqoli are traditionally owned fishing grounds that are passed down from generation to generation. Fiji is one of the few countries that has demarcated boundaries of *qoliqoli* and recognized their traditional ownership in national law. The demarcation process took approximately 20 years (from 1974 to 1994) and has been applied to the customary fishing areas, which are generally inshore (from the high-water mark to the reef edges). The present-day qoliqoli can range from 0.5 kilometres to more than 10 kilometres out to sea from the high-water mark. Beyond the qoliqoli boundaries are Fiji's archipelagic waters, over which the government exercises its sovereignty.

Every indigenous Fijian must be registered to a clan to have the right to fish in a qoliqoli. As a token of respect, permission from the chief must be sought to fish in another qoliqoli area, even if the individual has an ancestral connection to that area.



Map of qoliqoli boundaries in Fiji (in red). Source: Fiji LMMA Network Database, 2008 supplied by Alifereti Tawake

Written by Alifereti Tawake, adapted from Vierros et al, 2010.

2. The nature of traditional area-based management systems

Customary practices in Pacific Island communities have long been used in accordance with traditional spiritual beliefs, and established by traditional leaders to allow depleted marine resources to recover. These practices, which are rooted in customary marine tenure, include seasonal bans on harvesting, temporary closed (no-take) areas, and restrictions on time, places and species or taking by certain classes of persons. Closed areas include the tabu areas of Fiji, Vanuatu and Kiribati, the ra'ui in Cook Islands, the masalai in Papua New Guinea, and the bul in Palau. In Palau, the bul can be put in place to close an area of reef to harvesting on a short-term basis, for example, during periods of fish spawning (Vierros et al, 2010). A case study from New Zealand, below, discusses the system of *rāhui* used by Māori.

CASE STUDY: Use of *rāhui* as a tool for area-based management

In Māori culture, a *rāhui* is a form of tapu restricting access to, or use of, an area or resource by unauthorised persons. *Rāhui* may be imposed for many reasons, including a perceived need for conservation of food resources or because the area concerned is in a state of 'tapu', due, for example, to a recent death in the area, out of respect for the dead and to prevent the gathering of food there for a specified period. *Rāhui* may be placed on land, sea, rivers, forests, gardens, fishing grounds, and other food resources. A *rāhui* is given its authority by the mana of the person or group that imposes it (Barlow, 1994).

The customary practice of *rāhui* is still used today, and public compliance is generally on a voluntary basis. This practice can be enforced through the legal system, although the term "*rāhui*" is not stipulated in law. Under fisheries legislation, and subject to the approval of the Minister for Primary Industries or the Chief Executive of Ministry of Agriculture and Forestry, Māori can temporarily place a partial or complete ban on the take of species in an area or temporarily restrict or prohibit fishing methods in an area. These practices can be put in place to replenish species or provide for the exercise of Māori non-commercial fishing rights.

This sign indicates a modern form of *rāhui* (ban). The taking of pipi and cockles is prohibited in the area. The ban is the result of a partnership between the Ministry of Fisheries and the Hauraki Māori Trust Board. (Source: Te Ara Encyclopedia of New Zealand. Photograph by Simon Nathan).

Vanuatu also has networks of spatial-temporal refugia created as part of a range of customary practices depending on the cultural group, such as the ordination or death of a traditional leader, death of any clan member, grade-taking rituals, and as part of agricultural and ritualised exchange cycles (Hickey 2006, Hickey 2007). These area closures may be off-limits to fishing for as long as seven years. The trend of protecting commercially-harvested resources through the use of taboos has continued into the present, as many resources are targeted for commercial purposes and for export to urban centres and overseas. Contemporary village-based management prohibitions continue to be locally monitored and enforced by village leaders, where a village court, though not legally recognized, continues to effectively adjudicate on most offenses occurring in rural areas, as it has for centuries (Hickey, 2006).

While the Pacific islanders have a long tradition in using area closures to achieve fisheries benefits, the practice has also been employed elsewhere in the world. For example, in Northern Tanzania's Tanga region, fishing villages have grouped together to establish collaborative fisheries management plans with support of the local government authorities. In each fishery management area, a few reefs have been closed to fishing by the villagers themselves. Initially this was for a period of just a few years, but the participatory monitoring program that has been carried out, involving fishers themselves, has shown that reef health and fish abundance have increased. This has led to the villagers extending the time period of

fisheries closures (Salm, Clark and Siirila, 2000). In Panama, the indigenous Kuna have incorporated their traditional holistic worldview into the establishment and management of a protected area, which was later recognized by the government. This case study, below, demonstrates not only the adaptability of traditional knowledge into contemporary circumstances, but also shows that a protected area can be a flexible tool that can be applied consistently with indigenous worldviews and traditional practices.

CASE STUDY: *Comarca de la Biosfera* of Gunayala, Panamá, a protected area for the present and future generations: a Guna vision for sustainability and integral development.

The indigenous population of *guna* in the Comarca of Gunayala in Panamá has its own holistic worldview of nature and environment, which has served as a basis for developing a protected area on their territory. The *Comarca* or territory of *guna* has a legally established autonomous administration, recognized by the government of Panamá.

In 1983 the *guna* community initiated a planning process, led by the Kuna Workers Union (later know as Kuna Ecological Association - AEK) and the Research Project for the Management Wildlife Areas of Kuna Yala (PEMASKY), which resulted in the General Management and Development Plan for the Comarca Gunayala. The goal in this plan was to declare the entire region as a "Comarca de la Biosfera". The document was endorsed and approved by the Guna General Congress in 1987, declaring Narganá as a "Comarca de la Biosfera" (including land and sea), managed by the *guna* people. The concept of "Comarca de la Biosfera" is closely related to the worldview of the *guna* indigenous peoples, where nature is seen as a unity and part of humans, rather than viewed as separate. Hence the protection of nature according to the *guna* vision means the defense of "our Mother".

Seven years later the national government recognized only the terrestrial area (not the marine area), and declared it a protected area within the category of "Wildlife Area in the Corregimiento de Narganá". The area covered was 99,414.78 hectares, accounting for almost one third (31%) of the total area of the continental *Comarca*, and excluding the coastal marine cultural area. With the declaration of this protected area, the national government had to create and recognize a new management category- "Wildlife Area in an Indigenous Reserve or Comarca"- recognizing the rights of the *guna* population and respecting their right to decide over their own destiny.

The Protected Area of Narganá declaration respected the traditional productive activities of the communities which remained unchanged - the *nainu* agroforestry systems kept being practiced, hunting activities were not prohibited, the access to marine resources was not denied and the community organization kept going forwards according to the principles of *duiggwanegsed – together we govern our own destiny*. However, there was also opposition to the declaration of the protected area. This as a consequence of the doubts and negative images of protected areas created by the government, which have been established without previous consultation and without respecting indigenous rights.

More recently, a process to approve a marine protected area in Narganá- involving six communities Wargandup, Yandup, Akuanusadup, Diguir, Niadup y Maguebgandi – has been put in place. This area would be a multiple use marine protected area with its own regulations to be applied by resource users and with appropriate mechanisms for the direct participation of communities, including leaders, fishermen and other community members, and with support of interested institutions.

Sources: Castillo, 2003 and 2010; Castillo and Gilberto, 2002; Plan Ambiental Marino-Costero (2004-2009); Biosfera de la Comarca Kuna Yala. Plan General de Manejo y Desarrollo (Resumen Ejecutivo: documento de trabajo) (1995).

Case study provided by the International Collective in Support of Fishworkers

3. The role of sacred natural sites and in management and protection of the marine and coastal environment

Sacred natural sites are areas of land or water having special spiritual significance to people and communities. Natural areas that are held to be sacred by peoples are found all around the world, and exist in almost every country. There are considered to be many thousands of distinct belief systems in the world, and many have ethics related to conservation. Sites can be sacred in accordance to many traditions or belief systems, including indigenous, local or mainstream. Identification and protection of sacred natural sites is an important form of culture-based conservation. In addition to their cultural values, these sites often harbour valuable biodiversity and key ecosystems, and are thus of high importance for conservation of biodiversity (Wild and McLeod, 2008).

While most sacred sites are on land, some encompass coastal and marine area. One example of a sacred site encompassing coastal and marine area is Dhimurru Indigenous Protected Area (IPA) in northeast Arnhem Land, Australia. Located on aboriginal land, this site, like many sacred sites, is part of a rich cultural tradition intertwining with the land and the sea. Yolngu people have a cultural responsibility to manage the land in accordance with spiritual obligations of their ancestors. Yolngu values encompass a cultural connection to the land which is a sacred one and is secured through a relationship between *rom* (law/protocol), *manikay* (song/ceremony) and *Miny'tji* (art). Natural and cultural values within Dhimurru IPA are managed from within the cultural worldview of the Yolngu people and are therefore never treated separated. The area is characterized by rich coastal biodiversity, including marine turtles and dugongs, which are of cultural importance to Yolngu, and which are part of a management programme within the IPA (Wild and McLeod, 2008).

Despite the legal recognition of Yolngu peoples' land rights, Yolngu people today still struggle for other people to recognize these rights. This is likely not an unusual predicament for a sacred site, particularly from people not familiar with the specific traditions of the resource owners. To halt illegal access to land and potential damage to sacred sites, Dhimurru manages a permit system that is at the forefront of this fight. Dhimurru also has signage with cultural interpretation explaining the cultural and spiritual values of the sacred site as well as its importance to the land rights movement. The signage is a good example of the Dhimurru strategy of promoting reconciliation and cultural understanding through the interpretation of Yolngu beliefs and values to visitors (Wild and McLeod, 2008).

More modern religious beliefs can also provide an impetus for conservation and sustainable use of biodiversity. The case study below, from Zanzibar, provides the example of what is thought to be the first Islamic marine conservation initiative.

CASE STUDY: Misali Island, Zanzibar, recognized as a Sacred Gift to a Living Planet

Misali Island is a small coral island located off the west coast of Pemba Island in Zanzibar, Tanzania. Local fishermen harvest the rich fishing grounds around Misali Island and use it as a temporary fishing camp. In the early 1990s, the fishermen faced two main threats to their livelihoods. The first was the planned leasing of the island to a European tourism operator, which would have prevented the fishermen from using it as a camp and would have curtailed their fishing activities. The second was the increasing use of destructive fishing practices by some fishermen.

In response to the tourist threat, the fishermen collaborated with conservationists to challenge the government's decision to concession the island as a tourist resort. After considerable lobbying, the concession was reversed and a proposal was then developed for a co-management area run by the fishermen, which was finally declared the Misali Island Marine Conservation Area in 1998.

The challenge of destructive fishing practices still remained. It was during the campaign against these practices that Misali Island's sacred values emerged. It is considered a holy island in local Islamic

belief, as a result of a traditional story about the visit of the Prophet Hadhara to the island and his praying directly on the island. Building on this local tradition and the fact that most Misali fishermen are Muslim, a programme was developed to work with mosque Imams to bring out the strong environmental teachings of Islam in support of fisheries co-management and sustainable tourism at Misali. Named the "Misali Ethics Programme", the programme organized a workshop to discuss the teachings of the Qur'an and its guidance on the use of the environment. As a result, it was proposed that the management of the Misali Island Marine Conservation Area should be based on the ethical principles laid down by Islam. The programme worked with villages, mosque leaders and Madrassa schools and developed training materials for Imams. Early on, both the government and Mufti of Zanzibar supported the project and in 2000 the government offered the example of the Misali Ethics Programme as a "Sacred Gift for a Living Planet".

The programme has worked well, with fishermen practising some specific conservation measures, and with lessons learned having spread to other villages, with wider relevance to Islamic communities elsewhere.

Adapted from Wild and McLeod, 2008.

D. Other methods for traditional regulation of fishing and resource extraction

Fishing is an important indigenous cultural practice. Fish, turtles and marine invertebrates are used for food, cultural reasons and for economic development. It should be noted that tropical small-scale fisheries differ from industrial fisheries in many ways, including, importantly, in that they are not open access, as demonstrated in the discussion on customary marine tenure in section c above. In areas with customary marine tenure, traditional fisheries management was based to a large degree on such qualitative controls as limited access, closed seasons, areas and species, and a range of behavioural prohibitions which limited fishing pressure (Ruddle and Hickey, 2008, Johannes 1978, 1982).

Fishing communities are often isolated in remote rural regions, with numerous villages and landing sites and complex distribution channels, making these fisheries difficult to manage through scientific models that require extensive data collection, including catch and effort. Also, commonly, a real limitation is set on fishing activities because craft are small and often un-motorized, fish cannot be kept fresh for long, and neighbouring areas may be off-limits due to exclusive rights systems. Thus, opportunities for increased catches are limited (Ruddle and Hickey, 2008).

Tropical nearshore fishers may possess a profound local knowledge of their tenured waters that is put to use to increase catches and to manage resources (Johannes, 1981, Ruddle and Hickey, 2008). For example, in Australia, aboriginal tradition recognizes the need to protect and maintain fish stocks, and fish and fishing are important components of many cultural, ceremonial and social events, communal sharing, as well as tools for teaching and practicing traditional ways. Customary fishing rules, such as fishing seasons, continue to exist in many parts of Australia.

A number of traditional fisheries management methods exist around the world. Closure of areas from fishing, either temporarily or permanently (the marine managed area or marine protected area approach) is one effective tool for fisheries management, and is described in the section above. Other methods include restrictions on types of gear used, limiting harvesting to certain people, targeting only certain species, and temporal bans on harvesting. Tribes of the Pacific Northwest of North America maintained a diversity of access control mechanisms, rules for proper harvesting behaviour, and rituals to regulate resource use, for example in the opening dates of the salmon fishing season (Williams and Hunn, 1982). In Fiji, when the traditional Fijian beach trumpet tree (*Cordia subcordata*) turns yellow, this indicates octopus mating and spawning season, at which time a temporary ban on catching octopus is put in place (Vierros et al, 2010). In the Maluku Islands of Indonesia, entry, harvest or hunting in community-

controlled areas are regulated through the practice of *sasi*, a long-standing social institution for restricting access to certain resources. In Vanuatu, communities specify tabus on particular resources under threat or fishing gear deemed destructive. Examples of this include harvesting bans placed on commercial species such as trochus and bêche-de-mer (sea cucumber) and restrictions on the use of gill nets and night-time spearfishing (Hickey & Johannes 2002; Johannes & Hickey 2004). The case study below describes traditional fisheries management in Indonesia.

CASE STUDY: Customary arrangements and traditional knowledge in Indonesian fisheries

Fishing communities in Indonesia have, over generations, developed their own rules and regulations, as well as customary institutions, for regulating resource use. For example, in Kakorotan, an island located in the northern part of North Sulawesi Province within the Bunaken National Park, communities have been regulating fishing activities through the practice of *Eha* and *Mane'e* for several centuries. The word *Eha* comes from 'e' (warning) and 'ha' (no), implying prohibitions on fishing during certain periods. According to the *Eha* system, all natural resources on land and sea are prohibited from being used irresponsibly. There are regulations on use of specific resources at specific places, and all regulations are controlled by '*Mangangeha*,' a sub-institution within the Kakorotan customary institution. The word *Mane'e* comes from '*se'e*' or '*sasahara*' (agree)—it means all people agree to do something. In this traditional way of fishing, there are a number of regulations that are part of the *Mane'e* ritual, such as the type of fishing gear, the time to start the ritual, a distribution system for fish that is caught, and so on. Similarly, fishers on Kaledupa island, within the Wakatobi National Park, have been, for generations, establishing protected areas, individually or communally. Thus, community protected areas, such as Tuba Dikatutuang, can be found. (The term is from the Bajau language and means a common protection area.) There are several other such traditional systems that provide for rotational fishing, area-based and gear-based regulations, and restrictions on the use of destructive gear.

Source: International Collective in Support of Fishworkers (ICSF), 2010.

In New Zealand, coastal areas are significant to Maori both spiritually and as a source of food, weaving and carving materials. Coastal resources continue to provide sustenance and identity to coastal Maori. Rare weaving materials, such as pingao, grow on coastal dunes. Harbours and estuaries are important breeding, nursery and feeding grounds for fish and birds such as *patiki* (flounder), *matamata* (whitebait) and *kuaka* (godwits). Maori regard the coastal environment as 'baskets of food' providing *kaimoana* for the coastal community. As a food source, the coast needs to be treated with respect. For example, it is inappropriate to discharge waste into coastal areas (Te Ara Encyclopedia of New Zealand. http://www.teara.govt.nz/).

Monitoring of the status of a resource is a common practice amongst many groups of traditional resources users. The proximity and regular contact that the resource user has with the resource brings with it an ability to observe day-to-day changes, not only in the targets species, but in the ecosystem. For example, Icelandic fisheries spend a great deal of time communicating about fish distributions and abundance, and coastal communities in Maine monitor clam populations to help determine areas requiring enhancement (Berkes et al, 2000). Information from monitoring not only provides a basis for management activities (and for adjusting those activities as conditions change), but has also recently provided a basis for observing the effects of climate change locally. Thus, many traditional and small-scale fisheries incorporate both monitoring and adaptive management.

Traditional fisheries that have been controlled by local communities with hereditary rights can also promote equitable resource sharing. According to regulations adopted by the fishing communities in the Negombo estuary of Sri lanka, use-rights in the fishery are granted to descendants of certain fishing families. Among the stake-seine fishers who are organized into four rural societies, an effective

mechanism has been evolved for resource sharing in the fishery over a period of several hundred years. Sustainability of this traditional practice is due to the significant returns from the fishery, which have likely led to the fact that resource sharing practices have been formalized and are capable of continuing (Amarsinghe et al, 1997). A similar practice is found in Tamil Nadu (India) where it is called "*Paadu*" or "Rotation" system. In Pichavaram, it is locally called "*Vunuvalai kattu*" or regulation of stake-nets and is followed to regulate mangrove fishery (Subramanian, undated).

While many traditional fisheries and resource management systems are hierarchical, with management decisions taken by chiefs and/or village elders, there are also other models for traditional management. For example, in Japan, the female *Ama* divers practice a collaborative and matriarchal form of decision-making about resource harvesting, as described in the case study below.

CASE STUDY: The female *Ama* divers on Hegura Island, Japan

Female divers in Hegura island, Japan, are called the *ama*, or "sea-women". They have for over 1000 years made a livelihood of diving to collect shellfish, mainly abalone. Long, daily immersions in the ocean for generations have, over time, built coastal communities in which a uniquely intimate relationship with the sea provides the basis for sustainable resource use. Women-led hereditary collectivism regulates the use of the commonly owned coastal resources, including the introduction of new technology. Combining tradition and modernity, the *ama*, as many other coastal communities in Japan, reconcile conservation and sustainable use of marine resources as part of the practice of *satoumi*.

For the *ama* divers of Hegura Island, maintaining ecosystem health is at the basis of their management decisions, ultimately focusing on ensuring sustainability and conserving biodiversity for the wellbeing of their own community. All decisions about harvesting activities are discussed—sometimes heatedly debated—but ultimately decided by the collective whole. Harvesting seasons, harvesting grounds, allowable size of harvested species, and community-implemented no-take zones are decided collectively and regulated by the *ama* community association. Daily harvest time regulations for each species are also discussed and decided. In 2007, growing concern about decreasing stocks of abalone and turban shell, despite the implementation of no-take zones and regeneration efforts, led to discussions about regulating harvesting activities by imposing limits on harvesting times.

Debates on the ecosystem trade-offs of technological adoption have been central in decisions regarding natural resource management. Starting with the introduction of goggles in the 1800s, followed by wetsuits and flippers, concern over the potential risks of technology on availability of resources resulted in conditional and gradual adoption. More recently, the use of oxygen tanks was debated and finally banned. The ban likely resulted from the *ama's* recognition of their inability to ultimately control the technology they adopt. Or perhaps, as some of the elders interviewed commented, oxygen tanks would end their existence as free divers, as natural lung capacity and instinct are what defines their very identity and existence.

What is unique about the Hegura Island *ama* divers, and other female *ama* diver communities in Japan, is the matriarchal foundations of their fishing rights. Since target species, harvesting grounds and seasons are collectively shared, income disparities amongst *ama* divers are driven by individual diving skill, and women are the primary wage earners of the household.

Written by Raquel Moreno-Penaranda

This discussion has shown that small-scale fishing communities around the world, whether indigenous or not, are a diverse group. Small-scale fishermen are not uniformly poor, without skills or education or low in status, but rather vary amongst themselves and in relation with other groups in society. While some are poor, others are not. Some fishing communities employ diverse livelihood strategies, which include opportunities for temporary or part-time employment in other sectors of the economy. For some families this type of diversification provides flexibility and reduces their vulnerability to fluctuations in fishing

income (Coulthard et al, 2011). These dimensions of heterogeneity are important in how different fishers respond to management and policy regimes. At the same time, fishers can be strong advocates for responsible resource use when their economic and socio-cultural needs are taken into account, and their local/traditional knowledge can lead to new and innovative systems of governance, as described in the case study from Costa Rica, below.

CASE STUDY: A process of integral conservation and responsible use of the ocean by artisanal fishers in Costa Rica

The Marine Area for Responsible Artisanal Fishing of Tárcoles is an example from Costa Rica of how local artisanal fisherfolk´s knowledge and efforts, through the fisherfolk cooperative CoopeTárcoles R.L., has promoted the management and responsible use of the fishery resources, and a transformation of marine resources and protected areas governance in the country. The Marine Area for Responsible Artisanal Fishing implements measures for ensuring the sustainability of the local fishery and secures the artisanal fisherfolk´s rights of access to resources, their food security, participation in decision-making, while also promoting equity and protecting their cultural identity. In addition, the Marine Area for Responsible Fishing of Tárcoles has undertaken a process of community development, promoting the culture, knowledge and way of life of artisanal fishers; strengthening the involvement of children, women and youth in marine conservation and responsible use of resources; strengthening the self-esteem of fish-workers, including not only fishers, but all the others involved in the productive chain of the fishing activity such as mollusk collectors and *lujadoras* (men and women who work untangling the fishing lines and nets).

Local knowledge has been key not only as a tool for local conservation but also for equalizing power in the use and management of the sea and its resources, as well as promoting a model of community governance and locally-based decision making and management. Three elements are important to mention: (a) a participatory mapping process has allowed the geographic recording of the use of fishery resources, fishing effort, and the demarcation of important ecological zones; (b) a fisheries data-base that the local fisherfolk organization has developed to track their fishing efforts and record changes in the fishery has facilitated decision-making, and (c) a Code for Responsible Fishing adopted by CoopeTárcoles R.L. and adapted to the local context has promoted the responsible use of resources. Moreover, the initiative of the Community-based Marine Area of Responsible Fishing of Tárcoles has triggered processes of community development and empowerment that promotes the artisanal fisher culture and way of life as a tool for the responsible use and conservation of the sea.

Source: CoopeSolidar R.L. and CoopeTárcoles R.L

Case study provided by the International Collective in Support of Fishworkers

E. Traditional knowledge in increasing community resilience to the impacts of climate change

The impacts of climate change on indigenous and local communities are significant. Many coastal communities, particularly those residing on small islands and in low-lying areas, live in marginal ecosystems threatened by sea-level rise, more frequent storms and associated higher waves, ocean warming and acidification. Because of their high dependence on the natural resources, and the vulnerability of many coastal ecosystems to climate change, the maintenance of resilient social, ecological and cultural systems in these areas is key for adaptation.

Importantly, the traditional ecological knowledge of indigenous peoples is proving to be a critically valuable service to the global community. Observations of ecosystem change by indigenous peoples are acting as a sentinel-like warning system for climate change. More importantly, the long-term place-based

adaptation approaches developed by indigenous peoples provide valuable examples for the global community of low-carbon sustainable lifestyle, critical to developing local adaptations strategies in the face of climate instability.

Indigenous observations on climate change and its impacts are now being documented, and these observations are, in many cases, proving to be extremely powerful as local verification of global models or assessments, including through historical information. This was the case with the Arctic Climate Impact Assessment discussed in the section on traditional ecological knowledge. The case study below discusses two additional examples of such documentation that has been undertaken in the Arctic.

CASE STUDY: Climate change observations by indigenous communities in the Arctic

The Sila-Inuk project is a study of the impacts of climate change in Greenland. The project is undertaken by Inuit Circumpolar Conference, ICC-Greenland and Kalaallit Nunaanni Aalisartut Piniartullu Kattuffiat, The Association of Fishermen and Hunters in Greenland, KNAPK. In 2006, field interviews were conducted from Arsuk to Aappilattoq in South Greenland. Thirteen settlements were visited and 33 persons, hunters, fishermen, sheep farmers and others, men and women, old and young who have been observing the weather were interviewed. Preliminary observation on changes in weather, the environment and species are available. The plan for the project is to get to most areas of Greenland and to circulate the collected information to the interested parties as well as to a larger audience.

Adapted from http://www.inuit.org/index.asp?lang=eng&num=261

In a book called *Voices from the Bay*, the Canadian Arctic Resources Committee and the Nunavut municipality of Sanikilua, a small Inuit community on the Belcher Islands in Hudson Bay, published a verified collection of ecological change observations, including those related to climate change. The study covered the large bioregion along the shores of the James and Hudson bays. Inuit and Cree hunters and elders from over 28 communities provided the observations in a series of workshops. Published in 1997, this book is an early and comprehensive study of traditional ecological knowledge in the Arctic.

Adapted from http://www.carc.org/voices_from_the_bay.php

Observations of indigenous and local communities about climate change and its impacts can also become the basis for developing local adaptation strategies. Often such adaptation strategies have long been practised as a response to cyclones, drought and other environmental disasters that may wipe out the food supplies of a village. In Vanuatu, for example, villagers might prepare special "famine foods" that were long lasting and were stored for use in a time of need. Methods for overcoming food shortages included storing fermented fruits and utilizing alternative foods not normally eaten. Another strategy was to create "giant clam gardens", with fishers gathering giant clams into discrete areas on reef flats for their exclusive use in times of need. This also served to increase reproductive success by maintaining a close proximity of a breeding population dependent on external fertilization (Hickey, 2006). Clam gardens were also commonly cultivated by Northwest Coast peoples in Alaska, British Columbia and Washington State, whose use of mariculture greatly increased food security and augmented food from fishing and hunting (Williams, 2006).

In many villages in Vanuatu, family units build a sturdy "cyclone house" further inland, where they retreat to weather a serious storm. Such strategies are a common way of distributing environmental risk, and they generally include traditional agriculture systems that enhance diversity and prevent erosion, scattering food production sites, and shifting target species and catch amounts in fisheries (Nakashima et al, in press).

Traditional knowledge of climate, weather and environment, as well as traditional methods and indicators for forecasting weather, have been widely documented. The resulting historical record of climate observation can be used together with science to develop an improved understanding of climate, changes in climate, forecasting and climate models. Traditional indicators are generally most accurate locally, and can contribute to developing local climate change coping strategies. For example, in Samoa, a study of weather and climate knowledge served as a first source for historical and baseline data, provided initial insights into how indigenous communities in Samoa can formulate adaptation and response strategies, and recognized the need for continued documenting of local indigenous knowledge (Lefale, 2003). A similar study in Australia has made available on the Internet seasonal weather calendars, developed over thousands of years by indigenous communities. The project is a joint effort involving indigenous communities, Aboriginal and Torres Strait Islander Commission (ATSIC), the Bureau of Meteorology, and Monash University's Centre for Australian Indigenous Studies (CAIS) and School of Geography and Environmental Science (see http://www.bom.gov.au/iwk/about/index.shtml).

A study by the New Zealand National Institute of Water & Atmospheric Research (NIWA) Māori Research and Development Unit has recently completed a pilot programme to examine Māori environmental knowledge of weather and climate. Through participatory based interviews and workshops, representatives from the tribal groups Ngāti Pare (Coromandel) and Te Whānau a Apanui (Eastern Bay of Plenty), demonstrated an intimate understanding of weather and climate in their respective localities. Analysis of the key themes from these exchanges revealed three principal strands of weather and climate knowledge. These include: (i) The naming and classification of local weather and climate phenomena; (ii) The oral recording of weather and climate based events and trends; and (iii) The use of environmental indicators to forecast and predict weather and climate[3]. An important component of this project was the development of a matrix linking indicators of change with expected outcomes, as seen in figure 5. This knowledge was used in making decisions about the timing, safety and viability of various activities, and can contribute to increasing community resilience to climate change.

Name	Indicator	Expected outcome	Iwi / Region
Kākā (Native parrot)	Kākā begin acting up, twisting and squawking above the forest	A storm is on its way	Ngāti Pare
Koekoeā (Long-tailed cuckoo)	The koekoeā returns	Improved weather is on the way	Ngāti Pare
Moehau (Mt Moehau)	The shapes and colours of clouds above and below Moehau	Rainfall, winds (calm periods, squalls) and snow	Ngāti Pare
Ngā ngaru (Waves)	The sound of waves hitting local rocks	Rough or calm weather conditions are expected	Te Whānau a Apanui
Pareārau (Jupiter)	The shimmer of Pareārau is light and misty	A wet month follows	Te Whānau a Apanui
Pīpīwharauroa (Shining cuckoo)	The return of pīpīwharauroa	The beginning of warmer weather	Ngāti Pare
Pōānganga (Clematis)	Periodic blooming	A warm season lies ahead with gentle breezes	Te Whānau a Apanui
Ruru (Morepork)	The shrill cries of more than one ruru can be heard at night	Rainfall is approaching	Ngāti Pare
Tihirau (Mt Tihirau)	The clouds in the sky above Tihirau	Approaching rainfall or storm	Te Whānau a Apanui
Whakaari (White Island)	1. The plume lies to the left 2. The plume is stretched intact across the horizon	1. Rainfall expected 2. Fair weather is expected	Te Whānau a Apanui

Figure: Matrix linking traditional Maori indicators and expected outcomes.

[3] http://www.niwa.co.nz/our-science/climate/information-and-resources/maori/knowledge

While observations are important, they are most powerful when connected to potential response strategies. The Arctic Climate Impact Assessment (ACIA) contains a table (adapted from Nickels et al., 2002) describing indigenous responses to climate change in the Inuvialuit Settlement Region of Canada's Northwest Territories. This table, available in the figure below, illustrates a systematic way of linking observations with effects and response/adaptation strategies.

Observation	Effect	Response/adaptation
Erosion of the shoreline	Relocation of homes and possibly community considered	Stone breakwalls and gravel have been placed on the shoreline to alleviate erosion from wave action
Warmer temperatures in summer	Not able to store country food properly and thus not able to store it for use in winter	Community members travel back to communities more often in summer to store country food. This is expensive as it requires more fuel and time
Warmer temperatures in summer	Can no longer prepare dried/smoked fish in the same way, it gets cooked in the heat	People are building thicker roofs on the smoke houses to keep some heat out, tarpaulins and other materials are used to shelter country foods from heat
Lower water levels and some brooks drying up	Not as many good natural sources of drinking water available	Bottled water now taken on trips
Changing water levels and the formation of shifting sand bars	More difficult to plan travel in certain areas	Community members are finding new (usually longer and therefore more costly) routes to their usual camps and hunting grounds or are flying, incurring still greater expense
Warmer weather in winter	Animal fur is shorter and not as thick, changing the quality of the fur/skin used in making clothing, decreasing the money received when sold	Some people do not bother to hunt/trap, while others buy skins from the store that are not locally trapped, are usually not as good quality, and are expensive
Water warmer at surface	Kills fish in nets	Nets are checked and emptied more frequently so that fish caught in nets do not perish in the warm surface water and spoil
More mosquitoes and other biting insects	Getting bitten more	Use insect repellent lotion or spray as well as netting and screens for windows and entrances to houses
Changing animal travel/migration routes	Makes hunting more expensive, requires more fuel, gear, and time – high costs mean some residents (particularly elders) cannot afford to go hunting	Initiation of a community program for elders, through which younger hunters can provide meat to elders who are unable to travel or hunt for themselves

Figure: Indigenous responses to climate change in the Inuvialuit Settlement Region of Canada's Northwest Territories (adapted by the ACIA from Nickels et al., 2002).

These case studies demonstrate that indigenous peoples and local communities are powerful knowledge holders on climate change and key actors for developing policy to mitigate and cope with its effects. The value traditional knowledge and practices as they relate to observations and strategies for adaptation and mitigation is increasingly being recognized by the international scientific community and incorporated into assessments, including, increasingly, by the Intergovernmental Panel on Climate Change (IPCC), which fifth assessment report is endeavouring to include more information originating form indigenous and local communities.

F. Indigenous and local communities, their knowledge, and the management of offshore (deep and open ocean) areas

While the traditional management strategies described in previous sections are generally applied in shallow coastal and ocean areas, indigenous and local communities often have strong cultural, social, spiritual and economic connections to the deep and open ocean beyond the immediate coastal zone. Nowhere is this perhaps more the case than in the Pacific Ocean, where ocean voyaging is a long tradition, which originally brought settlers to the islands of the area, and where the ocean continues to connect and nourish the peoples and cultures of the islands. This tradition, practiced for thousands of years, is now again being revived (see case study below).

CASE STUDY: Pacific Voyagers

The original voyagers traveling in ocean canoes (*vaka moanas*) set off from Asia, most likely Taiwan, in the hopes of finding other lands. They found New Guinea, the Bismarck Archipelago, and the Solomon Islands first. Thousands of years later, the ancestors continued their journey and within 2500 years they reached the more remote Hawaiian Islands, Rapanui, and Aotearoa, establishing communities at each location with the root crops, fruit seeds, and domestic animals they carried on their voyage. The voyagers used only the sun, the stars, wind, waves, clouds, and wildlife as guides, as they successfully sailed across the Pacific Ocean and settled different lands.

This way of navigating was on the brink of extinction until one individual began to revive the artful skill. Pius Mau Piailug, a Micronesian navigator, afraid of his people losing this skill as a result of westernization, brought his skills to the Polynesian Voyaging Society. He, along with his protégé, Hawaiian Nainoa Thompson, began to revive the skill. In 1976, they successfully sailed the Hokule'a. Today, the revival of this cultural tradition continues. The crews on seven *vaka moanas* learn the skills of sailing and navigation, honing the craft throughout their journey. The website of the Polynesian Voyaging Society states: "We feel honoured to continue in the wake of our ancestors, learning from their ancient wisdom, and venturing forth into the future with a new mission of healing our ocean and a rejuvenated *Te Mana o Te Moana*, the Spirit of the Sea".

Photo of *vaka moanas* by Rui Camilo from Pacific Voyagers (www.pacificvoyagers.org)

Text adapted from www.pacificvoyagers.org

The culture of ocean-going canoes is not restricted to the islands of the Pacific, however, and many coastal indigenous peoples used canoes for fishing, travel and trade. For example, coastal First Nations in British Columbia (Canada) and Washington State (USA), as well as the Ainu in Japan, also traditionally used canoes for travel, including, in some cases, for trade and whaling activities. Some of these canoes were able to travel long distances through rough offshore waters and participated in offshore fisheries.

While there is ample evidence that indigenous peoples, particularly in the Pacific, travelled long distances in oceanic environments, customary marine tenure is generally limited to coastal areas. Some information exists that a tenure system could traditionally extend further offshore. For example, in Fiji, the traditional fishing grounds extended as far offshore as one could go, which could be a considerable distance in a fishing boat. The present day *qoliqoli* can range from 0.5 km to more than 10 km distance out to sea from

the high water mark (Vierros *et al*, 2010). The importance of these tenure systems is in their highly regulated access and extraction of resources, which is in contrast to the Western view of the ocean as open access, and an area where "freedom of the high seas" guides activities. There may well be some merit to considering how the ideas of tenure and the responsibility for stewardship of resources for the benefit of present and future generations could be applied further offshore.

Migratory species, such as cetaceans (whales, dolphins and porpoises), sharks and seabirds have special cultural values for many indigenous peoples. In the Pacific, whales and dolphins are considered sacred. In Polynesian culture, whales and dolphins are thought to possess *mana*, and have supernatural power of influence and ability to carry luck with them[4]. They are associated with identity, lifestyle and well-being. There is considered to be a universal bond between humans and cetaceans in Polynesian culture (Whimp, 2008). Migrations of whales are used as an environmental cue on some islands, and ceremonies and ritual surround cetaceans across the Pacific region. Given these cultural values, the conservation of culturally important migratory species, as well as the ocean ecosystem they depend on, would be of paramount importance for many indigenous peoples of the Pacific.

Traditional and local knowledge of highly migratory species can be particularly valuable in understanding their life histories and migrations, and, as a result, in identifying areas that are of special importance for life history stages of species (CBD EBSA criterion 2) or of importance for threatened, endangered or declining species and/or habitats (CBD EBSA criterion 3). For example, the life history of Beluga whales (*Delphinus leucas*) in Arctic waters has been studied through interviews with traditional hunters. Information collected was not only consistent with published scientific data on the whales, but was able to add valuable and previously unknown detail (Colman, 1997; Theberge and Deardren, 2006, Huntington, 2000). A combination of satellite telemetry data and traditional knowledge of beluga whales in the Chukchi Sea off Alaska was able to reveal connections between distant ecosystems and provide a more complete picture of populations of wild species (Martin, 2007; Huntington, Suydam and Rosenberg, D. 2004), assisting in efforts to understand their movements and provide for conservation needs. Thus, the argument could be made that traditional knowledge has an important role to play in identifying EBSAs, both inshore and offshore.

Traditional knowledge exists in communities around the world about migratory species which are regularly hunted, and/or which have special cultural significance. These species would include, for example, sharks, turtles and whales in places such as the Pacific Islands. This traditional knowledge could prove valuable in better understanding regional-scale patterns of movement, population sizes and other life history traits of the species. The case study below, from Indonesia, illustrates the role that traditional knowledge held by fishers in Timor about whale sharks played in efforts to better understand these species.

CASE STUDY: The role of traditional knowledge in understanding whale shark migrations between Australia and Indonesia

Whale sharks cross international boundaries due to their highly migratory nature. They are listed under Appendix II of CITES, and may thus become threatened if trade in them is not strictly regulated. In Australia, whale sharks are highly valued for ecotourism, and a large tourism industry has been built around them at Ningaloo Reef in Western Australia. However, little is known about the migration of these populations beyond Australian waters, information which is important for improved management and conservation of the species.

A project was undertaken (supported by the Australian government) to investigate the traditional ecological knowledge of whale sharks held by Bajo fishers from Nusa Tenggara Timor, in eastern

[4] www.pacificvoyagers.org

Indonesia, in order to gain information about whale shark ecology, migration, behaviour and population numbers in Indonesia. Bajo fishers are renowned for their intimate relationship with the marine environment. They depend almost exclusively on the exploitation of the marine environment and maritime associated activities for their subsistence needs and economic livelihoods, and for centuries have engaged in various forms of long distance fishing voyages around what is now the Indonesia archipelago, including fishing voyages to north and north-western Australian waters.

Bajo activities are governed by customary law (*Adat*) and specific members of communities are holders and teachers of specialised ritual and maritime knowledge (*ilmu*) passed down through generations. Bajo fishers hold customary beliefs and practices about whale sharks. As a result, Bajo do not hunt whale sharks as it is forbidden by customary law. Traditional ecological knowledge of Bajo fishers was able to pinpoint areas where whale sharks had been spotted regularly, including providing information about seasonal aspects of their behaviour, such as spawning sites. This information helped in understanding the migration patterns of the species between Australia and Indonesia, and Bajo observations fit with the scientific monitoring data of whale sharks collected in Australia. This project demonstrated that a combination of traditional ecological knowledge and new technology can lead to cost effective monitoring and good scientific results.

Adapted from Stacey et al, 2007.

The discussions in this study provide a number of examples of reasons why indigenous and local communities in coastal areas around the world would be concerned about the management of ocean resources in deep and open oceans, including in areas beyond national jurisdiction. Many of the species that these communities depend on for their livelihoods, or which they consider important culturally, migrate long distances between coastal and offshore areas, including between the EEZs of different countries and the high seas. As demonstrated in the discussion related to the ecosystem approach (above), the worldview of many indigenous communities is holistic, and is based on a deep understanding of the connections between species, their environment and people, and this would include an understanding of the many connections between the offshore ocean and the coast. Polynesian voyagers would surely have understood how each part of the ocean, including both the biotic and the abiotic world, interact with each other, and how each component is related to, and important for, the functioning of others.

One way to incorporate indigenous and local communities into the ongoing international debate and processes related to areas beyond national jurisdiction is through the scientific process of identification of EBSAs. As this chapter has shown, the traditional ecological knowledge possessed by indigenous and local communities can be valuable for understanding the migratory patterns, behaviour and habitat use by a number of highly migratory and culturally and economically important species, including but not limited to whales, turtles, sharks and seabirds. Their knowledge will also be of importance in providing local, site-specific information that can be used to ground-truth regional and global models of species and ecosystem distribution, as well as models related to climate change.

While the above will be important for moving ahead with the process of identifying EBSAs, there is also much that the global community could learn from traditional marine resource management practices of indigenous and local communities. Importantly, their holistic and interconnected understanding of the world, which views people as integral parts of natural systems, is an important basis for management that is inherently closer to the ecosystem approach than the sectoral management. Similarly, notions of stewardship, ownership, intergenerational responsibility, and the application of a variety of tools (including closed areas, harvest restrictions and other types of species and gear restrictions) to achieve sustainable use of resources as well as community livelihood and well-being objectives, can provide guidance for international efforts to manage marine biodiversity in areas beyond national jurisdiction.

1. Scaling up

Local bottom up approaches relying on local and traditional knowledge have often been successful in providing benefits for biodiversity and people. However, it is difficult for such local approaches to comprehensively and systematically provide for biodiversity conservation, livelihoods and human well-being needs on a larger (national, regional) scale. There is clearly a need to scale up local approaches to marine management, and connect them with broader national and regional approaches. Evidence exists that this is already happening, but efforts to track the contribution of local marine managed areas towards national and international targets have been complicated by lack of information about their exact number and coverage. Lists maintained in global databases (such as the World Database of Marine Protected Areas and MPA Global) are not complete and do not always consider smaller, locally-managed areas. In addition, some traditional marine managed areas are temporary in nature, and thus difficult to accurately report. A recently-compiled regional inventory of locally-managed marine areas (LMMAs) indicates that they are virtually the only type of marine protected area pursued in the independent countries of the Pacific Islands Region. The dependent states and territories are using more Western-style protected area approaches. The study indicates that approximately 30,000 km^2 is currently covered by different types of marine managed areas in the Pacific Islands region (Govan et al, 2009), as shown in the table below.

	Protected Areas with a marine component[1]	*Locally managed marine areas*[2]	*Community Conserved Areas*[2]	*No-take Zones*[2]	*Marine coverage, all records (Km^2)*	*LMMA coverage (Km^2)*	*No-take Zones (Km^2)*
Cook Islands	8	23	23	24	19	18	19
Fiji	45	217	217	222	10,880	10,816	593
Papua New Guinea	92	86	79	94	3,764*	59	18
Samoa	8	59	82	82	209	120	16
Solomon Islands	22	113	109	115	1,381*	941	311
Tonga	12	6	0	9	10,009*	93	10
Tuvalu	1	10	10	3	76	76	50
Vanuatu	26	44	44	44	89	58	89
Totals	**214**	**558**	**564**	**593**	**26,427***	**12,180**	**1,107**

* Considered to be substantially inaccurate. 1 World Database of Protected Areas, January 2008. 2 Definitions in main text, LMMAs may contain one or more CCAs or no-take zones.

Table 1: Inventory of Marine Managed Areas in the South Pacific, with emphasis on locally managed marine areas and community conserved areas (Govan, 2009).

Similarly, the example of *satoumi* in Japan shows that it is possible to revive and implement management systems based on traditional knowledge and cultural history and scale them up as part of national policy.

One concrete example of scaling up in the context of locally managed marine areas (LMMAs) in Fiji, which hosts some of the most extensive networks of traditional marine managed areas, as described in the case study below.

CASE STUDY: Developing Networks of Locally Managed Marine Areas (LMMA) from Sites to Systems: A Fiji LMMA Network Case Study

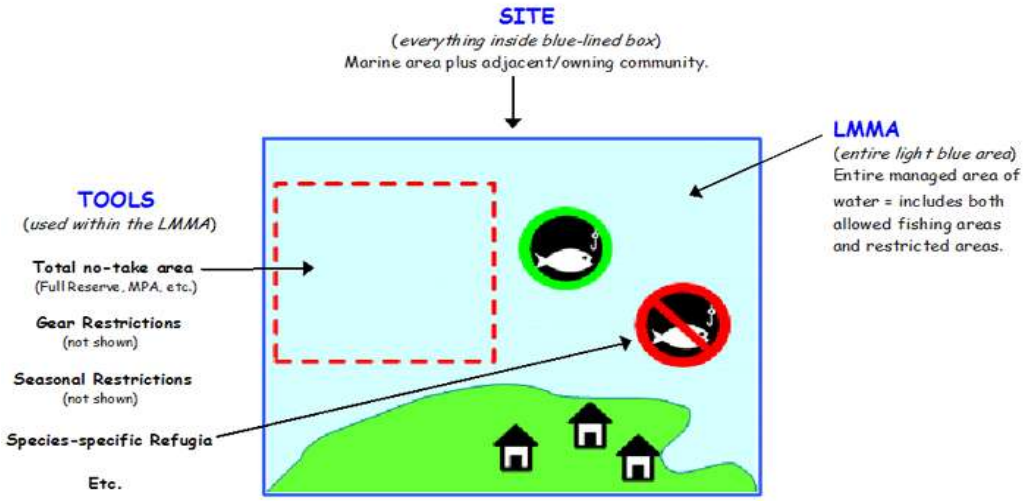
Fiji has 800,000 population inhabiting 300 islands. Most Fijian villages still lead a traditional subsistence-based livelihood with communities depending on local marine resources for at least part of their daily protein and income. In the 1990's, a combination of increased commercial fishing and larger local subsistence harvests left most of Fiji's coastal waters overfished. With the sharp decline in abundance, the pressure on village economies mounted, leaving 35-40% of rural

households below the poverty line. Since the late 1990s, Fijians have been responding, village by village, site by site, and scaling up from sites to managed systems linked by a network of communities and institutional partners that regulate the use of their customary marine areas, slowly restoring their productivity. These persistence efforts essentially led to the development of a network of managed customary marine areas between neighboring villages, within and between islands and across multiple habitats (mangrove, mudflat and sea grass areas, lagoons and reef areas. Although these *locally managed marine areas* (LMMAs) are an innovation of the last decade, they call on a rich tradition of customary management and governance of marine resources. The network is called the Fiji LMMA network and is one example of a unique and practical approach that has emerged to address some of the social and political obstacles to successful marine protected areas (MPA) network initiatives.

Well-designed networks of MPAs are essential for marine conservation in many places, yet it is often challenging for practitioners and scientists to establish networks of MPAs that adequately fulfil the biodiversity conservation needs, as well as the socio-economic needs at a particular community or site. The resurgence of LMMAs in Fiji, has resulted from the active participation of communities and the communities' perception of the likely benefits, including the recovery of marine resources, improved food security, improved governance and security of tenure, health benefits, revival of cultural and traditional management practices, access to information and services and community organization. The commonly accepted scientific rationale that MPAs provides fisheries and biodiversity benefits is not enough. The LMMA approach builds on existing community strengths in traditional knowledge, customary tenure and governance, combined with local awareness for the various stakeholders' needs and communities' willingness to take action.

The LMMA Network started in 2000 and is comprised of at least 8 country-wide networks of LMMA systems across the Indo-Pacific region. It consists of a group of practitioners (communities, researchers, policy makers) working together to improve the practice of marine conservation efforts. These country-wide networks such as the FLMMA network operate independently from, but within the overall framework of the LMMA network.

LMMAs now cover an extensive area of south-western Pacific, measuring more than 12,000km^2 in area and involving 500 communities in 15 Pacific Island countries. Categories of management include community-based marine area management initiatives and collaborative management (national, NGOs, institutions and resource owners/users) of marine resources (co-management). LMMA tools include: no-take areas or *tabus*, seasonal harvest and rotational harvest areas (temporary or permanent); species-specific harvest refugia, e.g., turtle/lobster moratoria; and restriction of fishing or harvesting effort.



Source: www.lmmanetwork.org

Management approaches can be adapted to the specific circumstances of small islands. The LMMA network has grown from eight sites in 2000 to 244 in 2005 and about 300 in 2008. Participating countries include the Federated States of Micronesia, Fiji, Indonesia, Palau, Vanuatu, Papua New Guinea, the Philippines and the Solomon Islands.

In Fiji, monitoring has demonstrated the real impact of the approach in economic terms (increased harvests and sustainability of marine resources). The shared vision of stakeholders underpins the success of the project, and this includes: healthy ecosystems and communities, abundant marine and fish stocks, and sustainable fisheries utilisation; protected marine biodiversity; sustainable development in coastal communities; understanding of what communities are doing and can do in managing marine areas; and understanding of ecological and socio-economic responses to LMMA and coastal management implementation. Adaptive management is central, and there is a strong emphasis on gender and youth empowerment. Results for the oldest Fiji site (Verata district) revealed that since 1997 there were: a 20-fold increase in clam density in the *tabu* areas; average of 200-300% increase in harvest in adjacent areas; tripling of fish catches; and 35-45% increase in household income. Similar trends are also observed in the other sites across Fiji.

Currently, there are more than 200 traditionally imposed Locally Managed Marine Areas (LMMAs) including no-take areas. This is in addition to the 3 to 4 marine protected areas established with input from the scientific community. One of the MPA's has been accepted legally. The active development of community action plans with community input guides relevant actions. This could take the form of an agreement between traditional chiefs. Maps of no-take areas and LMMA boundaries with management actions and laws on posters were provided to every house in the local language (about 20 – 60 houses per village). In one instance when laws were broken, people were shamed or given a village punishment e.g. compulsory work on the village farm.

Written by Alifereti Tawake, adapted from Vierros et al, 2010.

Across the Indo-Pacific, the implementation of LMMAs has facilitated the achievement of widespread livelihood and conservation objectives that are often based on traditional knowledge, customary tenure, governance, and are driven by local awareness of the need for action and likely benefits. As demonstrated

by the LMMA approach, the many benefits include the recovery of natural resources, food security, improved governance, access to information and services, health benefits, improved security of tenure, cultural recovery, and community organization (Govan, 2009).

2. Governance

The scaling up of community-based traditional management systems, and their incorporation into national and regional approaches in a manner that enables communities to retain power over their resources presents challenges for contemporary governance systems. The effectiveness of governance may depend on institutional diversity, which will combine bottom-up and top-down approaches. Local community participation can provide detailed knowledge about species and ecosystems, but top down structures are often essential for taking into account knowledge of ecological linkages across larger areas (Jones et al, 2011).

An often useful model for integrating traditional practices and government-led conservation efforts is a co-management system (collaboration between customary institutions, government and/or other stakeholders). For example, protected area co-management between local communities and governments has often been successful in ensuring that both community livelihoods and environmental conservation goals are met.

However, achieving success in co-management is not without its challenges, as is demonstrated in the case study below from New Zealand (Taiepa et al, 1997), which provides an account from the Maori perspective on early experiences in co-management. While many of these issues have now been resolved, it is useful to look at this case study as an example on how perceptions held by different cultures may make it difficult to collaboratively manage resources.

CASE STUDY: Learning from experiences in co-management in New Zealand

Early experiences in co-management arrangements between New Zealand's Department of Conservation and Maori show that obstacles to establishing agreements that involve Maori in equitable conservation decision-making roles include divergent philosophies (preservation versus conservation for future use), institutional inertia, a lack of concrete models of co-management to evaluate success or otherwise to promote conservation, a lack of resources and opportunities for capacity building and scientific research amongst Maori, opposition and a lack of trust from conservation non-governmental organizations that are predominantly euro-centric in approach and membership, and a fundamental reluctance of some to share power with Maori.

Recent examples of work towards co-management emphasize the need for innovative methods to build trust and explore common ground and differences. Meetings on *marae* (traditional Maori gathering places) have established guiding principles, lengthy dialogue, and a collective symbol as a metaphor for co-management. These were valuable steps towards building trust and understanding required for the restoration of coastal lakes and a river, and the potential joint management of two national parks on the west coast of the North Island.

Establishment of a research project to assess the sustainability of a traditional harvest of a sea-bird (*Puffinus griseus*) by Rakiura Maori was facilitated by drawing up a 'cultural safety' contract. This contract underscored the role of Maori as directors of the research, protected their intellectual property rights to their traditional environmental knowledge, guaranteed continuity of the collaborative research project and regulated how results were to be communicated. The scientific ethics of a university ecological research team were safeguarded by the contract, which ensured that they could publish their inferences without erasure or interference.

The New Zealand experience shows that even when legislation signals from the top down that the

doorway is open for co-management with indigenous people, this by itself is unlikely to make it happen. Active facilitation by innovative middle-level agreements and the creation of new administrative structures are needed to govern co-management of a broad spectrum of resource issues. Bottom-up initiatives involving single, or very localized, resource uses may also trigger co-management. Models for successful co-management involving indigenous peoples must focus more strongly on issues of equity or power sharing, and therefore may be very different from models directed at a single conservation outcome.

An example of the most current practices in co-governance can be found in the 2011 Relationship Agreement and Engagement Protocols between the Department of Conservation and Tūhoe for Te Urewera National Park. While not a formal joint management arrangement, the Agreement acknowledges the different perspectives to achieve shared strategic goals for national park management. The Agreement seeks to optimise the working relationship between Government and Maori by "appreciating each other's perspective and aspirations on the protection, preservation and use of Te Urewera National Park".

Adapted from Taiepa et al, 1997 and Tūhoe and Department of Conservation Relationship Agreement and Engagement Protocols between the Department of Conservation and Tūhoe for Te Urewera National Park.

Positive experience in co-management and/or community-driven marine management can be found in many cases where communities' rights to their resources have been recognized, and where marine managed areas provide for sustainable uses that benefit community livelihoods and well-being. In Brazil, such areas have been integrated into the National System of Protected Areas, as described in the case study below.

CASE STUDY: Marine Extractive Reserves (MER) and Marine Sustainable Development Reserves (MSDR) in Brazil

In Brazil the establishment of MPAs has, in the past, created many conflicts between artisanal fishermen and protected area authorities. Most of these conflicts resulted from restriction of artisanal fishing activities in areas traditionally used by these fishermen. In many cases the conflicts appeared as result of the fact that these protected areas were created without participation of fishing communities.

In 2000, when a new National System of Protected Areas was created, new categories were established, particularly Marine Extractive Reserves (MER) and Reserves for Sustainable development (RSD), where sustainable uses provide the means to achieve biodiversity conservation and improvement in the living standards of fishermen. A legal framework has been created for the participation of coastal communities in the establishment and management of these reserves. Under this system, traditional fishing communities apply to be given exclusive rights to exploit the fish or shellfish of an environmentally-sensitive area, under a strict management plan that guarantees the integrity of the coastal ecosystem. The reserves have succeeded in providing biodiversity benefits, as well as economic benefits for coastal communities. In recent years the demand for establishment of sustainable use reserves by fishing communities has greatly increased. In the most recent reserve to be approved, the complaint of the local population was about long delays in getting official designation from the federal government – a contrast to situations in which communities protest against restrictions introduced in protected areas imposed from above.

Sources: Draft GBO-3 and http://www.usp.br/nupaub/english/wionspapers.pdf

The CBD Conference of the Parties has adopted policy guidance on indigenous and local communities and protected area governance, which includes advice on governance types, equity and recognizing the role of community conserved areas (CCAs). The guidance can be found in the box below.

Community conserved areas (CCAs), governance and the CBD Programme of work on protected areas

The relationship between people and protected areas is one of the most challenging, and encapsulates the problems inherent in trade-offs between the common good and the rights and needs of the individual. Programme Element 2 of the CBD Programme of Work on Protected Areas (PoWPA) set some standards to avoid such conflicts and provides for the equitable distribution of costs and benefits by emphasizing diverse protected area governance types, participatory decision-making and management processes that incorporate and respond to the interests of a broad range of stakeholders, particularly indigenous and local communities. Some relevant COP decisions on PoWPA regarding Community conserved areas (CCAs)and governance are:

In decision IX/18: Parties are invited to "improve and, where necessary, diversify and strengthen protected-area governance types, leading to or in accordance with appropriate national legislation including recognizing and taking into account, where appropriate, indigenous, local and other community-based organizations (para. 6 (a)); "recognize the contribution of, where appropriate, co-managed protected areas, private protected areas and indigenous and local community conserved areas within the national protected area system through acknowledgement in national legislation or other effective means" (para. 6 (b)).

Decision X/31:Para 31(b) Invites Parties to "Recognize the role of indigenous and local community conserved areas and conserved areas of other stakeholders in biodiversity conservation, collaborative management and diversification of governance types".

Target 11 of the Strategic Plan for Biodiversity 2011-2020: Seized with these issues the Conference of the Parties in target 11 of the Strategic Plan for Biodiversity 2011-2020 calls for equitably managed protected areas and also other area-based conservation measures.

3. The role of traditional knowledge in responding to current threats to marine and coastal biodiversity

At the present time, marine and coastal biodiversity is facing urgent threats, many of which are global in nature. These threats include ocean warming and acidification, pollution and over-exploitation of marine resources. While the above sections have described traditional knowledge and management mainly in their historical and cultural contexts, this knowledge can also be vital for dealing with contemporary global challenges. Traditional knowledge can lead to new and innovative ways to manage marine and coastal biodiversity and resources that will increase both the resilience of biodiversity and that of coastal communities. In order to accomplish this, traditional knowledge cannot remain stagnant, but must be permitted to innovate and develop new approaches to marine protection. This has already taken place in many locations, for example in cases where communities have made *tabu* or *rāhui* areas into permanent no-take areas, a concept that was not present in traditional culture, but was deemed important as a response to modern-day threats to the marine environment and its resources. These new and blended approaches are discussed further at the end of the next chapter.

Traditional systems have also been scaled up, as was demonstrated by the network of LMMAs in Fiji, and as such can become important components of national strategies for conservation and sustainable use of biodiversity. The application of *satoumi* in Japan provides an example of how a concept and practice based on traditional cultural history can be combined with scientific knowledge to provide the basis for implementing the ecosystem approach in marine and coastal environments through national policies and programmes. These case studies demonstrate the flexibility of traditional knowledge and management strategies, and the richness of innovative ideas that are rooted in cultural diversity.

In the context of the CBD, the identification of EBSAs, as well as their later management by an appropriate entity, has emerged as a key strategy for addressing threats to marine biodiversity. Traditional knowledge can have a role to play in the identification of EBSA, and this section has described cases where traditional and local knowledge have been instrumental in the study of migratory species and other marine animals. Similarly, communities can be vital in the selection and management of EBSAs, and their participation, as well as the success of conservation measures, is greatly enhanced through the consideration of cultural and social criteria in the EBSA process, as described in the next section.

G. Social and cultural criteria for the identification ecologically or biologically significant areas as well as the establishment and management of marine protected areas

This section will review selected existing social, cultural and related criteria for the identification of EBSAs as well as the establishment and management of MPAs. The section will also describe how such criteria are used in conjunction with ecological criteria, and how traditional knowledge has been integrated into their application.

The broader application of social and cultural criteria is important for several reasons. Firstly, the current information used to identify EBSAs and to design and implement MPAs is usually drawn from the fields of biology, ecology, fisheries science, oceanography and geology. While the information available from these disciplines (together with the scientific knowledge of indigenous and local communities) is sufficient for the application of the scientific EBSA criteria adopted by the CBD, the eventual management of the identified areas will be dependent on social, economic and cultural factors. Thus, societal information may ultimately be one of the most crucial types of information to integrate into the planning process (Agardy, 2000).

The success of any marine management regime is closely related to how well indigenous and local communities, other user groups and stakeholders are identified and brought into the planning and management processes. Humans and their needs, including the needs of future generations, are the driving force for marine protected area work, and humans stand to most benefit from their effective implementation (Agardy, 200). Current processes of ecosystem degradation are having an effect on coastal communities and, in particular, on poor people. The impact of ecosystem changes on poor people, women and indigenous peoples has not adequately been taken into account in management decisions (MEA, 2005). An improved marine management system that lists social, cultural and economic outcomes amongst its goals might therefore be able to reduce poverty and improve the well-being of coastal communities.

Humans also stand to lose when the design of marine protected areas only takes into account narrow biological objectives, and poorly designed MPAs have caused social harm, including conflict and social and economic dislocation for disadvantages communities, such as artisanal fishing communities near MPAs (Christie, 2004). The use of social and cultural criteria in addition to ecological criteria will thus shift the basic viewpoint of management and protection away from a purely scientific exercise that considers only biological and ecological systems to one that considers the diversity of humans, their interactions and cultures together with biological diversity.

The use of social and cultural criteria also focuses conservation efforts on the maintenance or restoration of human livelihoods and well-being, and perceives that a diverse and resilient marine environment and its biodiversity are the sources of these. This sentiment is expressed, for example, in the Pacific Islands Regional Ocean Policy, which puts forward a vision of "a Healthy Ocean that Sustains the Livelihoods and Aspirations of Pacific Island Communities".

H. Existing social, cultural and other criteria

Ideally, the application of social and cultural criteria will provide for the social success of a managed marine area. Such measures of success include broad stakeholder participation, equitable sharing of

economic benefits and the presence of conflict-resolution mechanisms (Christie, 2004). Without such measures in place, an MPA or other managed area, which is located in an area with pre-existing human settlements and/or uses, will likely not be successful in the long term. In addition, many traditional societies prefer value-based criteria that give particular weight to sacred natural sites, sites of historical importance, or sites identified with the origins of a particular cultural group (Wild and McLeod, 2008).

A review of ten sets of social and cultural criteria (the criteria reviewed includes those used by the IMO, the Wider Caribbean Region, The Mediterranean, the ASEAN Region, Palau, Australia, Brazil, Trinidad and Tobago, Gulf of Maine and British Columbia) was undertaken as part of this study, as was as a review of some material that analyze such criteria (e.g. McMath, 2008, Lundquist and Granek, 2005, Leslie, 2005). This included criteria used in international, regional, national and sub-national processes for identifying areas for protection and management. In addition, the study also looked into economic and practical criteria, which are often directly related to social and cultural conditions, and their usage overlaps to some degree. The results of the review are presented here, along with some examples of social and cultural criteria currently in use. A summary table of the criteria reviewed can be found in the Annex to this document.

It should be noted that the specific criteria to be applied are directly dependent on the goals and objectives of the conservation or management action. While biological and ecological criteria may aim, for example, for the conservation of components of biodiversity, socio-cultural and other criteria are based on an understanding of the social, cultural, economic and political processes patterning the area (Aswani and Hamilton, 2004). The goal for applying such criteria may, for example, be the maintenance and restoration of livelihoods and community well-being, protection of important cultural sites, community ownership of conservation and management activities, protection of culturally important or sacred sites, the equitable sharing of costs and benefits of conservation, and the long-term sustainability and political acceptance of management activities.

Accordingly, the application of socio-cultural and economic criteria will require the collection of comprehensive information and data about these factors, as well as the involvement of indigenous and local communities and other stakeholders to address current and future social, economic and cultural issues and needs. The decision-making process should endeavour to effectively integrate both long-term and short-term environmental, economic, social and equity considerations.

1. Common cultural criteria

Common cultural criteria currently in use incorporate the following aspects:

- **Current cultural and traditional use**: This category includes areas that have traditional uses by indigenous and local communities, as well as areas that are important for maintaining or restoring productivity, diversity and/or integrity of resources and places used for traditional and cultural activities, including sustainable economic uses.
- **Current customary management areas and systems**: This category includes areas and resources that being managed by indigenous or local communities using their local and/or traditional knowledge.
- **Cultural value other than direct use**: This category includes sacred sites, and areas that have religious, historic, artistic or other cultural value.
- **Cultural heritage**: This category includes areas that have important historical and archaeological sites.

These common categories cover both present uses and current and historical values that are not related to direct use. It should be noted, though, that there is likely to be a certain amount of overlap between these categories. For example, a site with historic importance may also be considered to be a present day sacred

site, and a site with religious or artistic value may also be used to harvest resources by indigenous and local communities, and may be actively managed by them to restore or maximize harvest.

In addition, the application of cultural criteria is directly related to issues of ownership of land and resources by indigenous and local communities. Ownerships structures such as customary marine tenure, land claims and native title should be kept in mind when applying the criteria.

2. Common socio-economic criteria

In this context, social and economic criteria are considered together, as it is difficult to separate the two in practice. The socio-economic criteria currently in use incorporate the following aspects:

- **Social, human or economic dependency**: This category includes areas that provide important ecosystem services for individuals and communities, and upon which the survival, livelihoods and well-being of people are dependent on. Providing for access to, and sustainable uses of, such areas for fishing, recreation and traditional subsistence or food production activities is important.
- **Social importance**: This category includes areas that have existing or potential value to local or international communities because of cultural, educational, aesthetic or recreational qualities. The maintenance or restoration of these values through management is important.
- **Economic importance**: This category includes areas that have existing or potential economic value and/or uses, and may provide economic benefits for communities through opportunities to engage in small-scale fishing, tourism or other economic activity. This category may also include areas whose protection, maintenance or restoration makes a direct economic contribution to fisheries (breeding or nursery areas, or an areas that are the source of economically important species) or to recreation, tourism or other economic activity.
- **Social acceptability**: This category includes areas that have a high degree of support from indigenous and local communities, as well as from stakeholders.
- **Compatibility**: This category includes areas that have existing uses and management regimes that are generally compatible with the goals of the proposed conservation/management action. The category may also include areas that may help resolve conflicts between natural resource values and human activities, or which may provide for resolution of conflicts between users.
- **Conflicts of interest**: This category considers the degree to which the proposed conservation or management action would affect the activities of local residents, and cause social or economic hardship on communities.

As was the case with the cultural criteria, there is a degree of overlap between these criteria, and a given area may easily meet many criteria at the same time. Many of these criteria are also closely related to ecological criteria, some of which seek to increase the abundance or and facilitate the recovery of an economically important species. The criteria relating to social acceptability, conflict and compatibility are often listed under “practical considerations” in many regional and national criteria. However, since the underlying factors determining how well those criteria are met are generally societal, they are included here as socio-economic criteria.

Other criteria commonly applied include the following:

- Scientific importance covers the value for research and monitoring.
- Accessibility, including for recreation, tourism, education
- Threats - degree of insulation from external destructive influences.

3. Examples of cultural, social and economic criteria currently in use

The IMO social, cultural and economic criteria for selecting Particularly Sensitive Sea Areas (PSSAs) listed below are common of the types of considerations taken into account in such criteria. In totality, the IMO PSSA criteria consist of ecological criteria as well as practical considerations.

IMO Social, cultural and economic criteria for the identification of a Particularly Sensitive Sea Area (PSSA) IMO Resolution A.982(24)

Social or economic dependency – An area where the environmental quality and use of living marine resources are of particular social or economic importance, including fishing, recreation, tourism and the livelihoods of people who depend on access to the area.

Human dependency – An area that is of particular importance for the support of traditional subsistence or food production activities or for the protection of the cultural resources of the local human populations.

Cultural heritage – An area that is of particular because of the presence of significant historical and archaeological sites.

An example of regionally-applied criteria is provided from the Wider Caribbean Region, where the socio-economic and cultural criteria below are used together with ecological criteria for selection protected areas to be listed under the Specially Protected Areas and Wildlife (SPAW) Protocol.

Socio-economic and cultural criteria for the evaluation of the protected areas to be listed under the SPAW Protocol (Wider Caribbean Region)

Productivity – the protected area helps conserve, maintain or restore natural processes that contribute to increasing the abundance of natural resources used by humans, and consequently contribute to regional sustainable development.

Cultural and traditional use – the protected area has a special value in a regional context for the conservation, maintenance or restoration of the productivity and biological integrity of natural resources that provide for sustainable traditional or cultural activities, such as those of indigenous communities.

Socio-economic benefits – the protected area has special value in a regional context for the conservation, maintenance or restoration of the productivity and biological integrity of natural resources that provide for economic or social benefits of user groups such as subsistence fishermen and rural communities, or economic sectors such as tourism.

The ASEAN region also has produced criteria for selection national marine protected areas. The social, economic and cultural criteria are applied in addition to ecological criteria, and are particularly well articulated.

ASEAN Criteria for National Marine Protected Areas

Social criteria

Social acceptance – The degree to which the support of local people is assured. Every effort should be made to canvass local support. When an area is already protected by local tradition or practice, it should be encouraged, and the area should receive a higher

rating. An "official" protected area definition may not be necessary to ensure government recognition of the area if local support is high.

Public safety – The degree to which the creation of a MPA may diminish pollution or other disease agents that contribute to public safety.

Recreation – The degree to which the area is, or could be, used for recreation. Sites that provide the local community the opportunity to use, enjoy and learn about their local natural environment should rate highly for this criterion.

Culture – The religious, historic, artistic or other cultural value of the site. Natural areas that also contain important cultural features should be given high rating as their protection may help to maintain the integrity of the adjacent ecosystem.

Aesthetics – A seascape, landscape or other area of exceptional scenic beauty. Natural areas that also contain features of natural beauty should be given higher rating since the safeguarding of such features often requires that the integrity to adjacent coastal and marine systems be maintained. However, where species diversity and biological value are low, such areas retain a high value for recreation and tourism.

Conflicts of interest – The degree to which area protection would affect the activities of local residents. If the area is to be used for recreation purposes, for example, the site should not be a major fishing area and should have few dependent fishermen. In some instances, careful zoning can minimize such conflicts.

Accessibility – The ease of access across both land and sea. Areas to be used by visitors, students, researchers and fishermen must be accessible to them. The more accessibility, the greater the value; but the greater the level of use, the greater the likelihood of conflicting interests and the greater impact of users. Accessibility weighs high for MPAs with predominantly social objectives, fairly high for those with economic goals, and low for those meeting ecological criteria.

Research, education and public awareness – the degree to which an area represents various ecological characteristics and can serve for research and demonstration of scientific methods. Areas that clearly demonstrate different habitat types and ecological relationships and are sufficiently large both to serve conservation and to accommodate teaching and public awareness should receive a higher rating. An area which serves as a "control site" or bench mark for scientific research or ecological monitoring programme should receive also a higher rating.

Conflict and compatibility – The degree to which an area may help to resolve conflicts between natural resource values and human activities, or the degree to which compatibilities between them may be enhanced. If an area can be used to exemplify the resolution of conflicts in the region, it should receive a higher rating.

Economic criteria

Importance to economic species – the degree to which certain commercially important species depend on the area. Reefs, estuaries or wetlands, for example, may be critical habitats for certain species that breed, rest, shelter or feed there, and that form the basis of local fisheries in adjacent areas. Such habitats need management to support the exploited stocks. Consideration should be given to the dependence of fishermen and the size of the fishery yield.

Nature of threats – the extent to which changes in use patterns threaten the overall value to people. Habitats may be threatened directly by destructive practices, such as fishing

with explosives and certain bottom trawls, or by overexploitation of resources. Areas traditionally harvested by local fishermen become important to manage. The numbers of fishermen on these grounds may increase, bringing extra pressure to bear on stocks and habitats. Even if the numbers do not change, the capture methods that yield more catches per unit effort may replace the traditional capture methods. The stocks of some species may not be capable of withstanding such increased exploitation of their breeding population. In this way, whole species have disappeared from fishing grounds or have become exceedingly rare.

Direct and indirect economic benefits – the degree to which protection will affect the local economy in the long term. Those that have obvious positive effects such as tourism that are compatible with conservation should have higher rating.

I. Experiences in applying social and cultural criteria

Social and cultural criteria, where they are considered, are generally applied together with ecological criteria in identifying priority areas for protection. It should be noted that different methods of data collection are required for ecological and socio-cultural criteria. While ecological criteria are generally applied using scientific methodologies, including algorithms and models, the use of socio-cultural criteria requires social science methodologies (interviews, questionnaires, etc) to acquire. Where traditional knowledge is collected for the purpose of applying either ecological or socio-cultural criteria, the prior informed consent of the knowledge holders should be obtained, and the knowledge utilized through mutually agreed terms.

Both qualitative and quantitative approaches are used in applying criteria, and the application often relies on a combination of expert opinion, stakeholder involvement and analytical techniques. Commonly, sites are first identified by applying ecological criteria, incorporating into the identification process the best available scientific information, local/traditional knowledge and available analytical techniques. The sites identified through the application of ecological criteria can then be refined at a later stage using social and cultural criteria and/or through community consultations, helping to guide the selection of sites for management, as well as the consideration of appropriate management regimes for those sites. To facilitate this process, social, economic and/or cultural criteria can also be incorporated into a decision-support tool, such as Marxan, which selects potential sites based on scientific information, conservation goals and costs provided to it. In this case, socio-economic or cultural criteria might be incorporated as a "cost" as done by Klein et al, 2008. Marxan and other site selection tools can also be used in integrating scientific knowledge and local/traditional knowledge in identification and selection of sites for protection, as described in the case study below.

CASE STUDY: Integrating community and science-based approaches to identify priority areas for protection in British Columbia

Decision-support tools are increasingly being used to select areas that are representative, or meet specific criteria, such as the CBD EBSA criteria. A study carried out in British Columbia, Canada, focused on areas used by Gitga'at First Nation and the Huu-ay-aht First Nation. First Nations in British Columbia are important resource users and have a constitutional right to fish. They also have a long, multigenerational history of sustainably using natural resources that uniquely provides them with deep knowledge and understanding of their local marine waters. This knowledge can contribute to improved decision-making. In regards to this study, the aim of the First Nation communities was to achieve recovery of depleted marine species and sustainable fisheries for current and future generations.

The community component consisted of semi-structured interviews with resource users and

community meetings to receive feedback. The aim of the interviews was to identify individual preferences for long-term goals in the marine environment, possible areas for protection or other special management, and envisaged levels of protection. The interviewees were former and present marine resource users of various ages (including elders and hereditary chiefs) with representation from the communities' traditional clans. Participants drew areas they wished to see protected on nautical charts. These were digitized, summarized and presented at community meetings to ascertain level of agreement.

The science-based approach consisted of using the decision-support tool Marxan to seek systematic prioritization of potential protected areas in the study region, using best available spatial data (species and habitat distributions and physical features, such as salinity, sediment types and bathymetry). Human impacts and areas used by fisheries were also taken into account in the Marxan analysis. The community-based and science-based maps of priority areas were combined in Marxan to create an integrated map, and the compatibility between these two types of prioritizations was assessed.

Results showed many commonalities between the community-based and science-based approaches. The community-based approach incorporated important ecological features, and represented more biodiversity features than could be expected given their size. Participants at community meetings thought that the science-based maps represented important areas for conservation relatively well, but did not capture them all (for example small bays and inlets were left out). However, the science-based maps identified offshore areas that had not been identified in the community-based map. Participants considered the integrated map equivalent to, or better than, the science-based and community-based scenarios alone, and preferred the larger amount of area that this combined map identified for protection. The results show that the approaches had a high degree of consistency, but at the same time, each added something to the other. Thus, it is possible to reconcile science-based and community-based approaches by employing a systematic approach to MPA planning.

Adapted from Ban et al, 2009.

As has become evident from the discussion in previous sections, human factors more than ecology often dictate conservation opportunity and the subsequent success of implementation (Knight and Cowling, 2007). The case study above referred to a situation where the communities themselves wanted to protect their marine resources for current and future generations. However, in other cases, the relationship between conservation and management initiatives and communities may be less harmonious. Factors such as community support are difficult to quantify and map, although some attempts to accomplish this have been made. Such factors can also fluctuate with time, as circumstances change. In particular, top down government and/or NGO-led initiatives to establish representative networks of marine protected areas to meet international targets, such as the CBD 10% target for effective conservation, may encounter community opposition for a number of valid reasons, particularly if the initiative is not in the community's best interest, if livelihoods are likely to suffer, or if the community perceives no particularly good reason for the MPA to be established.

A network of MPAs that is being established as part of a broader (national, regional) planning process will likely have the best chance of success if communities are involved throughout the planning, establishment and management processes. In particular, it is important to have a mechanism that will allow the ultimate selection and implementation of MPAs to remain a flexible and community-driven process. In this case, too, spatial decision-support tools, such as Marxan, can rapidly identify both complementary and alternative conservation priorities, and to integrate community knowledge and values, providing for a collaborative platform (Game et al, 2010).

While there is much to be said for the flexibility and ability of systematic conservation planning to integrate community perspectives and traditional and local knowledge, along with science, into the planning process, it is also important to keep in mind that many areas of the world have pre-existing traditional management systems that are able to provide for sustainable use of marine resources along with community livelihoods needs. In such cases, implementation of policies and programmes based on Western models and approaches, and driven by quantitative global MPA targets, may not be appropriate, nor the best way to achieve biodiversity goals and human well-being needs. Instead, using and strengthening pre-existing local systems of marine management is a wiser strategy, which is much more likely to produce the desired results of holistic, sustainable marine resources management in the long term. These approaches differ from the MPA network approach in that they consider multiple impacts and employ a number of different tools, of which closed (no-take) areas are one. Because such pre-existing systems are already adapted to local ecological and cultural conditions (Ruddle and Hickey, 2008), they provide time-tested and proven alternative approaches to management systems that have been imported from other countries and are implemented in a top-down manner. In addition, pre-existing management systems can be built upon in ways that combines traditional knowledge with science, providing a basis for new and evolved systems that are equipped to cope with escalating modern-day threats to marine biodiversity in innovative ways, as described in section 2 of this report. However, care should be taken that unsuitable laws and inappropriate application do not disempower communities (Wild and McLeod, 2008) and that communities retain ownership of their resources. The case study below provides an example from Palau, where the Palau Protected Area Network was built upon traditional area-based closures (the "b*ul*"), but also considered the latest scientific knowledge, and provided legal recognition for the resulting national system. Similar experiences in evolution of traditional management systems can also be found elsewhere in the world.

CASE STUDY: The Protected Areas Network (PAN) of Palau – Recognition of traditional resource management by a national legal framework

In Palau, the Protected Areas Network (PAN) Act is a national legislation that was passed in November 2003 as a national framework to support state and community level action to address local resource management needs and to protect nation-wide biodiversity, habitats and natural resources. Traditional bans on harvesting or "bul" put in place in an area are generally short-term. However, some States and local communities want to be able to extend a traditional ban or "bul" on marine areas on a long-term basis. This can be done by having it become a protected area under the PAN. This would make the protected area more effective and enforceable (with the support from the National Government enforcement agencies). Some traditional leaders have approached the national government to see traditional managed areas recognised under the PAN. If traditional leaders are not well respected or effective in the community, a traditional protected area with a "bul" in place can still be unsuccessful. If a community-designated protected area is part of the PAN (legislation which has national backing), Conservation Officers can help the States and communities enforce and monitor these protected areas. Normally the state government can only fine people a limited amount ($100 USD), however, under the PAN, an offence can attract up to a $10,000 USD fine. The PAN is a national legal framework that supports communities by giving them extra protection and technical support, and strengthens local systems by encouraging and enabling the local community to protect their resources. Traditional leadership is slowly eroding. There is a mixture of traditional and modern techniques in operation. Thus, the PAN gives legal recognition of traditional law and practices.

Written by Alma Ridep-Morris, adapted from Vierros et al, 2010.

III. IDENTIFICATION OF SPECIFIC ELEMENTS FOR INTEGRATING TRADITIONAL, SCIENTIFIC, TECHNICAL AND TECHNOLOGICAL KNOWLEDGE OF INDIGENOUS AND LOCAL COMMUNITIES, AS WELL AS SOCIAL AND CULTURAL CRITERIA AND OTHER ASPECTS, FOR THE IDENTIFICATION OF ECOLOGICALLY OR BIOLOGICALLY SIGNIFICANT MARINE AREAS (EBSAS) AS WELL AS THE ESTABLISHMENT AND MANAGEMENT OF MARINE PROTECTED AREAS

This study has shown that there is a link between biological and social success, and that social conditions often determine long-term biological success of conservation initiatives. Because humans and their needs, including the needs of future generations, are important for the conservation and management of marine resources, the application of ecological criteria for EBSA identification may need to be accompanied by the subsequent application of social and cultural criteria for the selection and management of EBSAs, particularly in areas with pre-existing human populations and uses.

Chapter 3 of this study reviewed existing sets of social, cultural and economic criteria used internationally, regionally, nationally and sub-nationally. A summary of commonly used criteria are included in this chapter, and a consideration of these can provide a basis for further debate and for the eventual adoption of socio-cultural criteria for EBSAs to be used alongside the already-existing scientific criteria.

In applying scientific, social and cultural criteria, a number of considerations should be kept in mind as follows:

- Positive experience in co-management and/or community-driven marine management can be found in many cases where communities' rights to their resources have been recognized, and where marine managed areas provide for sustainable uses that benefit community livelihoods and well-being.
- Recognition of the importance of local and traditional knowledge and the need for building on pre-existing systems of traditional resource management is likely to increase community ownership of conservation and management initiatives, and thus their sustainability in the long term.
- There is a need to build meaningful and equal partnerships between scientists, managers and members of indigenous and local communities in research leading to identification of EBSAs and in monitoring and managing such areas. These partnerships should seek to apply both science and traditional ecological knowledge.
- While all efforts must be undertaken to protect and conserve resources, it is important to also take into account the livelihoods and well-being of communities that have traditionally depended on those resources, and to ensure that socio-cultural benefits of EBSAs (and not only the costs) flow back to communities.

Chapter 2 of this study has shown that indigenous and local communities possess traditional knowledge, innovations and practices that have global importance for conservation and sustainable use of marine biodiversity and resources. Thus, the argument could be made that traditional knowledge has an important role to play in identifying EBSAs, both inshore and offshore. In particular, traditional ecological knowledge can provide:

- **Location-specific knowledge** about species, habitats and ecological interactions, including knowledge about migratory species in support of CBD EBSA criterions 2 and 3, as well as

information about important habitats such as juvenile habitats or spawning aggregations. TEK can also be used to validate regional or global models of species distribution or climate change.

- **Increased knowledge of environmental linkages** between various ecological processes, multiple species and abiotic factors that influence species biology, including trophic structures, migration movements, as well as the behaviour of species.
- **Local capacity-building and power sharing** through creation of research programmes where indigenous peoples and/or community members are equal partners with scientists.

Where traditional knowledge is collected for the purpose of applying either ecological or socio-cultural criteria, the prior informed consent of the knowledge holders should be obtained, and the knowledge utilized through mutually agreed terms.

Chapter 2 has also shown that the knowledge and practices of indigenous and local communities are not only important for identifying areas that are potential EBSAs, but have also resulted in traditional marine management systems and strategies that have significance for considering how biodiversity in the world ocean, including in areas beyond national jurisdiction, is managed. The concepts of significance include:

- The recognition of the interconnectedness of all things, including the understanding that people are integral parts of natural systems and that management must be undertaken in a holistic manner.
- The concepts of stewardship and intergenerational responsibility in providing for sustainable use of marine resources, while recognizing that providing benefits for people is vital for conservation success.
- The need for marine resources management to employ multiple tools and approaches, and to be sustainable, adaptive and to enhance community resilience and self-sufficiency in a time of change.

It should also be kept in mind that enhancing and building upon traditional marine management strategies in the context of national and international policies relating to biodiversity conservation, marine protected areas and fisheries management is likely to provide benefits for both communities and biodiversity.

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Annex

SUMMARY OF SELECTED SOCIAL, CULTURAL AND ECONOMIC CRITERIA

	IMO	Wider Caribbean	ASEAN	Palau	Australia	SPAMI	Trinidad & Tobago	Brazil	Gulf of Maine	British Columbia
Current cultural and traditional use		X		X	X	X		X	X	
Current customary management areas and systems				X	X	X		X		
Cultural value other than direct use			X	X	X	X				X
Cultural heritage	X				X	X			X	
Human dependency	X				X	X		X		
Social or economic dependency	X				X			X		
Social importance or benefits		X		X	X		X	X		X
Economic importance or benefits		X	X	X	X		X	X	X	X
Social acceptability			X	X	X	X			X	X
Compatibility			X	X	X				X	
Conflicts of interest			X	X					X	
Scientific and educational importance			X		X	X	X	X	X	
Accessibility			X						X	
Threats			X		X	X		X	X	
Aesthetics			X		X	X	X			
Recreation			X		X	X	X		X	
Public safety			X							
Opportunities for sustainable development or use				X		X		X		

Notes:

IMO criteria are available online at: http://www.gc.noaa.gov/documents/982-1.pdf

The Wider Caribbean criteria are online at: http://www.car-spaw-rac.org/IMG/pdf/Guidelines_and_criteria_final_-English.pdf

The SPAMI criteria are online at: http://www.rac-spa.org/sites/default/files/annex/annex_1_en.pdf

The ASEAN criteria are online at: http://www.aseansec.org/cme/ASEAN%20Criteria%20for%20National%20MPAs.pdf

Palau Protected Area Network design criteria can be found in Hinchley, D., Lipsett-Moore, G., Sheppard, S., Sengebau, F.U, Verheij, E. and Austin, S. (2007) Biodiversity planning for Palau's Protected Areas Network: An ecoregional assessment. TNC Pacific Island Countries Report No. 1/07. http://www.reefresilience.org/pdf/PALAU_ERA-FINAL.pdf

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Trinidad and Tobago criteria are online at http://www.cbd.int/doc/case-studies/lr/lr-tt-rule-area-en.pdf

Brazilian criteria evaluation is based on Diegues, A.C. (2008) Marine Protected Areas and Artisanal Fisheries in Brazil. Samudra Monograph. International Collective in Support of Fishworkers. http://icsf.net/icsf2006/uploads/publications/monograph/pdf/english/issue_99/ALL.pdf

The Gulf of Maine criteria are online at http://www.gulfofmaine.org/library/mpas/selection_eval_0798.PDF

The British Columbia draft marine protected areas strategy can be found online at http://www.mccpacific.org/MPA-DraftCanadaBCStrat-May27.pdf

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