

CORAL TRIANGLE REGIONAL ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT (EAFM) GUIDELINES



**CORAL TRIANGLE
INITIATIVE**
ON CORAL REEFS, FISHERIES AND FOOD SECURITY

A publication supporting the **Coral Triangle Initiative on
Coral Reefs, Fisheries and Food Security (CTI-CFF)**

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Coral Triangle Regional Ecosystem Approach to Fisheries Management (EAFM) Guidelines

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USAID PROJECT NUMBER: GCP LWA Award # LAG-A-00-99-00048-00

CITATION: Pomeroy, R., R. Brainard, M. Moews, A. Heenan, J. Shackeroff, and N. Armada. *Coral Triangle Regional Ecosystem Approach to Fisheries Management (EAFM) Guidelines*. Publication. Honolulu, Hawaii: The USAID Coral Triangle Support Partnership, 2013. Print.

PRINTED IN: Honolulu, Hawaii, USA

This is a publication of the Coral Triangle Initiative on Corals, Fisheries and Food Security (CTI-CFF). Funding for the preparation of this document was provided by the USAID-funded Coral Triangle Support Partnership (CTSP). CTSP is a consortium led by the World Wildlife Fund, The Nature Conservancy and Conservation International with funding support from the United States Agency for International Development's Regional Asia Program.

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ACRONYMS AND ABBREVIATIONS

CBFM: Community-based fisheries management

CBFMP: Community-based fisheries management plan

CTI: Coral Triangle Initiative

EAFM: Ecosystem approach to fisheries management

EBM: Ecosystem-based management

ECB: Environmental education, capacity development, and social communication

FAO: United Nations Food and Agriculture Organization

FMU: Fisheries Management Unit

IMU: Integrated management unit

ICM: Integrated coastal management

IWM: Integrated watershed management

LMMA: Locally managed marine area

MCS: Monitoring, control, and surveillance

MPA: Marine protected area

SPC: Secretariat of the Pacific Community

TURF: Territorial use rights in fisheries

GLOSSARY OF TERMS

ADAPTATION – Adjustment in natural or human systems in response to actual or expected climate and/or ocean changes or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation include: anticipatory, autonomous, and planned adaptation (IPCC 2001).

ADAPTIVE MANAGEMENT – A systematic process for continually improving management policies and practices toward achieving articulated goals and objectives by learning from the outcomes of previously employed policies and practices. The basic steps of adaptive management are to conceptualize; plan actions and monitor; implement actions and monitor; analyze, use, and adapt; and capture and share learning. Active adaptive management is where management options are used as a deliberate experiment for the purpose of learning (Millennium Ecosystem Assessment 2006).

CLIMATE – Weather averaged over a long period of time, typically over 30 years or more. Climate is what you expect; weather is what you get (IPCC 2001).

CLIMATE CHANGE – A change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer (IPCC 2001).

CLIMATE CHANGE ADAPTATION (CCA) – Actions taken to help society, communities, and ecosystems moderate, cope with, or take advantage of actual or expected changes in climate conditions. Adaptation can reduce vulnerability, both in the short and long term (IPCC 2001).

CLIMATE STORY – The summary of past, present, and potential future climate conditions and their potential impacts on target resources of importance to a community or society. The climate story is developed based on both community-based and scientific observations of climate change and potential impacts on target resources and the provision of ecosystem services.

COASTAL AND MARINE SPATIAL PLANNING (CMSP) – A public process of analyzing and allocating the spatial and temporal distribution of human activities in coastal and marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process. Sometimes used interchangeably with marine spatial planning (MSP) (Ehler and Douvère 2009).

COASTAL MANAGEMENT AREA – See Management area.

CO-MANAGEMENT – A partnership arrangement between key stakeholders (e.g. communities of local resource users, such as fishers, tour operators, coastal developers, etc.) and government to share the responsibility and authority for the management of fisheries and coastal resources, with various degrees of power sharing.

COMMUNITY BASED MANAGEMENT (CBM) – Management planning and implementation carried out by the people and stakeholders in a community.

ECOSYSTEM APPROACH (EA) – A strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way. Often used interchangeably with Ecosystem-based management (EBM) (CBD 2000).

ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT (EAFM) – An approach to fisheries management and development that strives to balance diverse societal objectives by taking into account the knowledge and uncertainties about biotic, abiotic, and human components of ecosystems and their interactions, applying an integrated approach to fisheries within ecologically meaningful boundaries. An EAFM is a practical way to implement sustainable development for the management of fisheries by finding a balance between ecological and human well-being through good governance. The purpose of EAFM is to plan, develop, and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems (Garcia et al., 2003; Food and Agriculture Organisation 2003, 2011).

ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT PLAN (EAFM PLAN) – The output of a planning framework that outlines the integrated set of management arrangements for a fishery to generate more acceptable, sustainable, and beneficial community outcomes.

ECOSYSTEM GOODS AND SERVICES – The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services, such as spiritual and cultural benefits; and supporting services, such as nutrient cycling or waste degradation, that maintain the conditions for life on Earth.

ECOSYSTEM-BASED FISHERIES MANAGEMENT (EBFM) – Considered a component of ecosystem-based management, focused on the fisheries sector. EBFM considers both the impacts of the environment on fisheries health and productivity and the impacts that fishing has on all aspects of the marine ecosystem. Often used interchangeably with an ecosystem approach to fisheries management (EAFM).

ECOSYSTEM-BASED MANAGEMENT (EBM) – A management framework that integrates biological, social, and economic factors into a comprehensive strategy aimed at protecting and enhancing the sustainability, diversity, and productivity of natural resources. EBM “emphasizes the protection of ecosystem structure, functioning, and key processes; is place-based in focusing on a specific ecosystem and the range of activities affecting it; explicitly accounts for the interconnectedness among systems, such as between air, land, and sea; and integrates ecological, social, economic, and institutional perspectives, recognizing their strong interdependencies.” Sometimes used interchangeably with ecosystem approach (EA) (McLeod et al., 2005).

FACILITATOR – A person who manages the interaction of other people to achieve an acceptable outcome for all.

FISHERIES MANAGEMENT – An integrated process to improve the benefits that society receives from harvesting fish consisting of (i) information gathering, (ii) analysis, (iii) planning, (iv) consultation, (v) decision making, (vi) allocation of resources, and (vi) formulation and implementation—with enforcement as necessary—of regulations or rules which govern fisheries activities in order to ensure the continued productivity of the resources and accomplishment of other fisheries objectives.

FISHERY MANAGEMENT UNIT (FMU) – An area of the ecosystem and fisheries that is the focus for management under an ecosystem approach to fisheries management. The fisheries can be any particular types of fishing (e.g. trawl fishery) and/or a particular resource fishery (e.g. shrimp fishery).

FOOD SECURITY – The availability of consistent and sufficient quantities of food, access to appropriate and sufficient foods, and consumption or appropriate use of basic nutrition and food preparation.

FOOD WEB – A system of interlocking and interdependent food chains.

GOVERNANCE OR GOVERNANCE SYSTEM – The way formal and informal rules are set and implemented. It includes the planning and implementation mechanisms and the processes and institutions through which citizens and governing groups (institutions and arrangements) voice their interests, mediate differences, exercise their legal rights, and meet their obligations.

HABITAT – The environment in which the fish and other living marine resources live, including everything that surrounds and affects their life—e.g., water quality; bottom; vegetation; and associated species (including food supplies).

INDICATOR – A variable, pointer, or index that measures the current condition of a selected component of the ecosystem. The position and trend of the indicator in relation to a benchmark indicates the present status of the component. Indicators provide a bridge between objectives and action.

INTEGRATED COASTAL MANAGEMENT (ICM) – An ecosystem approach to managing a coastal area. A continuous mechanism that involves a systematic process for managing competing issues in marine and coastal areas, including diverse and multiple uses of natural resources. ICM puts into practice effective governance, active partnerships, practical coordinating strategies, sustainable financial resources, and strengthened technical institutional capacities. Under ICM, decisions are taken for the sustainable use, development, and protection of coastal and marine areas and resources.

INTEGRATED MANAGEMENT PLAN – The integrated management plan is both a process and a document. Its primary goal is to provide a planning framework to achieve healthy ecosystems and sustainable use of fisheries resources and the process by which a given area will be managed for a period of time.

INTEGRATION – The process of simultaneously and synergistically working toward multiple objectives and goals—for example, the five goals of the CTI-CFF Regional Plan of Action—rather than undertaking separate activities in parallel or sequentially. Integration is carried out at the scale of priority geographies or management areas, including those within seascapes. For governance, integration means working across sectors (Integration guide).

LIVELIHOOD – “How we make our living, the things we use, and the choices we make to ensure that our lives run as we like.” A sustainable livelihood, then, is a livelihood that “can continue into the future despite any changes and disasters and without losing that which makes the livelihood possible. This may include food production or being prepared for natural disasters. It is important to remember that income generation may be just one part of a livelihood” (Govan, 2011).

LOCALLY MANAGED AREA – Any area of coastline and marine waters that is managed by the local community in collaboration with government or non-governmental organizations. This definition was developed to be inclusive of other commonly used terms for this type of locally-based management including: Locally Marine Managed Areas (LMMAs); Territorial Use Rights in Fisheries (TURFs); Community-Based Coastal Resource Management (CBCRM); and Community-Based Management (CBM). LMAs can be a tool for any or all of the following: fisheries management, biodiversity conservation, threatened species management, ecotourism development, and climate change adaptation (Gombos et al. 2013).

MANAGEMENT AREA – The spatial extent of the land and/or water that is identified for management integration. Management areas, which should be as large as possible, may fall under the jurisdiction of one or more local communities, local governments, provincial or national governments, or a combination of all of these. Management areas are ideally defined by ecological boundaries, resource use patterns, and governance jurisdictions. Examples of management areas include seascapes, marine protected area (MPA) networks, and fisheries management units (FMUs). Examples of zones within managed areas include various types of MPAs, various types of FMUs, various types of land-based protected or management areas, and others.

MANAGEMENT GOAL – A broad statement of a desired outcomes. Goals are usually not quantifiable and may not have established timeframes for achievement.

MANAGEMENT MEASURES – Specific controls applied to achieve the management objective, including gear regulations, areas and time closures (see MPA), and input and output controls on fishing effort.

MANAGEMENT OBJECTIVE – A description of a set of activities that, once completed, will achieve the desired outcome. Objectives can be quantified and measured and, where possible, have established time-frames for achievement.

MANAGEMENT PLAN – An explicit set of rules governing how to apply the principles and framework of natural resource management in a given area. This plan may be adapted to changes in the natural and social environment or upon the basis of new information about how a system functions. It may or may not have a legal basis for implementation.

MARINE MANAGEMENT AREA (MPA) – See management area.

MARINE PROTECTED AREA (MPA) – A clearly defined geographical space—recognized, dedicated, and managed through legal or other effective means—to achieve the long-term conservation of nature with associated ecosystem services and cultural values. MPAs include a wide variety of governance types (including community-based areas), and include but are not limited to marine reserves where no extraction is permitted (Dudley 2008; IUCN-WCPA 2008).

MARINE PROTECTED AREA NETWORK – A collection of individual MPAs or reserves operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels that are designed to meet objectives that a single reserve cannot achieve (IUCN-WCPA, 2008).

MARINE RESERVE – A type of MPA or zone within a larger MPA where no extraction is permitted and that is primarily established to “reserve” marine life for the future. Marine reserves are also known as no-take areas, fish sanctuaries, fish refuges, no-take replenishment zones, and fisheries replenishment areas (IUCN-WCPA 2008).

MARINE SPATIAL PLANNING (MSP) – See coastal and marine spatial planning

MILESTONE – A step or event that, if achieved, indicates progress toward the completion of an activity and/or objective. “Milestone” is sometimes interchanged with “benchmark.”

MONITORING, CONTROL AND SURVEILLANCE (MCS) – The overall process and set of activities used to ensure laws, rules, and regulations are complied with.

OBJECTIVE – What is intended to be achieved. An objective should be linked to indicator(s) against which progress can be measured. Positive or negative change resulting from the achievement of an objective is an outcome.

OCEAN ACIDIFICATION (OA) – Ocean acidification occurs when CO₂ from the atmosphere is absorbed into the ocean and reacts with water to create carbonic acid. This decreases both ocean pH and the concentration of the carbonate ion, which is essential for calcification by calcifying marine organisms such as corals (Kleypas et al. 2006).

OCEAN CHANGE – A change in the state of ocean conditions that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties (e.g. temperature, salinity, currents, pH, etc.), and that persists for an extended period, typically decades or longer. Ocean changes of particular concern include ocean acidification, ocean warming, and ocean de-oxygenation.

OPERATIONAL OBJECTIVE – A short-term objective achievable through management intervention.

OUTCOME – The change in status, attitude, or behavior that results from a set of management activities. An outcome should be able to be tracked through measurement and/or observation over time.

PLANNING TEAM – Any “core” planning team for any process should include those individuals committed to facilitating and overseeing the process and completing any associated documents or reports. In addition to the core team, specialized technical experts and partners may be needed to be consulted at different steps

in the process. Depending on the target resources of concern to the community, and the type of process being undertaken, members of the planning team may include technical expertise (from, for example, forestry, coastal resource management, land use, agriculture, tourism, fisheries, transportation, social services, and emergency management services) as well as policy makers, representatives from relevant economic interests, community leaders, and the government or non-government decision-makers that can carry forward the planning team's findings.

PRECAUTIONARY APPROACH – Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation (UNCED 1992).

PRECAUTIONARY PRINCIPLE – Preparing for unknown changes and protecting resources is the best approach for long-term community resilience to keep resources healthy in the long-term. With or without climate and/or ocean change impacts, these are things that will help our community be happier and healthier over time.

PROMOTING AGENCY – The government agency that takes the lead in promoting a new concept, such as EAFM.

RECRUITMENT – The addition of a new cohort to a population, or the new cohort that was added. The magnitude of recruitment depends on the time and life history stage at which it is recorded (Mora and Sale 2002).

SEASCAPE – Large multiple-use marine areas, defined scientifically and strategically, in which government authorities, private organizations, and other stakeholders cooperate to conserve the diversity and abundance of marine life and promote human well-being.

SCOPING – Determination of the broad parameters that a project will involve and affect, including a description of the geographic area, stakeholders, fisheries, critical habitats, and issues on which a project or resource management plan must focus (SPC 2010).

SPAWNING AGGREGATION – A group of conspecific fish gathered for the purposes of spawning with fish densities or numbers significantly higher than those found in the area of aggregation during the non-reproductive periods (Domeier and Colin 2007).

STAKEHOLDER – Any individual, group, or organization with an interest (or a “stake”) in, or who/that can affect or is affected (positively or negatively) by a process or management decision.

SUB-NATIONAL – A geographic or governance area that is smaller than the national level. Sub-national includes all designations of vertical governance structure between the community level and the national level. Examples include province or multi-province, local government unit (or regency) or multiple local governments working together, and other appropriate designations.

SUSTAINABLE DEVELOPMENT – Development (improvement in human well-being) that meets the needs of the present without compromising the ability of future generations to meet their own needs.

SUSTAINABLE USE – The harvesting of natural resources that does not lead to long-term decline of the resource and biodiversity, thereby maintaining its potential to meet the needs of the present without compromising the ability of future generations to meet their own needs.

TARGET RESOURCE – A target resource refers to the social and ecological assets of the community. Social assets may include people, homes, schools, hospitals, roads, business, and livelihoods. Ecological assets may include rivers, sand dunes, wetlands, estuaries, mangroves, coral reefs, and fish. Target resources are the focus of vulnerability assessment and adaptation planning.

TERRITORIAL USE RIGHTS IN FISHERIES (TURF) – A certain territory and certain rights of use relating to fishing within that territory.

U.S. CTI SUPPORT PROGRAM IMPLEMENTATION PARTNERS – Lead national agencies for MPAs, fisheries, and environment; Coral Triangle Support Partnership (CTSP) consortium members and other NGOs; key academic and technical persons involved in setting policy for MPAs; fisheries and climate change; and CTSP field staff who lead projects in each country supported by the US-CTI.

U.S. CTI SUPPORT PROGRAM INTEGRATION SITES – Geographic areas where the integration of MPA, fisheries, and climate change adaptation strategies are being planned and implemented under U.S. government funding and in support of Coral Triangle Initiative goals and objectives.

U.S. CTI SUPPORT PROGRAM PRIORITY GEOGRAPHIES – Broad geographies within which are the project sites, where CTSP is providing technical and financial support for field conservation.

VULNERABILITY – The degree to which a human or natural system is susceptible to, and unable to cope with, adverse effects of climate and/or ocean change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity (IPCC 2001).

VULNERABILITY ASSESSMENT (VA) – An evaluation of the exposure, sensitivity, and adaptive capacity of a target resource to climate and/or ocean change threats. It serves as a primary input to adaptation planning.

ACKNOWLEDGEMENTS

These guidelines were prepared by members of the USCTI EAFM Regional Team: Robert Pomeroy (CTSP), Rusty Brainard (NOAA), Janna Shackeroff (NOAA), Megan Moews (NOAA), Adel Heenan (NOAA), and Nygiel Armada (Program Integrator). Thank you to Andrew Smith, Etuati Ropeti, Annadel Cabanban, Derek Staples, Simon Funge-Smith, and Rudolf Hermes for review and comments.



I. INTRODUCTION

In 2007, the governments of Indonesia, Malaysia, Papua New Guinea, Philippines, Solomon Islands, and Timor-Leste came together to form the Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI-CFF), a multi-government partnership aiming to safeguard the region's marine and coastal resources and the services they provide to society. Supporting the world's most biologically diverse marine region (Figure 1), as well as some one in three of the region's 363 million people dependent upon coastal resources for food security, the Coral Triangle countries endeavored to form what may be the most ambitious regional ocean governance initiative to date.

Under the CTI-CFF, the six Coral Triangle countries (CT6) adopted a Regional Plan of Action (RPOA) with five overarching goals: 1) strengthening management of seascapes; 2) applying an ecosystem approach to fisheries management (EAFM); 3) developing and strengthening the management of marine protected areas; 4) implementing climate change adaptation measures; and 5) protecting threatened marine species.

Applying an ecosystem approach to fisheries management (EAFM) is considered the preferred option and best practice for the long-term sustainability of fisheries and the services that fisheries ecosystems provide to society (e.g., food security, livelihoods, economic security, coastal protection, human health and well-being). Because EAFM is so new in policy and practice, its preeminence in the CTI-CFF Regional Plan of Action—whose first target is to ensure “strong legislative, policy, and regulatory frameworks in place for achieving an EAFM”—represents an ambitious, if not challenging, agenda for this vast and diverse region. Specifically, the CTI-CFF agreed to work collaboratively to “develop a common regional framework for

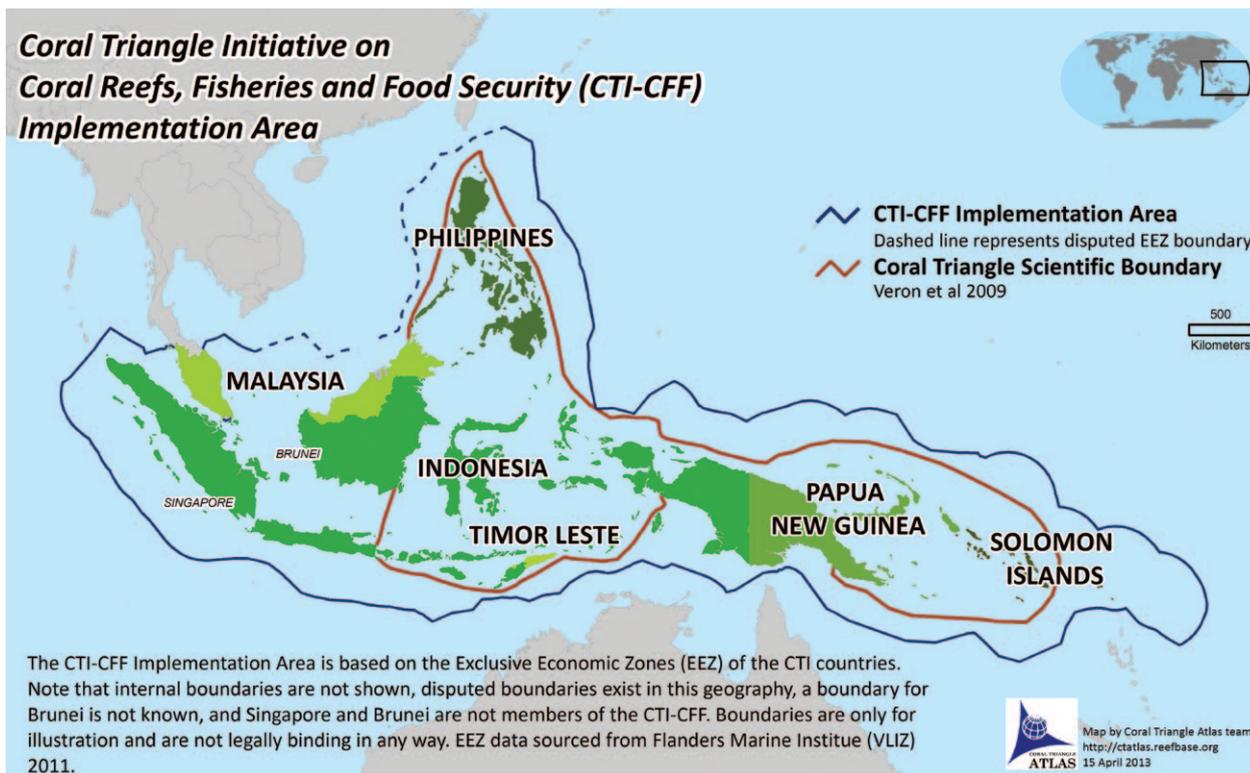


Figure 1: The Coral Triangle Region, showing the coral triangle scientific boundary and the CTI-CFF implementation area based on exclusive economic zones.

legislation and policy that would support EAFM and strengthen regional and national legislation, policies, and regulations.” To do so, the Coral Triangle Regional Ecosystem Approach to Fisheries Management (EAFM) Guidelines or EAFM Regional Guidelines are meant to support the CT6 countries and the CTI-CFF in this process. The EAFM Regional Guidelines describe herein what is meant by an EAFM, explain why EAFM is a preferred option for sustainable livelihoods and food security, and outline basic steps on how to implement an EAFM at various spatial and governance scales across the Coral Triangle region.

This document draws on two prior sets of EAFM guidance documents for the Asia-Pacific region, as well as suggests specific approaches more attuned to the Coral Triangle region, countries, and contexts therein. Of the two guidance documents from which the EAFM Guidelines draw, the Secretariat of the Pacific Community’s (SPC) guidance focuses on community-based EAFM for the Pacific Islands (SPC 2010); the United Nations Food and Agriculture Organization (FAO) Regional Office for Asia and the Pacific developed more conceptual guidelines for the Asia-Pacific region (Staples & Funge-Smith 2009). Providing an EAFM framework for the CT region, as is the purpose of this document herein, therefore integrates the steps for an EAFM at the community level as per the SPC guidelines, with the more conceptual level and larger geographic scale as per the FAO guidelines. In doing so, the EAFM Guidelines for the CTI-CFF strive to enable successful coordination, planning, and implementation of an EAFM within and across regional, national, provincial, and local levels in the Coral Triangle.

In the sections following, this document first describes EAFM as a management paradigm differing from conventional fisheries management in its scale, scope, and approach. While the primary audiences of this document are senior officials and practitioners in the Coral Triangle region’s fisheries management institutions—local, provincial, national, and regional—it is also applicable to the marine, coastal, and climate institutions and communities with specific authority over and stake in components of the Coral Triangle’s

fisheries ecosystems. EAFM necessitates high levels of cooperation, coordination, and participation across sectors (e.g. coastal, climate, development), with the public, and often across jurisdictional boundaries.

Common to all fisheries institutions and practitioners is the fisheries management plan, and the process of envisioning, developing, implementing, and revising it. Because the fisheries management planning process can also be a convening force for the various sectors and stakeholders, this document follows the general description of EAFM with a full description of the EAFM fisheries management planning process. In doing so, it aims to illustrate to all interested audiences—from the central fisheries institutions to the partner coastal, community, and climate institutions, and communities and stakeholders—how each may contribute to and cooperate with the EAFM process. It is important to note that while these guidelines were produced for the CTI-CFF, the guidance provided can be applied to other countries throughout the Asia-Pacific region.

Overall, this document attempts to support the Coral Triangle country leaders' goal of governing fisheries across a six-country region at the scales relevant to ensuring sustainability of fisheries, food security, and other ecosystem services and respecting the different contexts across the vast region. Thus, this document attempts to provide guidance that can (a) serve as a harmonized approach within and across CT countries; (b) be tailored nationally and locally to specific needs and context; and (c) enable the fisheries institutions central to EAFM to guide the cross-sectoral, cross-scale, and participatory process surrounding the management approach and planning process.

2. WHAT IS AN ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT?

“An ecosystem approach to fisheries management and development strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic, and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries” (FAO 2003).

Fisheries in the Coral Triangle, as across much of the globe, are facing significant declines due to local and global threats, as well as ineffective management and governance. Conventional fisheries management not only often fails to stem declines in many fisheries, but also often fails to protect the people, communities, and societies dependent upon healthy and productive fisheries ecosystems for food, jobs, economic development, and coastal protection, among other such benefits. EAFM evolved as a new management approach to better match the scales of fisheries governance with the scales of fisheries, their ecosystems, the people dependent upon them, and the nature of threats facing them all.

What differs in an EAFM versus conventional fisheries management is that, at its core, EAFM seeks to manage fisheries within the context of the ecological and social systems in which they exist. Recognizing the need for an ecosystem approach stems from the increased understanding of fisheries systems holistically: the interactions within and among fish species; the habitat and broader ecosystem; the fish and fishers; fishing communities; and broader social, economic, and governance systems supporting and influencing them (Figure 2).

EAFM is an approach to fisheries management that strives to balance diverse societal objectives by taking into account knowledge about living (including people) and non-living components of ecosystems and their interactions, and by applying an integrated approach to fisheries within ecologically, socially, and governance-wise meaningful boundaries. As such, EAFM requires the inclusion in management of the interactions between the:

- core elements of the fishery (the fish and the fishers),
- habitats (coral reefs, sea grass, mangroves), ecological, oceanographic, and environmental conditions that interact with the fisheries, and
- social, economic, and governance systems surrounding and affecting them.

For the purposes of EAFM, an ecosystem can be defined as “a relatively self-contained system that contains plants, animals (including

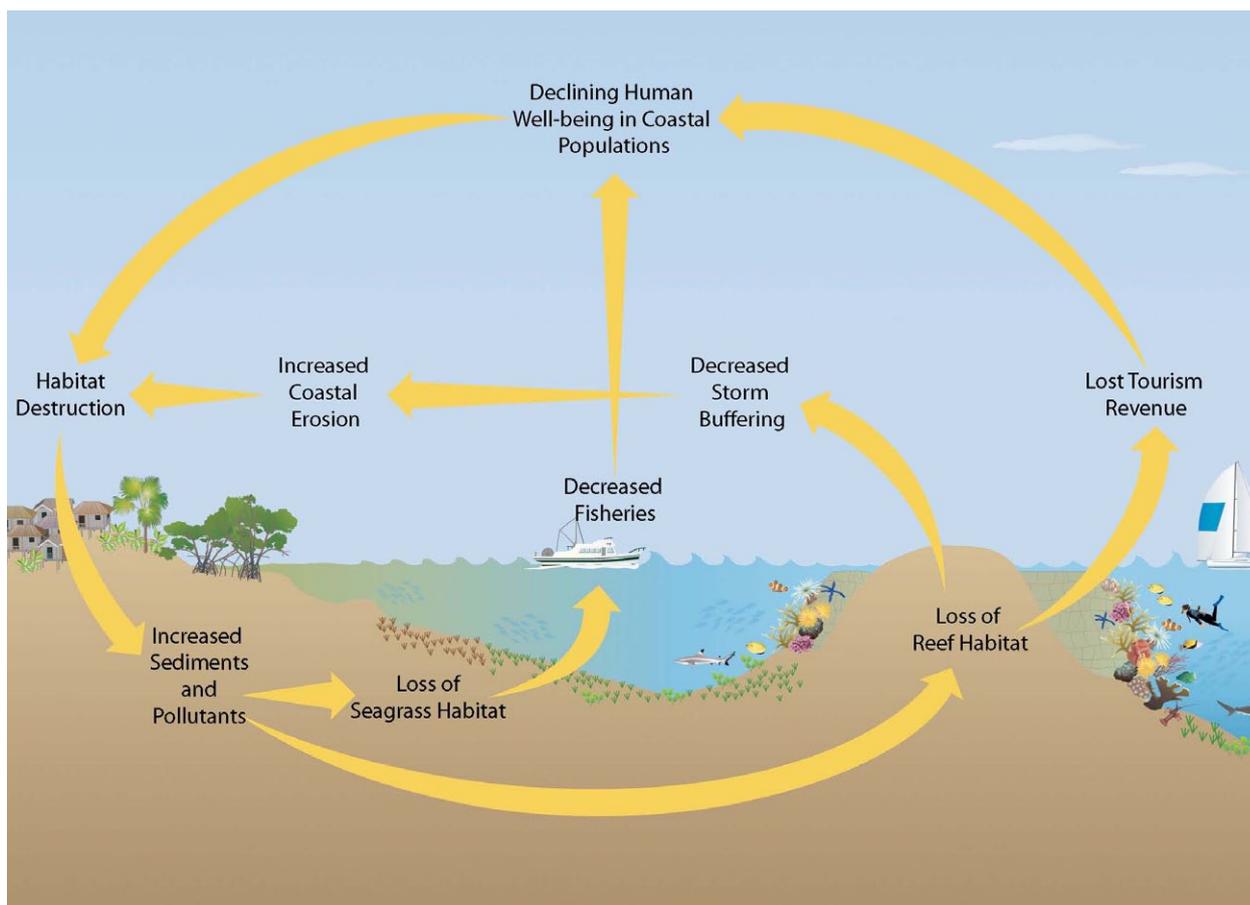


Figure 2: Recognizing Ecosystem-wide connections and effects that different components of the ecosystem can have on each other (UNEP 2011).

humans), micro-organisms, and non-living components of the environment as well as the interactions between them" (SPC 2010).

Managing fisheries in isolation from what they affect and are affected by proves ineffective—the fisheries and the societal objectives they support are unsustainable. Fish species depend upon their surrounding and supporting ecosystems, which are affected by fishing activities and other human activities, as well as natural processes. Fishing can impact marine ecosystems by (1) catching unwanted species (bycatch); (2) causing physical damage to benthic habitats; and (3) disrupting food chains. Other human activities unrelated to fishing—such as agriculture, forestry, coastal development, and introduced species and pathogens—can also affect marine ecosystems, including the many species that comprise them (Figure 3). Human and natural impacts on ecosystems are increasingly being exacerbated by the effects of human-induced climate change and ocean acidification.

Overcapacity (excessive levels of harvest in the fishery) is the single most important factor threatening the sustainability of fish stocks and fisheries that depend on them. Capacity reduction can provide benefits such as increased catches, increased profits, healthier fish stocks, and improved livelihoods for small-scale fishers. However, capacity reduction will create unemployment for and displacement of some fishers from the fishery. The only feasible solution to overcapacity may be based on a coordinated and integrated approach involving a mixed strategy of resource management, resource restoration and conservation, livelihoods and economic and community development, and restructured governance arrangements. The reduction of overcapacity implies an increased focus on people-related solutions and on communities.



Figure 3: Cumulative impacts from a variety of sources including intensive fishing, agricultural impacts, and population increase/development (UNEP 2011).

Therefore, by approaching the ecological and social systems holistically, EAFM goes beyond merely addressing depleted fish stocks by placing controls on fishing activities. Instead, fisheries authorities are replacing target species-based fisheries management with a broader approach that attempts to address the sustainability of the ecosystems upon which the fisheries depend, including the people and economies of coastal communities, fish stocks, and ecosystems, including safeguarding non-target species. EAFM addresses both human and ecological well-being and merges two resource and fisheries-management paradigms aimed at 1) protecting and conserving ecosystem structure and function and 2) providing food, income, and livelihoods for humans.

Sustainable management in the face of long-term, non-fisheries activities that impact marine ecosystems and the associated fisheries, thus, suggests EAFM is concerned about managing issues and resources often outside of the purview of fisheries authorities (Figure 4). Because of the broad issues involved, the full implementation of EAFM requires collaboration and cooperation across and between communities and a diverse range of local, provincial, and national government agencies and communities with overlapping responsibilities for managing activities that impact marine ecosystems and at broader spatial and temporal scales.

The conceptual objectives and principles of relevance for EAFM, selected operational objectives and related measures and actions, and selected implementation issues are discussed in detail in Garcia et al. 2003. There are a number of interrelated guiding principles or conceptual objectives which underlie EAFM:



Figure 4: Considerations for holistic management of an ecosystem. From coastal development, agriculture, offshore energy, and the effects of climate change to small- and large-scale fishing, tourism, recreation, habitats, fisheries, and protected species—the human, natural, and governmental interconnections must all be considered in managing for a sustainable marine ecosystem (UNEP 2011).

- Human and ecosystem well-being
- Resource scarcity
- Maximum acceptable fishing level
- Maximum biological productivity
- Impact reversibility
- Impact minimization
- Rebuilding of resources
- Ecosystem integrity
- Species interdependence
- Institutional integration
- Uncertainty, risk, and precaution
- Compatibility of management measures
- The precautionary principle and precautionary approach
- Subsidiary, decentralization, and participation
- Equity

3. WHAT ARE THE DIFFERENCES BETWEEN CONVENTIONAL FISHERIES MANAGEMENT AND AN EAFM?

EAFM is still an evolving practice, and in the near term it will almost always be an extension of current approaches to fisheries management. EAFM does not replace or diminish the need for many aspects of conventional fisheries management, such as controlling fishing mortality or the need to control fishing capacity in order to avoid economic waste. However, EAFM does differ in substantial ways from conventional fisheries management approaches, which may need to be adjusted to implement EAFM.

EAFM is based on conventional fisheries management but broadens the perspective beyond seeing a fishery as simply “fish in the sea, people in boats,” beyond consideration only of commercially important species, and beyond management efforts directed solely at the harvesting process (Table I). Though there are many differences in implementation strategies, the conventional fisheries management planning process focuses on the assessment and management of target stocks, and management plans may be developed for the fishery and/or for specific fish stocks. The focus of those plans is the target fish stock with no or limited consideration of the sustainable use of the broader ecosystem. In some cases, as in the United States and Australia, conventional fisheries management planning has been transitioning toward ecosystem approaches through inclusion of considerations of essential fish habitat.

TABLE I: A COMPARISON BETWEEN CONVENTIONAL FISHERIES MANAGEMENT AND AN EAFM

| | Conventional Fisheries Management | EAFM |
|--------------------------------|---|---|
| Management objectives | Fisheries sector | Multiple: fisheries, ecosystem, and socioeconomic goods and services |
| Species considered | Target species | All species in ecosystem, particularly those impacted by fishing; habitat-building species |
| Scale | Stock/fishery | Broader ecosystem (spatial and temporal, e.g. longer timeframes accommodating climate change), and social systems relevant to fisheries |
| Assessment method | Stock assessment | Multispecies and ecosystem assessment/ indicators |
| Data | Scientific, largely target-stock specific | Scientific and traditional knowledge; includes components of the ecosystem, people, and governance systems |
| Governance/ management | Top down; fishery specific | Fisheries management institutions at various scales (local, sub-national, national, regional); cooperation across sectors and with communities across scale; participatory management (e.g. co-management); adaptive management |
| Management intervention | Mainly control of fishing | Fishing controls alongside ecosystem tools (e.g. marine spatial planning, MPAs, etc.); integrated coastal zone management; broad-based incentives; livelihoods |
| Stakeholders | Fishers, fishing industry, and associated supporting activities | Fishers, fishing industry, and associated supporting activities; households and communities; associated economic sectors like tourism, energy, agriculture. |

Modified from: FAO 2009



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An EAFM provides a broader framework for management of marine resources to achieve sustainable development through improved **ecological well-being** (e.g. habitat protection and restoration, pollution reduction and waste management, sustainable harvesting of fishery resources) and **human well-being** (e.g. food security, sustainable livelihoods, equitably distributed wealth). An EAFM can be implemented across different spatial and governance scales and can be customized to accommodate prioritization of major issues and objectives.

While promising, EAFM is still evolving, and much remains to be done to implement it effectively in the CT region. In the near term EAFM will most likely be adopted through extension and gradual modification of conventional fisheries management. This process has already begun; for example, in the Philippines, several municipal governments are grouping together to manage fisheries and habitats jointly and on an ecosystem, rather than just jurisdictional, scale.

4. WHAT ARE THE BENEFITS AND COSTS OF AN EAFM OVER CONVENTIONAL FISHERIES MANAGEMENT?

Moving towards a new management paradigm raises questions of the costs and benefits of action and inaction. Looking at Table 1 alone, it is clear that effective implementation of an EAFM may require:

- additional coordination with other sectors and with a more diverse array of stakeholders,
- coverage over a broader geography than conventional fisheries management, and
- more diverse information to support decision-making across sectors and stakeholders, among others.

Many argue that these additional information and coordination requirements will necessitate increased financial resources; however, this is not necessarily so if the cost of not managing efficiently across sectors and aspects of the ecosystem (e.g. habitat) results in the loss of fisheries and economic resources. That is, the cost of inaction could be far more substantial than the cost of implementing an EAFM. Moreover, most conventional fisheries management requires stock assessment of all target resources, which in many areas around the globe is far too expensive to actually be achieved. Therefore, conducting assessments of ecosystem indicators in an EAFM may actually be more cost effective than stock assessments of all target species. Furthermore, as coastal and marine ecosystems and fisheries are increasingly being influenced by climate change and ocean acidification, the benefits of transitioning to an EAFM will likewise become increasingly apparent because fisheries managers and policymakers will be better able to prepare coastal communities and economies for some of the significant ecological, social, and economic changes that will be occurring over coming decades.

5. HOW DOES AN EAFM COMPLEMENT OTHER MARINE AND COASTAL MANAGEMENT APPROACHES?

An EAFM complements most aspects of conventional fisheries management and integrates many other existing approaches to marine and coastal resources management. EAFM can be considered a sectoral management approach, focusing primarily on managing a given sector—fisheries—in a way that is consistent with a wider ecosystem well-being focus (both natural and human). Sectoral approaches fit within broader multi-sectoral approaches—such as ecosystem-based management (EBM) and, to a lesser extent, integrated coastal management (ICM)—which deal with goals for management that include all sectors such as fisheries, mining, shipping, tourism, coastal development, agriculture, and forestry. Within these multi-sectoral and sectoral management approaches are specific management actions that might be chosen to address specific goals, objectives, and needs of a place (UNEP 2011) (Figure 5); for example,

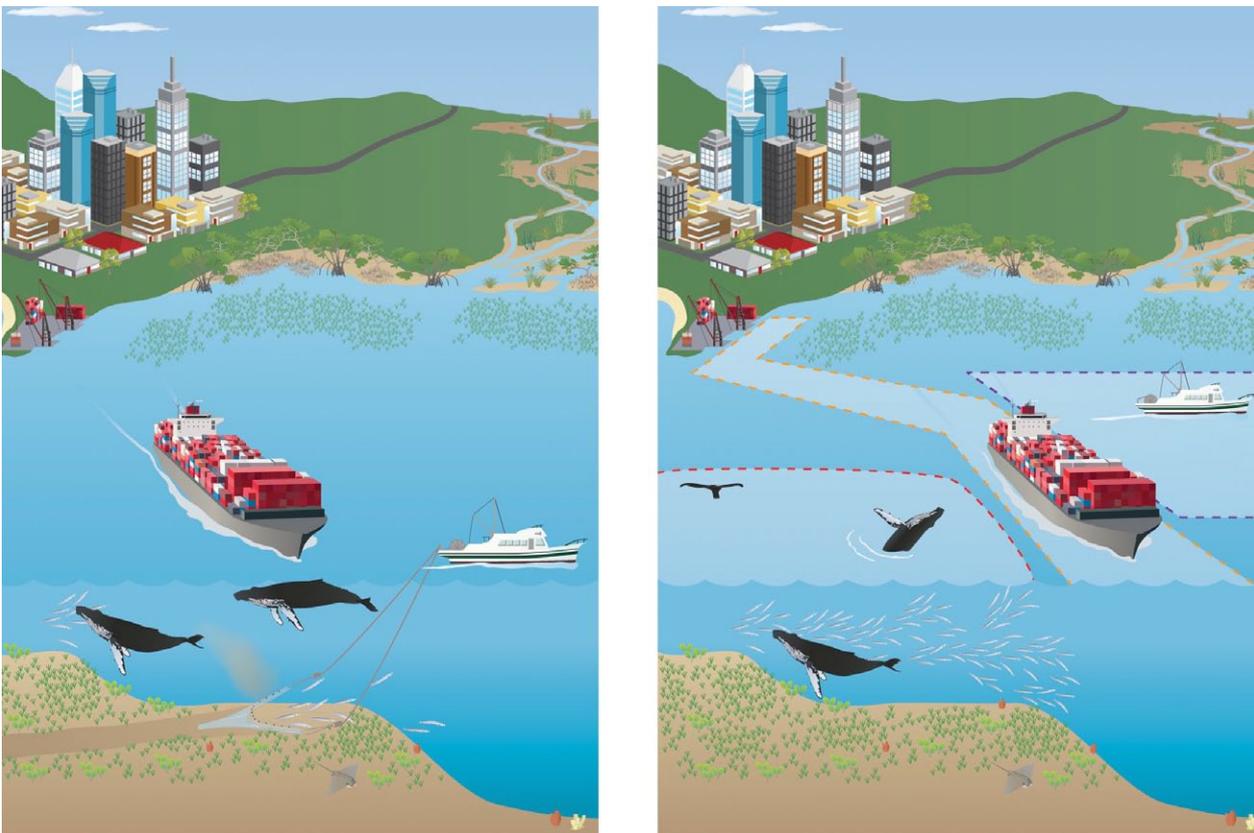


Figure 5: EAFM provides a framework for fisheries management that allows for the management for multiple objectives. By recognizing the potential or existing conflicts between activities that impact or are impacted by fisheries, EAFM provides a framework for accommodating multiple uses and reducing conflict.

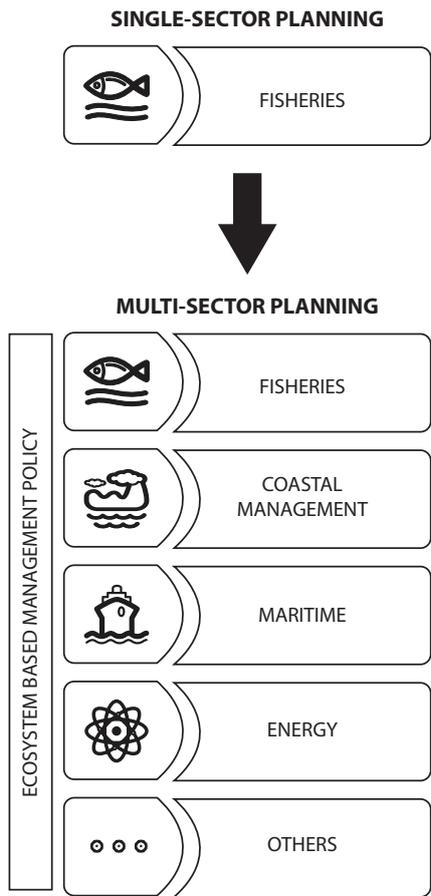


Figure 6: Single to multi-sector planning.

spatial management tools like marine protected areas (MPAs), locally managed marine areas (LMMA), and territorial use rights fisheries (TURFs), or temporal closures, gear restrictions, or traditional management practices. Together, these can address multiple objectives, covering both fisheries management and conservation objectives (Figure 6).

When an EAFM—which focuses primarily on marine resources—is linked with ICM—which focuses primarily on terrestrial and coastal resources—it provides for broader marine and coastal ecosystem-based management (EBM) (Figure 7). EBM focuses on holistically managing entire ecosystems, integrating all of the sectors that are both influenced by the ecosystem or that impact the ecosystem. Hence, EBM necessarily requires inter-sectoral coordination focused on managing to sustain ecosystem function and well-being to provide ecosystem goods and services for society.

With an increasingly widening range of marine and ocean-governance approaches being utilized (e.g. marine spatial planning, large marine ecosystems, ecosystem-based management, integrated ocean management) that deal with the management of several sectors, an EAFM should be one approach purposefully “nested” within and among these broader approaches. All of these approaches recognize that management must deal with broad ecosystem management (including both natural and human components) and try to optimize the social and economic benefits of a marine use activity (Figure 8).

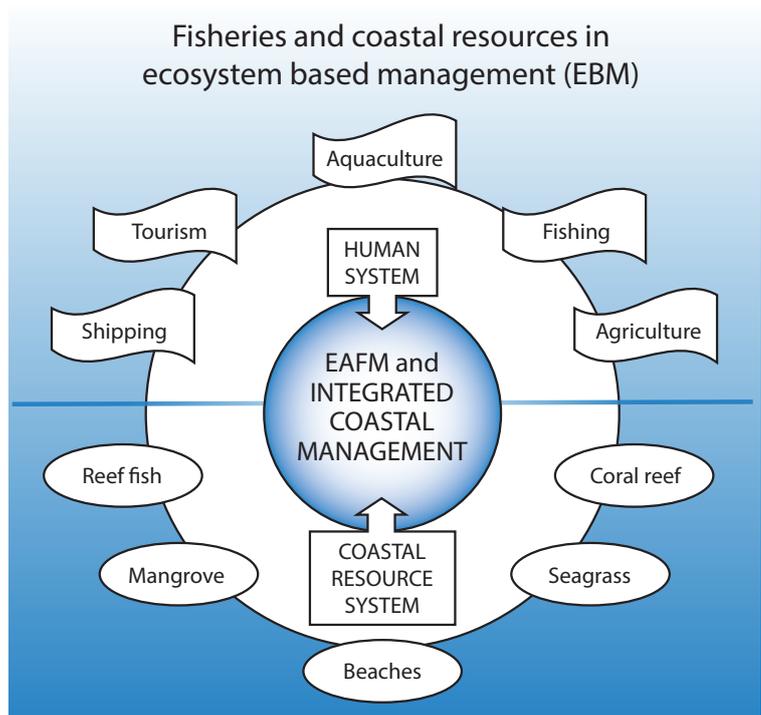


Figure 7: Incorporating considerations of the human system and coastal resource system into a combined EAFM and ICM feeds into the larger theme of Ecosystem-based management (EBM).

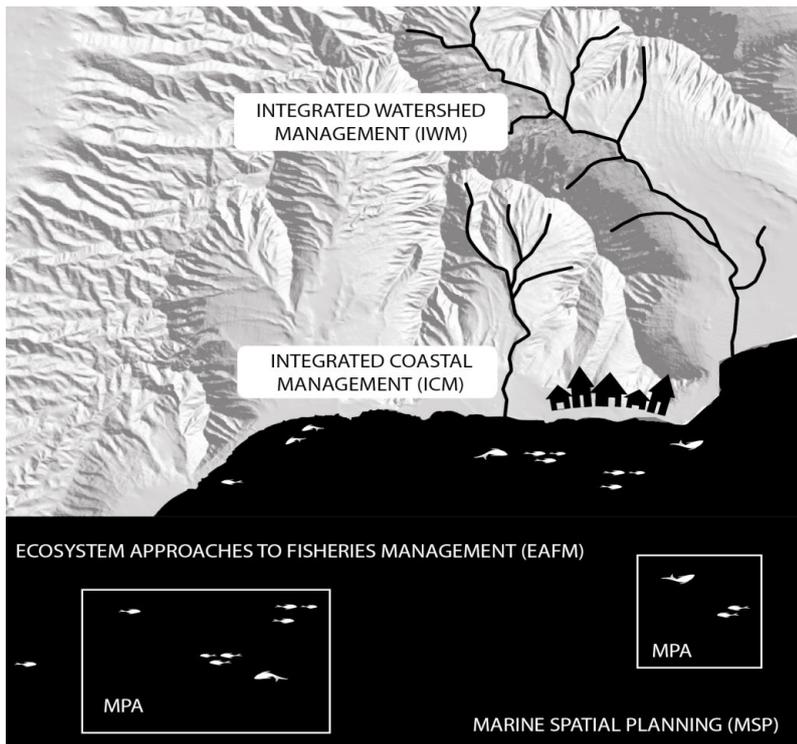


Figure 8: EBM links multiple resource-management approaches (NOAA Fisheries).

As an example, in the Bird's Head region of West Papua, Indonesia, efforts to initiate ecosystem-based management have helped protect the region's marine biodiversity for the benefit of local communities. Those efforts are being achieved through the leadership and commitment of district and provincial governments; the engagement of local communities; and the technical support of non-governmental organizations (NGOs), universities, and other partners. The first stage of that initiative focused on the establishment of a coordinated network of MPAs. Resulting from this work, eight new MPAs have been designated by district governments in the region since 2005, bringing the region's total to twelve. The MPA network was developed with the broader ecosystem in mind and incorporated considerations of the communities' high reliance on coastal resources for food and income. For example, as the team developed zoning plan proposals for the MPA network in the Raja Ampat Archipelago, efforts were made to balance maintaining access to traditional fishing grounds with biodiversity protection.

Over the course of the project so far, it has become clear that additional strategies are needed to address threats like unsustainable coastal development, strip mining, and illegal fisheries, which could not be adequately addressed by the network of MPAs alone. Planners have used photos from aerial surveys (originally intended to assess marine resource use) as evidence of the impact that expanding and poorly managed coastal development, land reclamation, and runoff from road construction were having on mangroves, seagrass, and coral reefs throughout Raja Ampat. The government is now developing spatial management plans nested within broader ecosystem-based management for both the terrestrial and marine ecosystems in the Bird's Head region, and the NGO partnerships remain committed to providing technical support and scientific guidance.

6. WHAT ARE IMPORTANT CONSIDERATIONS IN MOVING TO AN EAFM?

The shift to an EAFM from conventional fisheries management requires thoughtful consideration of a number of important issues and challenges. Primary considerations for adopting EAFM as a new or an evolution of a management approach will involve an **expanded scope of EAFM over conventional approaches**; specifically, EAFM will involve broader: **(a) scale; (b) participation; (c) institutional coordination and cooperation; and (d) knowledge, science, and information**. Alongside the expanded scope of management, moving towards EAFM will involve considerations of the **structure and framework surrounding EAFM**, including: **(e) policy and legal instruments; (f) costs, sustainable financing, and prioritization; and (g) capacity building and development**, underpinning all of which is the need for **(h) good governance**. Finally, there are general considerations of the **management approach**, namely ensuring that management involves: **(i) adaptive management; (j) managing for resilience; (k) the precautionary approach; and (l) clear outcome based objectives**. Each of these considerations is outlined below.

Transitioning towards an ecosystem approach will involve broadening the **(a) scale** of what is being managed—spatially and temporally—and likely will also involve more attention to governing across scales. One of the greatest shortfalls of conventional fisheries management—indeed, conventional environmental management—is the mismatch of scales of governance to the scales of the system being managed. Identifying appropriate spatial, temporal, and governance scales is perhaps one of the most important aspects of transitioning to EAFM. Fish, fisheries, and fishers rarely exist fully within a single management jurisdiction: upstream agricultural and urban runoff can affect fish nursery habitat; fish often swim across jurisdictional boundaries; illegal fishers extract resources from a management jurisdiction; global climate change causes warming in nearshore waters, shifting fish abundance and distribution; the list goes on. Fisheries management quickly becomes ineffective without attending to the relevant spatial scales of the ecosystem (e.g. including habitat, fish nursery grounds in management actions; fishing communities and households particularly dependent upon the ecosystem); without attending to the temporal scale of ecosystem interactions (e.g. seasonal fish spawning aggregations; long timescales of climate change impacts); and without ensuring an appropriate match of governance to the scales of the system (e.g. cooperating across local jurisdictions, sub-national, and national scales).

Establishing and implementing an effective EAFM, thus, should be based on the spatial, temporal, and governance scales appropriate to achieve the prioritized goals and objectives of management. Likely, as will be explored in the following section, the goals and objectives of an EAFM represent those of the fisheries institutions and the stakeholders in the communities involved, and address issues across sector. Scale factors into a plethora of management decisions: for example, in determining boundaries (e.g. defining the relevant fish stocks and habitats to manage); in determining the multiple spatial and temporal scales reflecting the natural hierarchy of the ecosystem (e.g. from large marine ecosystems such as the South China Sea in East Asia to small estuaries such as San Miguel Bay in the Philippines); and in establishing climate change adaptation measures (e.g. counting on uncertainties). In almost all situations, regardless of the

degree of management centralization, EAFM-implementing institutions will need to consider mechanisms to scale up and scale down management decision-making within and across the community, municipality, district, province, national, and regional levels.

There will always be questions about the efficiency of the management arrangement, particularly with respect to the level of centralization in a particular place. With thoughtful consideration, the development of efficient, flexible, and responsive management structures can be achieved and can allow for integration of science, management, and stakeholder involvement across different scales (Figure 9). In other words, the spatial and governance scales need to be adaptive to changes in the human system, such as rapid coastal development, and ecological systems, such as shifts in species distributions associated with climate change or ocean acidification.

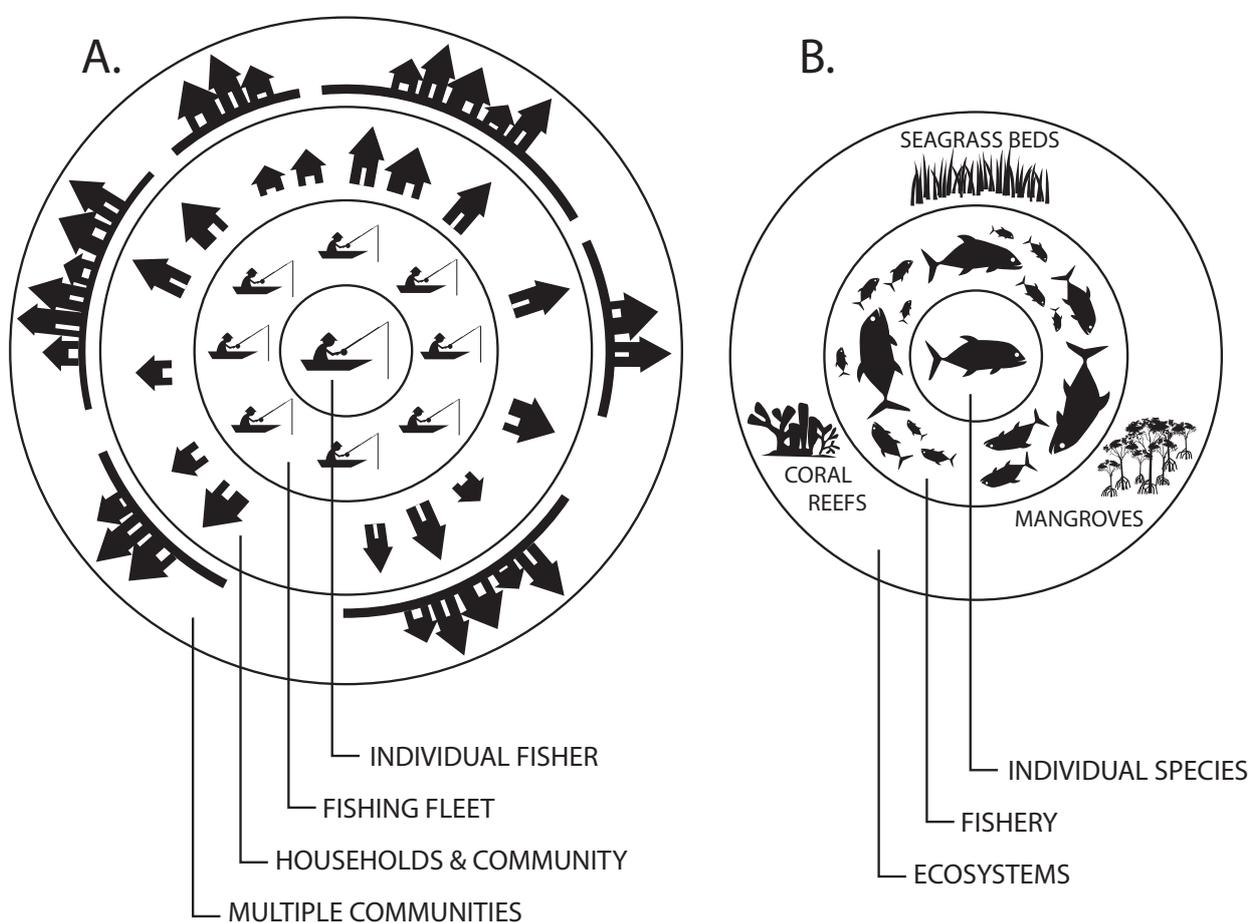


Figure 9: Different scales of management. Whether scaling up or down, vertically or horizontally, EAFM scaling considerations should include both (a) management of the individual fisherman to management of multiple communities and (b) management of the individual species to entire ecosystems.

As an example, in Banate Bay in Iloilo, Philippines, an integrated municipal council (IMC) has been established by several municipalities to manage large bodies of water in which these municipalities have jurisdiction. There is an advantage in having an IMC because several municipalities can pool their meager funds in protecting their fishery resources, and eliminate boundary disputes because their municipal waters are combined together and treated as a single management unit (Pomeroy et al. 2010).

As an example, in the Philippines, the Davao Gulf Management Council (DGMC) was established in November 1999 as a coordinating body organized to harmonize coastal resource management programs, projects and policies of Davao Gulf. The Davao Gulf area includes four provinces (Davao del Sur, Davao del Norte, Compostela Valley, and Davao Oriental) and the City of Davao. The DGMC represents five coastal cities and 18 coastal municipalities. Regular members of the DGMC are the respective mayors of the component cities and municipalities and government agencies. Each of the local government units (LGUs) regularly contributes financially to support the operations of the council, with the amount dependent upon the income class of the LGU.

Broadening both **(b) stakeholder participation** and **(c) coordination and cooperation across institutions** and sectors in the management process is a central principle of an EAFM. As described above, there are more people, households, and communities interacting with and who care about the fishery and its surrounding ecosystem than conventionally recognized. Establishing and the use of participatory processes is fundamental to sustainability and is fundamental to EAFM (as well as EBM, MPA networks, etc.). Cooperative or co-management is a participatory approach that can be used to implement an EAFM with increased stakeholder participation, in which the communities of local resource users (e.g. fishers, tour operators, coastal developers, etc.) and government share the responsibility and authority for the management (Figure 10). The inclusive, participatory method of EAFM engages and helps to address the interests of poor, small-scale fishers and other marginalized parts of society, such as women's groups. This can lead to more equitable benefits from the harvest and post-harvest activities and, ultimately, improved human well-being.

Alongside higher levels of stakeholder participation in EAFM is the parallel need to engage across multiple sectors affecting the fishery ecosystem, such as the ministries or institutions with management authority over fish, coasts, and climate as well as associated sectors like mining, energy, agriculture, and tourism, among others. Many of the issues threatening marine ecosystems are typically outside of the mandate of fisheries agencies, and governance under EAFM includes the coordination and cooperation between government agencies. This might include sharing data and information, supporting local implementation, and harmonizing work plans and budgets. Management decisions matched to the spatial scale of the ecosystem; to the programs for monitoring all desired ecosystem attributes (ecological, social, and economic); and to the relevant management authorities (national to provincial to local) are likely to be more successful in achieving ecosystem objectives. Moreover, an EAFM should be integrated with other sectoral and environmental management approaches—such as integrated coastal management (ICM) and integrated watershed management (IWM)—that address terrestrial and terrestrial/marine management.

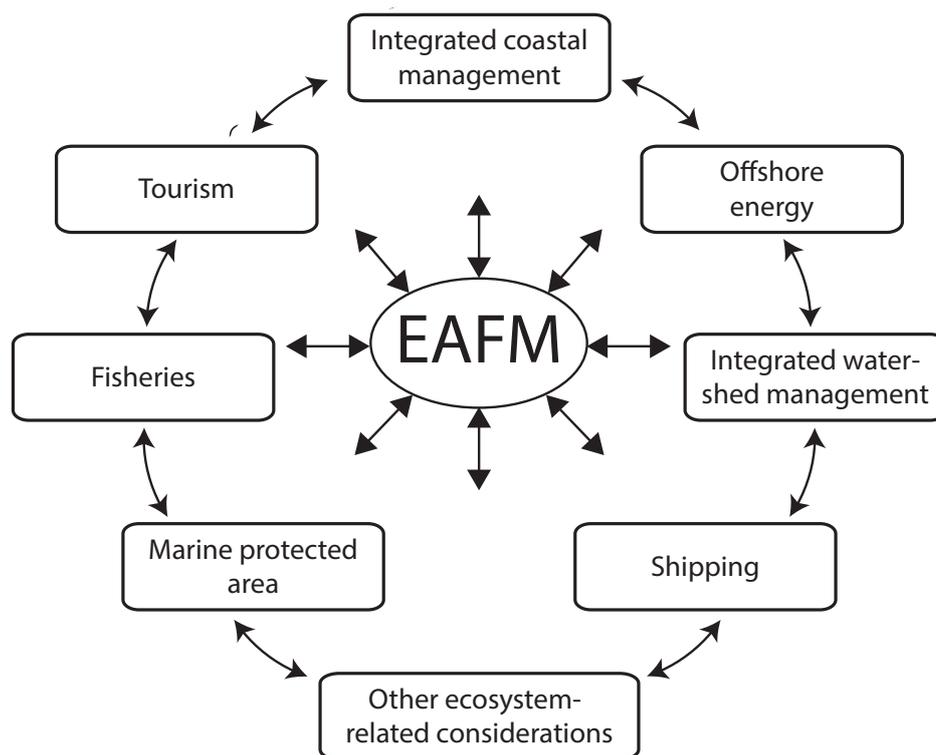


Figure 10: Coordination, cooperation and consultation.

An EAFM involves a broadening of conventional fisheries management practices for effective management. Rather than focusing on stock assessments of target species, an EAFM will rely upon the best available **(d) knowledge, science, and interdisciplinary information**, and will seek to establish monitoring and evaluation on the relevant components of the ecosystem: fisheries and fish stocks, habitat, oceanographic and environmental conditions, households and communities, and human activities, amongst many others. While new knowledge and information are often needed or more complex and sophisticated quantitative models often desired, EAFM can begin by gathering existing information and transitioning over time to more sophisticated information gathering. Therefore, it is important to coordinate the collection of information across agencies and experts and non-governmental organizations to understand the ecological, social, and economic properties of the fisheries management unit, including the interactions between these properties. Furthermore, EAFM is participatory, and traditional ecological knowledge, local knowledge, and indigenous knowledge is also used in the decision-making process.

As a starting point, basic knowledge and information can be gathered by any institution on the following questions: (1) what are the resources (target fisheries, habitats, households and communities, etc.), (2) where are they (spatial distribution over time), (3) what are the threats to these resources (polluted runoff, destructive fishing, climate change, ocean acidification), and (4) how and why are resources changing in response to the threats? Management institutions and practitioners can make substantive management decisions based on existing information and strive to design information collection; the lack of scientific data and certainty should not be used as an excuse not to act. Moreover, local fishers and the traditional knowledge of local people and community members, while not always in written form, nevertheless constitutes a wealth of information that can both inform as well as enable higher levels of stakeholder engagement. All sources, be they scientific or local/traditional, should be verified or validated wherever possible. Over time, information to support EAFM should be co-produced by fishers, managers, agencies, and external agents (e.g. scientists and non-governmental organizations).



An EAFM is rarely an integral part of national fisheries **(e) policy and legislation** which can lead to many deficiencies in current fishery management regimes, such as (1) weak cross-sectoral consultation and cooperation and (2) the failure to consider, or a legal inability to act on, external influences such as land-based pollution and habitat deterioration. Such problems need to be addressed and corrected where required. Particularly in the case of national policies and laws, an EAFM may require that existing legal instruments and the practices of other sectors that interact with or impact on fisheries need to be considered. There may need to be adjustments made to those instruments and practices pertaining to other sectors to support EAFM. A supportive EAFM policy framework should include harmonized national and local legislation and policies, as well as enable management approach that is precautionary, adaptive, and resilience-focused in the face of a changing world.

An EAFM is a widely accepted concept and various international instruments support its application. At the international level, the principles of an EAFM are reflected mainly in voluntary instruments such as the UN Conference on Environment and Development, the Convention on Biological Diversity, the FAO Code of Conduct for Responsible Fisheries, and the 2002 Plan of Implementation of the World Summit on Sustainable Development. These instruments have been adopted by national parties in each of the CT6 countries, although they have not been fully integrated into their national fisheries laws and policies. These EAFM Regional Guidelines will assist the CT6 countries in being able to fully meet these international obligations.

Quite possibly, institutions transitioning to EAFM may experience increased **(f) costs** of management, depending upon the needs for additional data and information; increased coordination, planning, consultative decision-making, and staff; and a wider scope in monitoring, control and surveillance (MCS), and enforcement. While some of these management costs will likely increase, consideration should also be given towards **prioritizing** and eliminating some activities that may no longer be needed under an

EAFM. The question of who pays for these potentially higher management costs should also be an important consideration. Should government pay? Should there be user fees? Should costs be shared between government and users? If users should pay, how much and how will user fees be established and implemented? If government should pay, what will be the source of funds? Remember that EAFM is an approach that builds upon and can be implemented increasingly over years; it does not have to happen all at once. Due to the often limited resources of fisheries agencies, applying an EAFM requires a process of prioritization to identify which areas need more attention or pose greater environmental and economic risk.

(g) Capacity building and development likely will be required to transition to an EAFM due to the very common and critical challenges of inadequate capacity and technical expertise to implement EAFM holistically and the increased demands of an EAFM, as well as difficulties in retaining good staff in the government sector. Capacity development, as a continuous process and need, may include enhancing institutional understanding what an EAFM is; how to organize and participate in it; effective communication with stakeholders; administration and business matters; coordination across sectors; and participation in negotiations. In the context of climate change and ocean acidification—fisheries in a changing world—many institutions around the world will likely need to grow staff skill sets to deal with pending ecosystem changes. For all matters of capacity building, development, and sustainable financing, cooperation with development partners can benefit both the technical expertise and innovation through peer learning needed to adapt to such a quickly changing world.

Guiding the prospective adaptation of the institutional and legal frameworks to an EAFM should be the idea of **(h) good governance**. Governance is a term describing how political, economic, and administrative and other forms of power or authority are exercised to manage a country's resources and affairs. Thus, governance comprises the mechanisms, processes, and institutions through which citizens and groups voice their interests, mediate differences, exercise their legal rights, and meet their obligations (AusAID 2000). This broad term is used to explain, amongst other things, to what extent governments are accountable to, and allow participation by, the public (Coffey, undated).

While the concept of governance is descriptive, the idea of good governance is standard-setting, i.e., normative in nature. The exact meaning varies according to the policy area in question but the general principles of good governance are seen to involve (UNESCAP 2007; OECD 2007): accountability, transparency, responsiveness, effectiveness, efficiency, and rule of law. Further principal elements of good governance are: consensus-orientation, participation, equality and inclusiveness, decentralization (UNESCAP 2007; OECD 2007), and forward vision, the latter implying the government's ability to anticipate future problems and issues based on current data and trends and develop policies that take into account future costs and anticipated changes (e.g. demographic, economic, environmental, etc.) (OECD 2007).

Good governance is an element needed in implementation of EAFM, as it should ensure both human and ecosystem well-being and equitable allocation of benefits as a condition for compliance. In fisheries, where management and exploitation occur largely out of public view and scrutiny—even given that the fishery is often managed by the public sector—accountability is of great importance. As a means of ensuring accountability, access to information and transparency in policy are critical. This access is also a precondition for meaningful public participation in decision-making. Policy effectiveness can be improved by decentralized management, as measures can be tailored to local needs and increased opportunities be given to local stakeholder participation in decision-making (Coffee, undated). In terms of the legal framework for good governance for fisheries management, the FAO Code of Conduct on Responsible Fisheries, although non-binding, refers to the need for increased transparency for within the decision-making process and to ensure that timely solutions to urgent matters are achieved. In addition, states are called upon to facilitate consultation and effective participation in decision making (Article 6 of the Code).

The adoption of an EAFM approach assumes that there is political will to actually undertake the changes needed for EAFM implementation. The rapid turnover of high-level policy staff in government and short political terms does limit the long-term strategic implementation of an EAFM. This emphasizes the need for longer term commitment which spans the short term appointment and three-year planning and budget horizons.

Similarly, the balance of ecological and societal well-being in EAFM suggests the need for a management approach that is at once adaptive, managing for resilience, and precautionary. Finally, developing clear outcome-based objectives will be critical to achieve effective implementation.

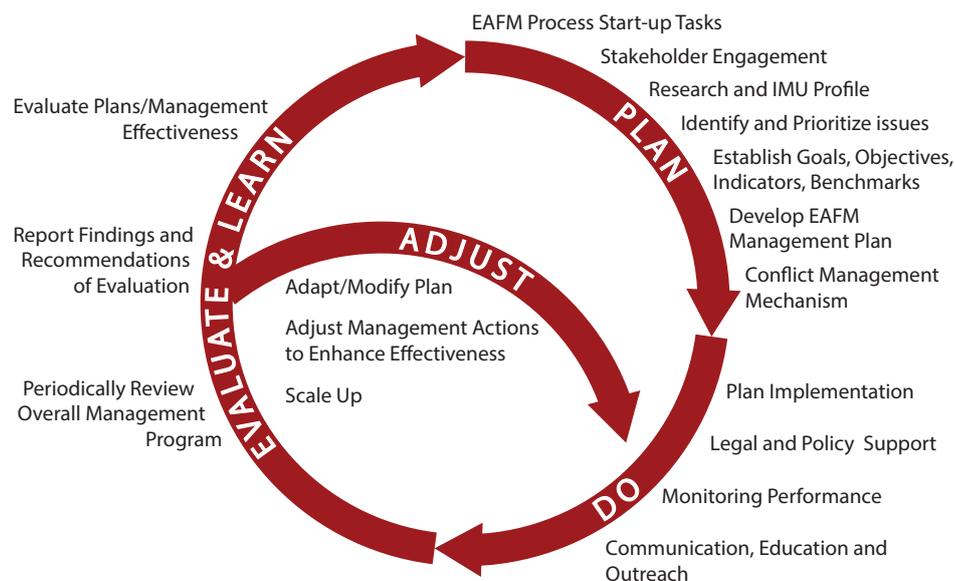


Figure 11: The adaptive management cycle, a process to learn by doing (CSIRO).

(i) Adaptive management is the process of testing assumptions in order to learn and adapt future action. It differs from the conventional practice of fisheries management by emphasizing the importance of feedbacks from both the fishery and supporting ecosystem in shaping management decisions, followed by further systematic experimentation to shape subsequent management decisions, and so on. In the commonly data-limited and information-limited conditions of EAFM, adaptive management presents a way for EAFM decision makers to systematically and timely “learn-by-doing” and test-learn-adapt various management actions, policies, and interventions.

People in fishing communities are vulnerable to the compounding effects of stresses within fishery systems, as well as to ecological and social forces outside their domain of influence. Building the adaptive capacity of ecosystems and of people is, therefore, central to realizing the conservation, social, and economic potential of fisheries (Andrew and Evans 2011); this is the essence of **(j) managing for resilience**. When integrated within the EAFM’s overarching legal and policy environment, resilience approaches have the potential to profoundly improve fisheries management. Resilient ecosystems and fisheries may be defined such that they “absorb stress and reorganize themselves following disturbances, while still delivering ecosystem goods and services derived from the fishery” (Figure 12). Over thousands of years, coastal communities in the CT region have evolved in an environment characterized by extreme, cyclical climatic variations. The fact of their continuing existence indicates that the social-ecological systems (SES) of these communities have adapted to these disruptions—they have developed a degree of resilience. EAFM and managing for resilience are compatible with each other.

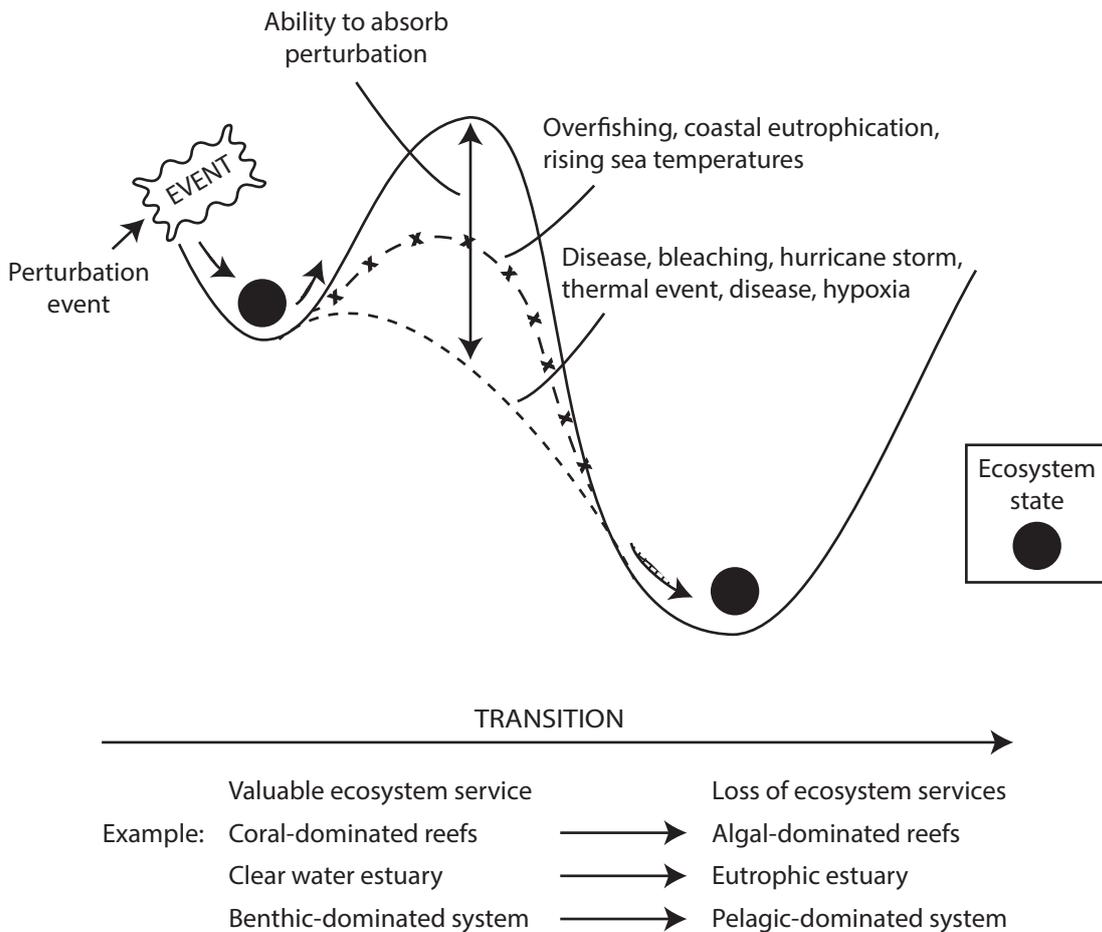


Figure 12: System thresholds and resilience. Natural or anthropogenic impacts can drive the system (which can be social or ecological) into a new, often undesirable and difficult to reverse state with reduced ecosystem services. The ability of the system to absorb these events (termed resilience) can depend on the additional natural or anthropogenic threats that the ecosystem is subject to, such as fishing pressure, coastal eutrophication or bleaching events. Less resilient systems can shift from a desired ecosystem state with valuable ecosystem services, towards a less desirable state where ecosystem services are lost. More resilient systems have a greater ability to absorb these events without shifting into an undesired state.

The **(k) precautionary approach** involves the application of prudent foresight to deal with uncertainties in fisheries systems, and it implies both the explicit consideration of possible undesirable outcomes and the inclusion of appropriate contingency and mitigation measures. Undesirable outcomes include not only overexploitation of fishery resources and negative environmental impacts but also unacceptable social and economic outcomes. An important component of the precautionary approach is to establish legal and social frameworks, including the control of access to fisheries. Because uncertainty can be expected to be greater when widening fisheries management to include ecosystem considerations, such as climate change and ocean acidification, the precautionary approach gains even greater importance within an EAFM. To implement a precautionary and adaptive EAFM management system, the managers should develop, in cooperation with the stakeholders, a set of **(l) clear outcome-based objectives** that are internally consistent and acceptable through compromise with the stakeholders. Reconciling the needs of multiple stakeholders utilizing resources from the same ecosystem, as well as dealing with ecosystem change and uncertainty, will be far more difficult if there are unclear or competing objectives.

7. HOW DO WE IMPLEMENT AN EAFM?

Implementing EAFM will vary depending on each government's (national, provincial, municipal, etc.) circumstances, laws, policies, administration, resources, uses, and socioeconomics, among other factors. What is common to all fisheries management—indeed, all environmental management—is the use of a management-planning process to develop a management plan. Therefore, for the remainder of this document, the EAFM Regional Guidelines describe fully the EAFM management-planning process and what is needed in the



EAFM plan itself, so as to demonstrate fully how to implement an EAFM. The primary audiences of this document are fisheries management institutions and officials—regardless of whether they are at the local, provincial, or national scale, or are a government institution or local community, because all likely use fisheries management plans as a primary tool of fisheries management implementation. In addition, since the management-planning process can help to convene all applicable agencies and stakeholders, the focus for the remainder of this document attempts to demonstrate the roles for each type of institution, practitioner, and stakeholder in the planning process and in implementing an EAFM.

7.1 GUIDANCE ON IMPLEMENTING AN EAFM PLAN

At the heart of the EAFM process is an integrated management plan: developed, implemented, monitored, and reviewed in a multi-year cyclical process. Not only does the EAFM plan explicitly identify management strategies and actions, it also identifies roles and responsibilities among the agencies, partners, and stakeholders and includes stakeholder involvement throughout the management process. Through the management plan, the implementing partners put forth an EAFM that is adaptive, precautionary, tuned to resilience, and centered on goals that are relevant to the scale and scope of EAFM.

These guidelines draw from the FAO (2003, 2009) and SPC (2010) guidelines to recommend an approach for the Coral Triangle region, allowing for harmonization within the cultural, environmental, and governance contexts of the Pacific Islands and Southeast Asia jurisdictions therein. See Figure 13 and 14 for schematics of the planning process for EAFM set out by the FAO and the SPC, respectively. The FAO (2009) and SPC (2010) guidelines are similar in emphasizing: (1) a management-planning process with high stakeholder engagement in the planning process, as well as throughout management implementation; (2) cross-sectoral coordination through the planning process, as well as in implementing management activities; (3) considering ecosystem scales (broader spatial and temporal scales) in planning

and management activities; (4) considering the interactions that occur between fisheries and ecosystems; (5) considerations of management measures to manage not only fisheries resources but ecosystems and habitats; and (6) managing in a precautionary and adaptive manner. These considerations—which reflect the considerations of EAFM as a holistic management paradigm—are emphasized in the remainder of the document. Furthermore, since the FAO guidelines are very broad and conceptual and the SPC guidelines focus on community-based and co-management, this document herein brings them together and adds a bit more detail applicable to all types of fisheries management institutions (local, provincial, national, and from other sectors).

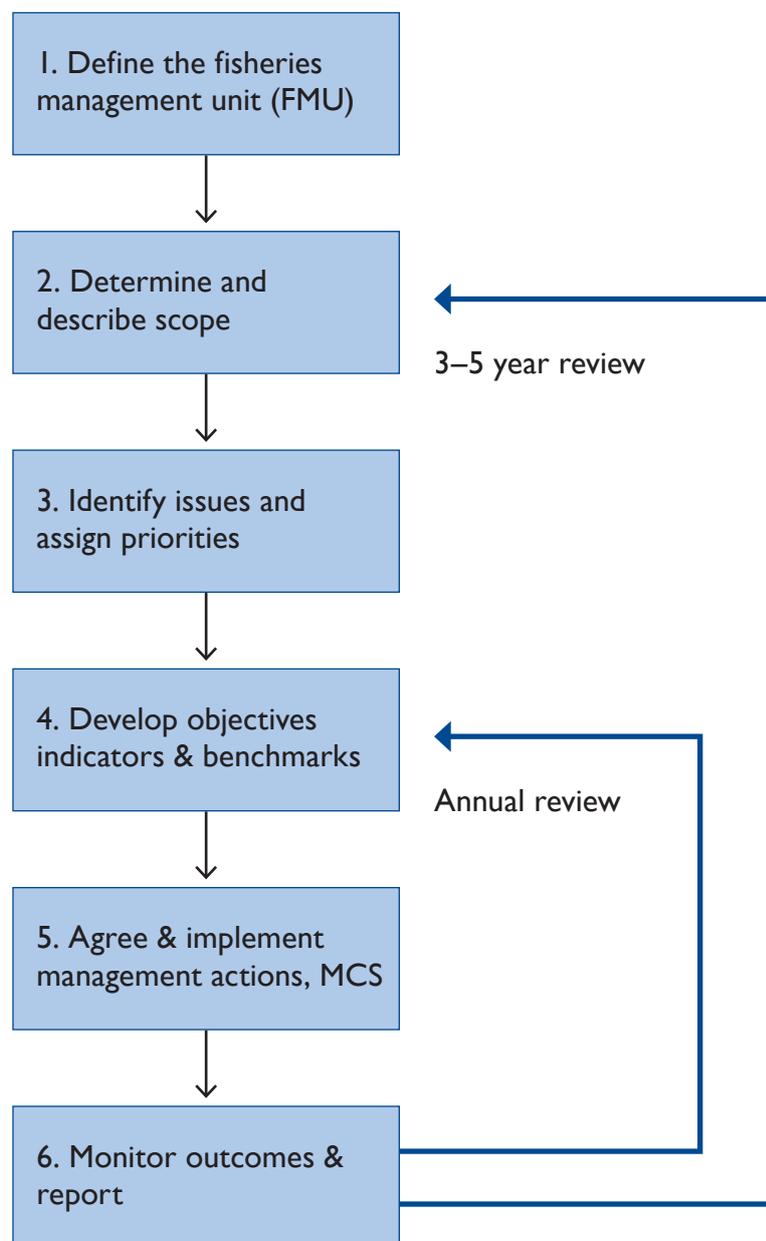


Figure 13: FAO EAFM planning process (FAO 2009).

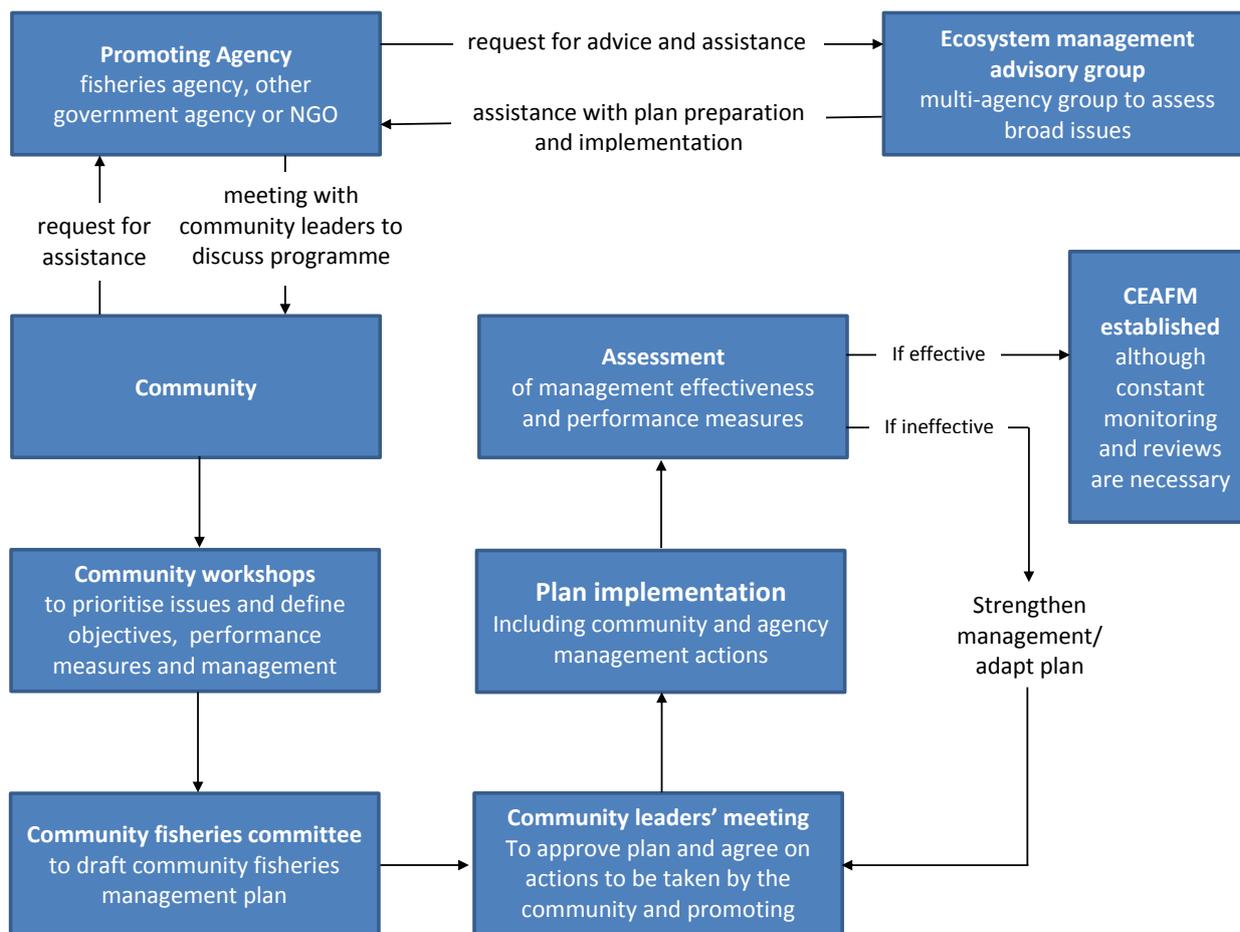


Figure 14: SPC EAFM planning process for a community level plan (FAO 2009).

7.2 AN EAFM PLANNING PROCESS (THE FIVE STEPS)

What follows is a five-step process for EAFM planning in the Coral Triangle region. While specifically written to help the CTI-CFF and CT6 countries meet their EAFM objectives in the RPOA and in national plans of action, these guidelines should be applicable to most tropical marine and coastal fisheries-management settings. This document draws from both the FAO's six-step process (2003, 2009) and the SPC's four-step process (2010) guidelines, and in doing so expands more descriptively the step-by-step process and enables better operationalization to reach the same endpoint. EAFM planning is intended to be cyclical, occurring at regular intervals (e.g. every five years) and as necessary based upon unexpected events (e.g. following unexpected changes in resource or community needs).

An EAFM is an adaptive management process in which stakeholder participation and a co-management approach play a central role. The process begins with a scoping phase, during which concerns over both fishing and non-fishing activities and social well-being are identified, along with the broad geographic area to be managed. Issues relevant to the EAFM plan will be ecological (e.g. fishing effects on habitats and ecosystem resilience, target and by-catch species); societal (e.g. related to livelihood options, health and safety, post-harvest and processing, and interactions with other sectors); and related to governance (e.g. institutional, consultation, and external drivers). Stakeholders, as well as management institutions across scale and sector, are engaged in all phases of the management cycle, including in deciding on priority issues to be addressed and the goals and objectives to the EAFM plan. Management institutions will

identify management strategies and actions to implement, and how to enforce them, to meet plan goals and objectives. An essential component of an EAFM is the identification of indicators that can be used to scientifically assess whether the goals and objectives of the EAFM management plan are being achieved and to review the effectiveness of management actions. This information is then used to adapt and revise the EAFM management plan as necessary.

The following five steps (plus a pre-step for start-up tasks) make up the EAFM planning process. It should be noted that the EAFM planning process is dynamic rather than linear, often cyclic as it evolves, and adaptive (Figure 15).

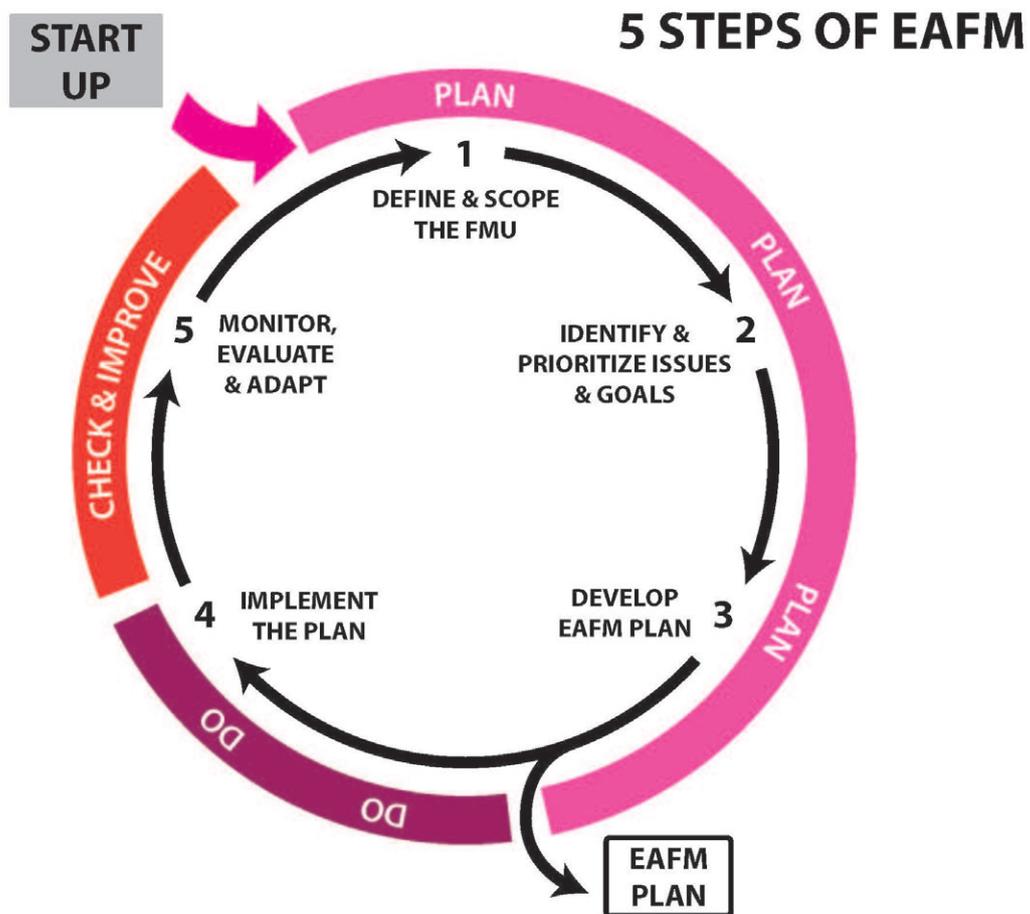


Figure 15: The five-step EAFM planning process.

PRE-STEP: Start-Up

- A. Prepare the ground
- B. Engage stakeholders

PLAN

Step 1. Define and scope the Fisheries management unit (FMU)

- Step 1.1 Define the FMU
- Step 1.2 Agree on the FMU vision
- Step 1.3 Scope the FMU

Step 2. Identify and prioritize issues and goals

- Step 2.1 Identify threats and issues
- Step 2.2 Prioritize threats and issues
- Step 2.3 Define the goals of the EAFM plan
- Step 2.4 Consider issues, constraints, and opportunities to achieving goal

Step 3. Develop the EAFM plan

- Step 3.1 Develop operational objectives
- Step 3.2 Develop indicators and benchmarks
- Step 3.3 Manage actions and compliance
- Step 3.4 Financing mechanism
- Step 3.5 Finalize the EAFM plan

DO

Step 4. Implement the EAFM plan

- Step 4.1 Formalize, communicate, and engage
- Step 4.2 Governance check
- Step 4.3 Co-management for implementation
- Step 4.4 Conflict management

CHECK AND IMPROVE

Step 5. Monitor, Evaluate and Adapt

- Step 5.1 Monitor performance of management actions
- Step 5.2 Evaluate and adapt the plan

What follows is a more detailed discussion of each of the steps and sub-steps of the EAFM planning process:

PRE-STEP: START-UP

Set-up tasks needed to initiate the EAFM process, many of which will be undertaken in more depth in latter steps of the EAFM planning process, are undertaken initially by the promoting agency. Later, these tasks may be directed by the EAFM team and facilitators (Activity A1 below).

In a local context, as stated by SPC (2010): “Preparation for working with communities consists of designing a culturally appropriate process. Under the SPC methodology, the process or model results in the development of a community-based fisheries management plan (CBFMP). The process has to be adapted to suit the traditional and cultural systems in each country. In many countries, the process will involve working with, or through, traditional community leaders or institutions while still allowing ample opportunities for other community groups to participate.” Cultural and social context will be important considerations in working with stakeholders in all places and at all scales; at the national scale, for example, the primary facilitators may wish to consider how to engage and facilitate given the particular cultural and institutional context of the various sectors that will be engaged in the planning process.

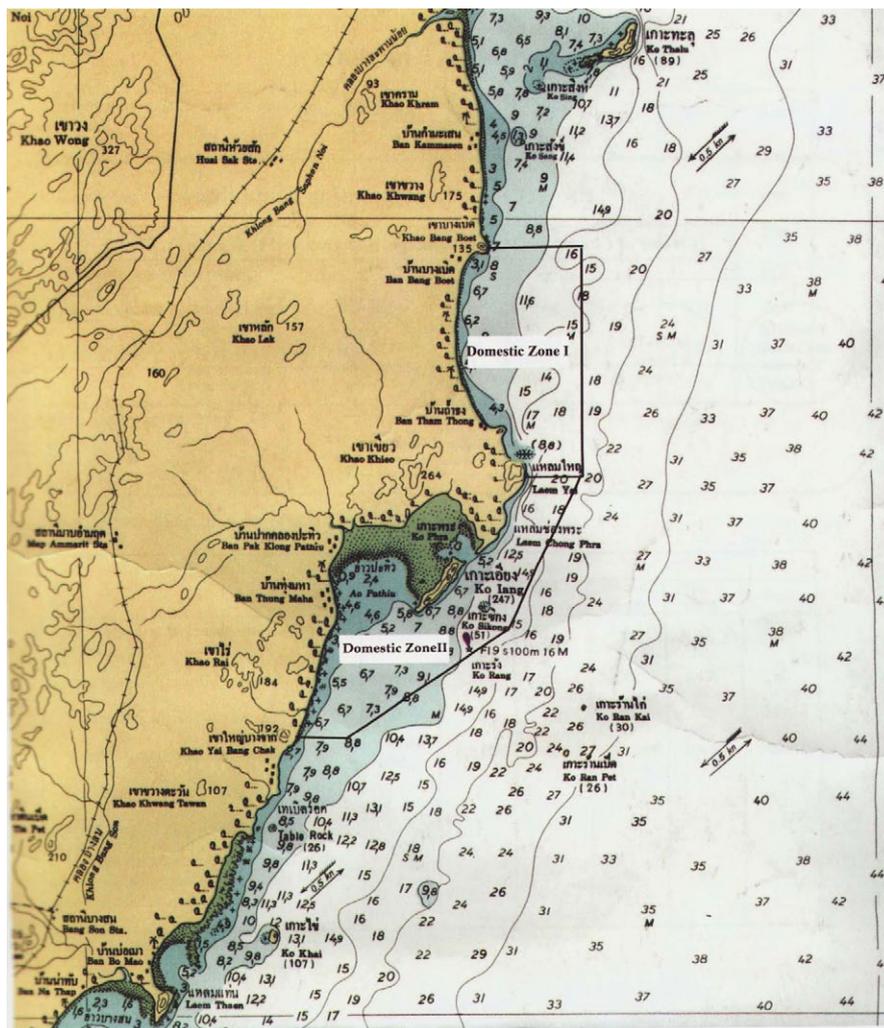


Figure 16: Coastal area with marked jurisdictional boundaries.

A. PREPARE THE GROUND

A1. IDENTIFY EAFM TEAM AND FACILITATORS – The promoting agency for EAFM (e.g. a government fisheries agency) establishes a team to guide the EAFM planning process. The team members will include, but not be limited to, representatives of government fisheries and environment agency staff and task experts (e.g. community organizing, conflict management). An independent and professional facilitator(s) should work alongside the team and will play a key role in consulting stakeholders during the EAFM process. The lead institution should be the fisheries agency (at the appropriate level). A team leader is identified to lead the planning process. The facilitator will, for example, be responsible for ensuring fair representation of all stakeholders groups, facilitating a transparent and fair decision-making process and clear two-way communication of information. The team will consult with fishers and other stakeholders in the area.

A2. DEVELOP START UP WORKPLAN – A start-up workplan outlines a set of planning activities to be undertaken during the preparation phases of implementation (for example, research activities), the sequence of activities, and the individual responsibilities for each activity. The workplan should set forth as precisely as possible what planning activities will be undertaken, by whom, when, and under what budget.

A3. IDENTIFY BROAD FISHERIES MANAGEMENT UNIT (FMU) AREA – Successful EAFM requires a clear statement of the area to be managed—the Fisheries Management Unit (FMU). Boundaries of the management area need to be identified, and if appropriate, legally established for governance. During this step the preliminary boundaries of the FMU are identified and agreed upon for planning based on ecologically, socially, or politically determined jurisdictional boundaries. During this start-up activity areas of overlap between FMUs, MPAs, and other managed areas can be identified. This allows for the planning process to have an area to begin work. More precise FMU boundaries will be defined in Step 1.

A4. EAFM INTRODUCTION – The EAFM planning team should begin making courtesy calls, meetings, and public awareness-raising to establish the initial working relationship between the community, the prospective agency partners, and the facilitator or agency. This entails a number of activities, including:

- Formally introducing EAFM to prospective partners;
- Answering questions about EAFM;
- Establishing rapport with prospective partners;
- Identifying roles of partners;
- Core group formation;
- Organizing and attending meetings, training, and awareness-raising sessions;
- Collection of baseline data on the management unit;
- Stakeholder identification;
- Meeting with local leaders, government officials, etc. and obtaining approvals; and
- Initiating the program with the community, government agency partners, and others.

A5. COORDINATE WITH OTHER MINISTRIES/AGENCIES AND GOVERNMENT LEVELS – It is important to ensure that coastal and fisheries institutions at each level of government (from local, municipal, district, provincial, national, to regional) are informed and engaged early in the EAFM planning process. This helps to harmonize policies and operational objectives across different levels of governance, as well as in situations of overlapping or mismatched jurisdiction (e.g. where several agencies have management authority over different parts of a fish's lifecycle). It may require bringing agencies together that

may traditionally have had very little interaction, but are actually working towards complementary goals or addressing overlapping issues. For instance, achieving long-term food security is often a key goal of an EAFM. Though often unlinked, food security is also an issue relevant to agencies involved in disaster risk management and planning. Both can better achieve their goals through coordination. Advantages of working in collaboration can include pooling/sharing of limited resources and expertise and a unified approach that can help avoid community confusion and disenchantment when separate groups interact with communities in different ways.

A6. IDENTIFY STAKEHOLDERS AND ORGANIZATIONS – Many potential stakeholders are needed to effectively implement an EAFM. Stakeholders are individuals, groups, or organizations of men and women, old and young, who are in one way or another interested, involved, or affected (positively or negatively) by a particular project. They may be motivated to take action based on their interest or values. Stakeholders may include groups affected by the management decisions, concerned about the management decisions, dependent upon the resources to be managed, with claims over the area or resources, with activities that impact on the area or resources, and with, for example, special seasonal or geographic interests. Support (or lack of support) by stakeholders can lead to success or failure of an EAFM. Stakeholder analysis is conducted to identify potential partners for an EAFM, to explore possible approaches in relating to a particular person or group who can be supportive or potentially hostile to an EAFM, and to provide insights into the dynamics and relationships of individuals and groups with various interests in a particular resource or project (Pomeroy and Guieb 2006).

A7. ESTABLISH CORE CONSULTATIVE GROUP – A core group is a small number of stakeholders (perhaps four or five), representing different sectors of the community and management agencies, who will work with the facilitators to guide the EAFM process after start-up. The core consultative group may include members of the initial EAFM team established in Step 1.1, or be new people. The core group is crucial, as it gives responsibility and power to the community members and others not typically engaged in fisheries management. The core group can serve to:

- Develop dialogue and provoke social discussion about an EAFM and resource management issues;
- Facilitate community organizing;
- Identify problems, issues, and opportunities;
- Assist in decision making within an EAFM process;
- Help stakeholders understand EAFM;
- Identify other stakeholders and stakeholder groups;
- Gather and spread information among community members.

A8. DETERMINE LEGAL BASIS FOR EAFM – It is desirable to have a legislative or policy mandate to undertake EAFM. This is especially true when using co-management, as it is better to provide local communities with legal authority to manage the integrated management unit and fisheries resources. For example, in many Pacific Islands countries, the traditional ownership of lagoons and reefs is claimed by adjacent coastal communities (SPC 2010). The development of fisheries legislation should therefore provide this authority. In some countries, the development of community fisheries by-laws or fisheries management ordinances includes provisions to allocate this authority. Although establishing a legal basis for EAFM is desirable, the lack of appropriate existing legislation should not be used as a reason to delay beginning the process.

Legal challenges to EAFM

Existing sectoral laws, by-laws, and regulations that both directly and indirectly affect fisheries and associated ecosystems should be reviewed before an EAFM is put into practice. This activity can highlight future legal challenges to working within ecosystem, rather than jurisdictional, boundaries.

Project FISH (Fisheries for Improved Sustainable Harvest) was a seven-year partnership between the U.S. Agency for International Development (USAID) and the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) in the Philippines (www.oneocean.org). A framework for an EAFM was implemented in Danajon Bank (a double-barrier reef system that includes the following four provinces: Bohol, Southern Leyte, Leyte, and Cebu). Towns in the area forged an inter-municipality alliance that enacted a joint law-enforcement ordinance to regulate fishing activity. In the Philippines, jurisdiction over municipal waters comes from the municipality and so, the enforcement laws operating over the alliance were questioned in court. During the court case, joint enforcement operations by the municipalities were suspended and the outcome was that the law was declared invalid. At that point, each municipality enacted their own individual law-enforcement ordinance. In some cases, like Project FISH, there may be legal challenges to implementing an EAFM, and forming alliances and coordinating mechanisms can help to bind municipalities together in ways that work within the existing legal frameworks. Conducting a review of the legal basis for an EAFM early on in the planning process can identify facilitating laws and potential legal pitfalls.

B. ENGAGE STAKEHOLDERS

The active participation of people is at the heart of an EAFM. These activities are establishing co-management which is central in EAFM.

BI. ASSESS STAKEHOLDER INTEREST AND COMMITMENT – Following the initial trigger for an EAFM, the EAFM team—with the help of the project facilitator—must gauge whether the community is ready to embark and commit to the EAFM process. The three key components are: 1) an awareness of the problems with fisheries and the marine environment; 2) a concern about these problems; and 3) a willingness to take actions to solve these problems. It should also be determined if the community (or communities) is cohesive—that is, there are no intractable internal disputes that would render community-based management difficult. If this assessment is positive, it is usually culturally appropriate to arrange a meeting with community leaders SPC (2010). Depending upon the scale of the resources at hand, the management institution may need to work with several or many communities. Fisheries management at the national level will also always have communities of stakeholders; community engagement is important and appropriate at all geographic scales of governance.

B2. COMMUNITY ORGANIZING – Success of an EAFM through community-based management or co-management is directly related to a well-organized community that has been empowered to take action to manage and conserve its marine resources (Pomeroy and Guieb 2006). Fishing cooperatives and fisher associations exist in many communities. However, these organizations will not automatically be suitable as representative organizations in an EAFM and co-management. It is likely that they were established with objectives that relate more to expanding exploitation, improving marketing, and increasing the incomes of members. Changes in outlook may be necessary for these organizations to play major roles in an EAFM. These changes may be difficult and lengthy, especially if the organization is still struggling with its original mandate. Putting more focus on management may strain the internal cohesion of the organization.



Helping to build a new community organizations may be more appropriate for an EAFM. Community organizing is much more than just establishing organizations, it is a process of empowerment, building awareness, promoting new values and behaviors, establishing self-reliance, building relationships, developing organizations and leadership, and enabling communities to take action. Thus, environmental education, capacity development, and social communication are central elements of this process (Pomeroy and Guieb 2006).

To participate in an EAFM and co-management, the stakeholders will need to organize themselves and reach internal consensus on the interests and concerns that they want brought forward. Meetings and discussions are held among the individual stakeholders to identify and clarify their interests and concerns and for those individuals with common interests and concerns to organize themselves into groups. Effective community participation in an EAFM and co-management requires strong community organizations to represent concerns of stakeholders. In some cases, community organizations capable of representing their members in an EAFM and co-management already exist in the community. In other cases, organizations will either need to be strengthened or newly established. One or more community organizations may be needed in the community depending upon its size, diversity, and needs. An appropriate person from each organization should be selected to represent them in the EAFM planning process.

B3. AWARENESS RAISING AND EMPOWERMENT – While most resource users have a good awareness and concern for fisheries and the marine environment, the issues of an EAFM are generally complex and there may be a need to provide more technical information on fisheries, ecosystems, and climate change, and to develop people's capacity to actively participate in the EAFM planning process (Pomeroy and Guieb 2006). Environmental education, capacity development, and social communication are integral and necessary parts of an EAFM and should be adaptively undertaken throughout the planning process. Environmental education introduces concepts and principles related to coastal and marine resource issues, as well as empowers communities with information and knowledge to assist them in taking appropriate actions to address the issues. Capacity development provides skills and institutional capacity for fishers, resource user organizations, local-provincial-national government officials and staff, and other stakeholders to take an active role in an EAFM. Social communication generates an on-going flow of information and dialogue between and among fisheries managers and community members to facilitate informed decision-making in the face of change.

The purpose is to empower people with the knowledge and skills they need to actively participate in the EAFM program. Empowered people will be enabled to begin to take greater control over resource, economic, and social problems and needs, and increase their awareness and understanding of fisheries resources and their management in an ecosystem context. Community members and government officials and staff are able to better understand the need for and benefits of an EAFM, the EAFM planning process and their individual and collective roles in an EAFM. Education and capacity building are continuing activities throughout the EAFM lifecycle, which should be initiated as soon as possible in the EAFM process.

Activities aimed at increasing awareness, knowledge, skills and institutional capacity, such as environmental education, capacity development and social communication, are sometimes placed together under the term 'social preparation'. Social preparation has several functions in an EAFM:

- Greater compliance and lower enforcement requirements;
- Reducing social conflict and resource impacts;
- Creating positive change in values and behavior towards the environment;
- Gaining support for an EAFM;
- Increasing knowledge and skills of fishers and other stakeholders;

- Fostering participation in the EAFM process;
- Enabling community members to assert their rights to use, sustainably manage, and conserve ecosystem resources.

B4. COMMUNITY MEETINGS – Community meetings and discussions are a means to gather and organize information on local situations and stakeholders' attitudes and perceptions regarding fisheries resources, ecosystem and habitat conditions, and management. Such meetings inform and educate stakeholders about the nature and status of fisheries resources and possible solutions to issues and concerns, such as implementing an EAFM. Community meetings should open and maintain communication among the various stakeholders. These meetings and discussions may initially be informal and unstructured as community members and stakeholders get acquainted and begin establishing a working rapport to determine if they can and want to work together.

B5. SOCIAL MARKETING – To produce a desired outcome, behaviors of the general population often need to be modified to support the desired change. To encourage these changes, efforts often focus on social marketing employing commercial marketing techniques to benefit either individuals or the entire community. Traditional marketing attempts to persuade target audiences to invest in a product or service in order to get promised results; the goal is to bring about change that lasts long enough for the individual consumer to make the purchase. Social marketing seeks to permanently change attitudes about social concerns, creating a change in the entire system or community. Unlike commercial marketing, which often seeks to maximize company profits, social marketing seeks to benefit an individual and/or the entire community by promoting behaviors that will have the most positive and beneficial impact overall. Social marketers seek to identify an already existing deficit or need that is perpetuating a detrimental social or environmental impact. The focus is on creating motivation to change current behaviors by providing tools to enable positive changes over time. Though social marketing is not the same as environmental education, they clearly complement each other.

The first step in any social marketing activity is identifying your target audience (fishers, community members, males, females, fishers using spear gun, fishers using illegal and destructive fishing methods, etc). The second step is to conduct qualitative and quantitative research techniques to begin to understand their audience's knowledge attitudes and perceptions towards any fisheries intervention proposed. Once there is a specific understanding of the target audiences and specific behavior changes identified activities, events, and communication interventions can then be implemented to move the audience knowledge, attitudes and practices towards tipping points for adoption of the desired behavior change. As with any intervention it is very important to conduct the audience research after the interventions have been introduced, to ensure that tipping points have been achieved as well as to ascertain how successful (or not) the interventions have been.

PLAN

STEP I. DEFINE AND SCOPE THE FISHERIES MANAGEMENT UNIT (FMU)

I.1 DEFINE THE FMU – A successful EAFM plan requires a clear statement of the area to be managed—the fisheries management unit (FMU). It will be important to scope the fisheries management unit—ecological, social, economic, and governance—so as to inform management. Where FMUs, MPAs, and other management areas overlap, the boundaries should be clarified and/or co-management by the relevant agencies and stakeholder groups.

I.2 AGREE ON THE FMU VISION – There should be agreement on a broad management vision for the FMU. The vision statement describes what we want the FMU area to look like in ideal terms in the future—the results we will be achieving through EAFM or the desired outcome of EAFM. The strategic

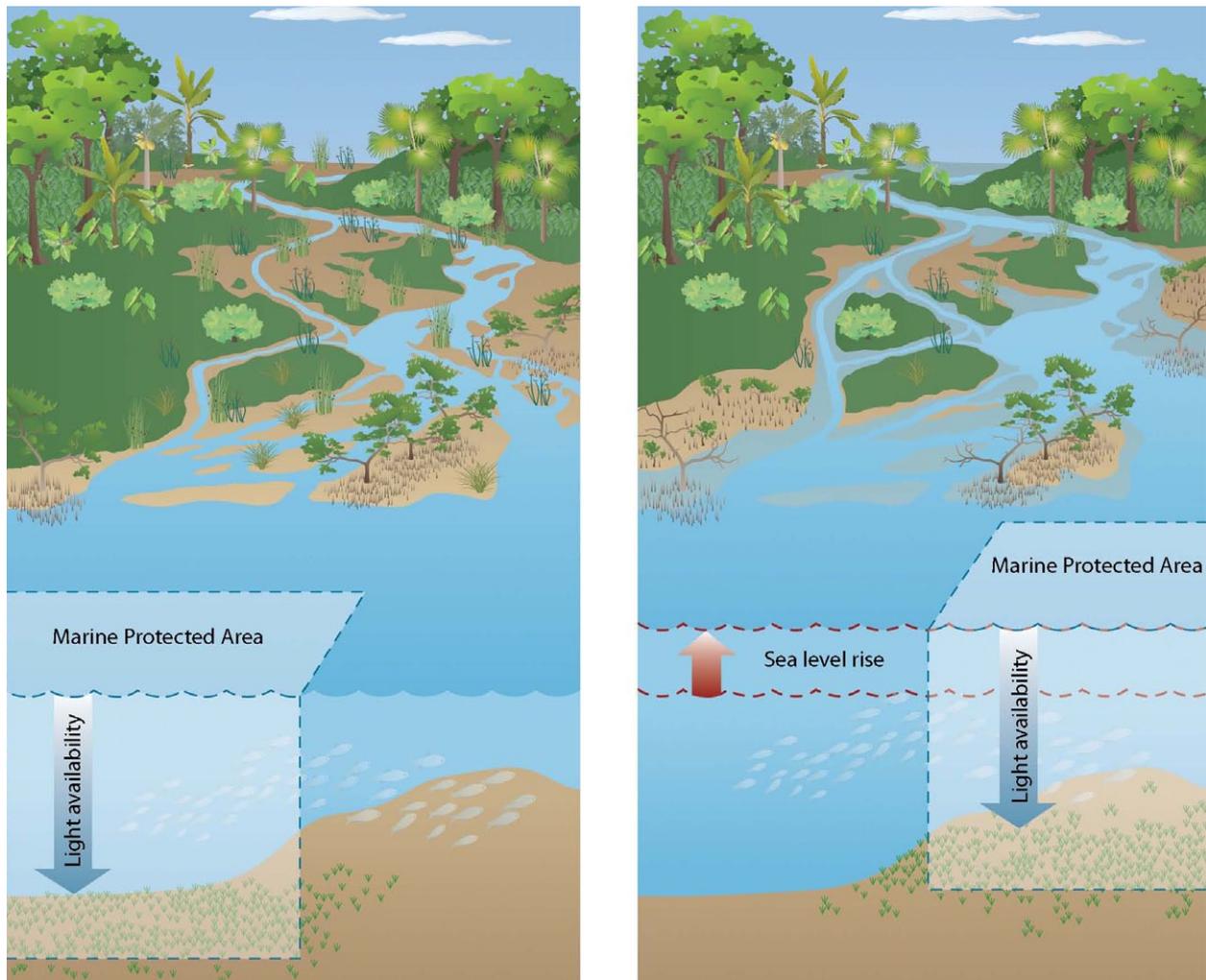


Figure 17: With sea level rise, sea grass beds shift locations in order remain within light and depth-tolerance zones, and mangrove forests retreat. With monitoring and evaluation of these circumstances, managers can adapt for better management of the changing ecosystems (UNEP 2011).

vision statement provides direction and inspiration for goal setting. It answers the question, “if we can achieve what we want to do, what will we look like in X years time?”

1.3 SCOPE THE FMU – An FMU Profile serves as a basis for planning and management activities and as a baseline for future monitoring activities. Developing an FMU Profile involves collecting information about the FMU to help define the FMU area. Information collection is achieved through gathering of existing information, through scientific research if practical, and through participatory research.

Ideally, the FMU will coincide with a precisely defined ecosystem; however, more realistically the FMU may first operate within more socially or politically determined jurisdictional boundaries. Generally, ecosystems are rarely clearly defined entities with unambiguous spatial limits, and they may cross or be contained within existing political or resource-management boundaries; however, the demarcation of boundaries that reflect ecological characteristics will be required. Ecosystem boundaries are based on biological and physical processes and features.

Marine resources are more typically managed across political jurisdictions rather than across well-defined ecosystems. The question is how to develop the FMU at the appropriate scale that addresses political, social/cultural, and ecosystem needs for management. When establishing the FMU, the boundaries of the

marine ecosystem should be defined based on: (1) benthic and oceanographic habitats and conditions, (2) the composition, abundance, and distribution of prioritized marine species and natural resources, and (3) human use patterns. For example, within the Coral Triangle region, the Sulu-Sulawesi ecoregion (or seascape) covers ~950,000 square kilometers of ocean habitat straddling the Philippines, Indonesia, and Malaysia. Knowledge of the spatial extent of marine ecosystems will help to identify appropriate spatial scales for the FMU area. Additionally, the demarcation of the FMU should then strike a balance between ecological/environmental boundaries with those that are politically practical to implement within existing and proposed governance systems. For practical purposes, the FMU should include the marine resources, fishers, and coastal communities that have the strongest interconnections.

There will always be an element of subjectivity in assessing what interconnections are sufficiently strong that the elements must be incorporated in the definition. Specific social dimensions included in the FMU might include: (1) areas where there is traditional fishing tenure, (2) specific fishing areas, (3) fishing communities, (4) fishing industry, and (5) human use/activities in the fishery ecosystem, among others.

There are no strict rules for achieving the appropriate balance between inclusion of interactions and the simplicity that is essential for effective management to be feasible. In this regard, stakeholder perceptions and acceptance could be strong guiding factors (Berkes et al. 2001). When considering the initial FMU area, it is important to bear in mind that in an EAFM, spatial boundaries should be flexible and adaptive as they are in nature and will likely change as new knowledge becomes available or ecosystems change in response to climate change and ocean acidification. Identifying and achieving boundaries for the FMU can be done in incremental steps, starting small and encompassing neighboring FMUs over time, as support and knowledge increases, as trust develops between neighboring communities, and as legal and policy frameworks evolve so as to accommodate cross-jurisdictional collaboration in future climate scenarios.

Finally, the primary implementing institution should seek to identify the various jurisdictional or governance boundaries surrounding the resources and the ecosystem interactions therein. This might include fisheries jurisdictional boundaries (e.g. provincial waters vs. federal waters), customary tenure areas, coastal zone-management areas, local governance units, watershed management areas, and others. Identifying various governance boundaries may help inform later discussions about cross-sectoral coordination.

At this stage in the planning process, the planning entities will seek to research and profile the FMU area, including establishing reference points of the social-ecological system within the FMU. Researching and profiling the FMU is an essential step in devising an EAFM plan that is specific and appropriate (Pomeroy and Guieb 2006). The EAFM plan cannot be generalized—it needs to reflect the unique combination of stakeholders, resources, habitats, and biophysical and socioeconomic conditions of the specific FMU.

Research constitutes the information-gathering activities of the EAFM planning process. A great deal of information is gathered about the fishery, ecosystems, resource-use activities, and people. Research informs the FMU profile, which serves as the basis for planning and management activities. During this activity, both secondary and primary data are collected and analyzed and an FMU profile is prepared. Throughout EAFM implementation, the role of research in EAFM is to help establish baselines, inform the management process, serve monitoring and evaluation activities, and nourish community education and involvement. Information can be both scientific and indigenous knowledge and qualitative and quantitative. Research can be both scientific and participatory. A common mistake is to focus on research to the exclusion of education and action. By involving community members in these activities, the research process itself becomes one of education and action. Participatory research—in which local people are partners in research design, information gathering, and data analysis (Pomeroy and Guieb 2006)—can lay the foundation for awareness and commitment from which other activities grow. The decision on the scope and scale of the FMU profile and research is made by the core group, based on information needs for decision-making and on available resources and time. A typical FMU profile includes:

- Resource and ecological assessment;
- Socio-economic assessment;
- Legal and institutional assessment (governance); and
- Resource-management issues and opportunities.

The EAFM team should work with local stakeholders to access new research and scientific information related to ecosystem boundaries, structure, and function, and then present this new information as a simple synthesis to the stakeholder group. Through a participatory process, this information—including strategies for their implementation—can be included during the refinement of the management-planning process.

When the FMU boundaries are identified, maps of the area should be prepared and validated through consultation with the stakeholders. This will serve not only to validate the boundaries, but also to inform stakeholders about the FMU and to come to an agreement on the FMU.

A number of assessment tools that allow for a more integrated assessment were reviewed by Paganyi (2007), who compared a number of ecosystem-modeling approaches in terms of their parameters, assumptions, and data requirements. A wide range of models are available, ranging from whole-ecosystem models such as Ecosim, Ecopath, and Atlantis; multispecies models (some are an extension of single-species models); bioenergetic models; and predator–prey models. Some of the advantages, disadvantages, and limitations of each were discussed. Though that analysis found that, in general, the models were not yet being used to guide decision making and management with the rigor currently being applied to single-species models, recent applications of the Atlantis Ecosystem Model—which explicitly includes ecological, hydrodynamic, and socio-economic submodels—suggest that they are now being used extensively in Australia and the United States to inform fisheries-management decision making (Fulton et al. 2003, 2005, 2007, 2010a,b; Link et al, 2011; Kaplan et al. 2011). Originally focused on the biophysical world and then fisheries, it has grown to begin to be used for multiple-use and climate questions. Atlantis is a deterministic biogeochemical whole-of-ecosystem model. Its overall structure is based around the Management Strategy Evaluation (MSE) approach, where there is a sub-model (or module) for each of the major steps in the adaptive management cycle (Figure 18).

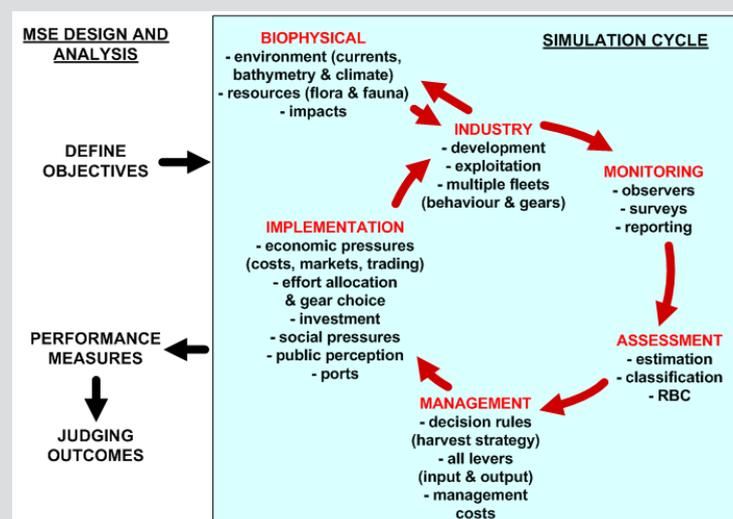


Figure 18: The management strategy evaluation approach and its link to the simulation cycle of an ecosystem model with the information types that can be used for each module.

STEP 2. IDENTIFY AND PRIORITIZE ISSUES AND GOALS

STEP 2.1 IDENTIFY THREATS AND ISSUES – “The next step is for stakeholders to undertake an initial evaluation of threats and issues associated with the fishery. This should cover economic, social, and ecological considerations and be guided by the high-level policy goals set at the national or regional level. Identifying threats and issues and finding solutions are best done during a meeting/workshop where all relevant stakeholders are gathered. It is important to get input from as many people as possible. If fewer people are involved at this stage, this increases the chances of some issues being missed and also reduces subsequent “ownership” of the process. The process can be made very interactive with a few basic media aids, drawing on paper and whiteboards, or using photographs or simple cartoons. Starting with each broad threat or issue, these are further divided into more specific issues that can be tackled through a management intervention of some sort. The use of component trees allows the threats or issues to be put into a structured framework for subsequent risk analysis and prioritization” (FAO 2009).

STEP 2.2 PRIORITIZE THREATS AND ISSUES – “This process is likely to result in many potential threats and issues, but there is a practical limit to how many threats and issues can be dealt with by a management system. One approach to prioritization of specific threats and issues is to conduct a risk or vulnerability assessment. Risk assessments can be either qualitative and expert-opinion based, or highly quantitative and data based. There are many ways to carry out a qualitative risk assessment” (FAO 2009).

SPC (2010) states “One way of proceeding is to take a broad approach, encouraging communities to address all issues, and then proceed to address issues under the separate three headings (fishing, non-fishing, and societal well-being). Many issues of community concern will have been broadly identified during the scoping process including stroll-through surveys or by community workshops. Issues are dealt with at meetings between facilitators from the promoting agency and members of the community. Whether addressing all issues together or separately, the tasks of the meeting are to identify and then prioritize the various issues. Identification involves listing of all the key issues and prioritization involves judging the severity of threats associated with each. At the identification stage, the meeting should list all issues. At the prioritization stage, each issue is given a score in relation to its relative effect on the community and marine ecosystems.”



An example of risk assessment is to score both the likelihood and consequences of failure (impact) in relation to each issue on a scale of, say, 0 to 5. High-priority issues are those with a high likelihood of occurrence and high impact. A risk analysis typically seeks answers to four questions:

1. What can go wrong? (Risk)
2. How likely is it to go wrong? (Likelihood)
3. What would be the consequences of it going wrong? (Consequence)
4. What can be done to reduce either the likelihood or the consequences of it going wrong? (Action)

(FAO 2009)

2.3 DEFINE THE GOALS FOR AN EAFM PLAN – A goal, or set of goals, is prepared related to the prioritized threats and issues identified. A goal is a general statement of the desired state towards which the stakeholders are working. A good goal meets the following criteria:

- **Visionary:** inspirational in outlining the desired state towards which the stakeholders are working.
- **Relatively general:** broadly defined to encompass all activities.
- **Brief:** simple and succinct so that all stakeholders can remember it.
- **Measurable:** defined so that changes can be accurately assessed.

Although in some instances there may be multiple goals, it is usually easier to have only one goal. An example of goals are:

- Fisheries and other living marine resources have been restored and are managed sustainably.
- Degraded, vulnerable and critical habitats are restored, conserved, and maintained.

2.4 CONSIDER CONSTRAINTS AND OPPORTUNITIES TO ACHIEVING GOAL(S) – Each goal is reviewed to identify issues, constraints, and opportunities to achieving it. These may include such issues, constraints, and opportunities as cost, political support, stakeholder support, institutional support, human capacity, time, and information/data needs.

STEP 3. DEVELOP THE EAFM PLAN

The objective of an EAFM is to work with communities, stakeholders, partners, and relevant agencies to develop and implement EAFM plans to manage fisheries within an ecosystem context. Each participating partner should be encouraged to analyze its resources, the social and ecological context, fishing practices, issues, threats, and other factors as described to develop a plan with undertakings to introduce appropriate management and conservation measures. The promoting agency and communities can reciprocally undertake efforts to support one another, e.g. by providing advice and assistance (SPC 2010).

STEP 3.1 OPERATIONAL OBJECTIVES – These are developed based on the issues affecting the goals. “An objective is a formal statement detailing the desired outcome of management. The community operational objectives will be related to the overall goal and will address the key issues identified and prioritized by community members. For example, if a high silt load in coastal waters was identified as a high-priority threat to corals and fish stocks, an appropriate objective would be “to reduce silt in coastal waters.” In general, an objective should be achievable within available resources and within a defined time

frame. A later stage would involve determining the management actions required and deciding on ways of measuring progress towards achieving the objective. In working with communities, there are various tools available to encourage community groups to consider threats and propose mitigating actions. One such tool is the problem–solution tree. This process is also similar to the “‘conceptual models’ and ‘results chains’ used by many conservation groups” (SPC 2010).

“All specific issues should be dealt with in the plan, but in a manner commensurate with the related risk. High-risk issues are elaborated into detailed objectives. Some medium-risk issues might require identification of a mechanism in the plan for ongoing review and some form of contingency plan. Low-risk issues might be noted in the plan, explaining why they are considered low risk. If the specific issue has been well articulated, it should not be difficult to create an objective related to addressing it. This needs to state what will be achieved in a general sense, e.g. minimize the impact on turtles” (FAO 2009).

For priority threat and issues identified earlier, write down one or more draft objectives. Each priority threat or issue can have more than one objective associated with it, depending upon what is to be accomplished. There are trade-offs between having too many objectives and having too few. If objectives are getting too long and complex, divide them. A general rule is to have between one and three objectives for each priority threat or issue.

STEP 3.2 INDICATORS AND BENCHMARKS – The stakeholders will also then need to decide on how to assess whether the objective is being achieved. This is done through setting indicators and benchmarks. In practice it should be possible to estimate the indicators from data that have or could be collected, but this should not exclude an indicator for which new data are required. Indicators and benchmarks are developed only after an objective has been agreed upon. An indicator tracks the key outcome identified in the objective and, when compared with an agreed-upon benchmark (often a target or a limit value or trend), provides a measure of how well management is performing (performance measure). A performance measure is simply the difference between the indicator value and its benchmark (often referred to as reference points) at any time of assessment. Benchmarks are often targets that specify the desired state of the indicator, e.g. 20 percent of area under an MPA, or limits that specify a boundary beyond which it is desirable (or undesirable) to be, e.g. 50 percent of existing fishing effort. The group of objectives, indicators, benchmarks, and performance measures provide a means of communication with decision makers and their ability to make appropriate changes in management” (FAO 2009).

“The next stage of the management process involves translating each objective into a reference target (or point) level which represents an optimum or desirable position or situation. A reference limit level represents an undesirable level. It is always desirable to set reference levels using a precautionary approach which involves setting reasonable limit reference levels, and taking firm actions when these are approached. It is also necessary to define an indicator which can be used as a measure of performance: this is a variable that can be measured and whose values and fluctuations reflect the situation in relation to the objective. Indicators and reference points can also be used for addressing socio-economic issues and non-fishing impacts on ecosystems. For an objective to develop alternative sources of income, for example, an appropriate indicator would be the number of new community enterprises. If the objective was to increase household income, the indicator could be the percentage change in the average income of households” (SPC 2010).

STEP 3.3 MANAGEMENT ACTIONS AND COMPLIANCE – “Once objectives have been agreed upon, there remains the task of deciding what needs to be done. Management actions are the measures required to achieve an objective; the SPC process uses the term ‘undertakings’ for management actions and in some conservation projects one or more management actions are referred to collectively as a ‘strategy’—a group of actions required to reduce threats. In fisheries management, actions can include technical measures such as placing restrictions on the type of fishing gear used and imposing closed



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seasons to protect spawning stocks. In most cases, there will be several management actions that could address a particular objective and a list of these could be assembled through brainstorming sessions with members of the target community assisted by relevant government agencies. Community engagement tools such as the problem-solution tree can be used to encourage community members to propose management actions that would solve particular problems. For each objective, it is useful to prepare a list of all possible management actions with particular attention given to their ease of application, likelihood of success, feasibility, and cost. All management actions must include reference to those responsible and the time frame required for their implementation. Different management actions will be the responsibility of the community, the promoting agency, or other agencies" (SPC 2010).

"From the wide range of tools contained in the manager's tool box, the most appropriate management interventions to meet the specific objective need to be selected. Often the same tool (e.g. an MPA) can meet several objectives. These can obviously be grouped but, unlike many fishery management processes that simply introduce interventions without first setting objectives, it will be clear to all stakeholders why a particular management measure is being introduced. Where possible, the use of specific management measures should be accompanied by decision rules on how they are to be applied. The rules state what management action should be taken under different conditions, as determined by its performance. In a small-scale fishery context these need to be pragmatic (e.g. relating to stricter enforcement if a particular measure is not working). The key is to try and agree about what might happen and how to counteract this before it does. This provides some certainty for all the players and the rules are known and understood. In certain cases, decision rules can be quantitative (e.g. setting catch limits for the species under consideration as pre-specified fractions of abundance, obtained from surveys) or, more commonly, qualitative action (e.g. a certain value of an indicator triggers a decision to bring forward a review of management)" (FAO 2009).

The implementation of an EAFM plan will involve the use of conventional fisheries management measures to address target species concerns; measures to maintain, restore, and conserve species and habitats so to preserve the structure and function of the ecosystem; as well as activities to link to additional management sectors, such as coastal, disaster risk reduction, and climate change adaptation. EAFM management measures should be inclusive of management plans and management measures undertaken through other management strategies (e.g. ICM, MPAs, marine spatial planning). An EBM framework can provide a coordinating mechanism for joint planning among different sectors that might have individual, integrated plans. The management measures species to the EAFM plan may include such activities as:

- output (catch) controls (e.g. quotas, escapement controls);
- input (effort) controls (e.g. limited entry, capacity limits, fishing location limits, territorial use rights) controls;
- technical measures to regulate fishing mortality (e.g. gear restrictions, size limits);
- spatial controls (e.g. area closures, MPAs, and no-take areas);
- temporal controls (e.g. seasonal closures; protecting spawning aggregations);
- ecosystem manipulation (e.g. habitat modification and population manipulation, such as restocking, stock enhancement);
- rights-based management approaches (access rights, input rights, catch rights);
- community-based management measures (e.g. locally managed areas, livelihood);
- links to ICM, MPA, watershed management plans (e.g. coastal development, non-point source pollution control in essential fish habitat areas)
- among many others.

EAFM management plans should stipulate an enforcement mechanism that specifies who is responsible, the means of enforcement, and the penalties for non-compliance. Monitoring, control, and surveillance (MCS) programs should be developed to support compliance and enforcement. Monitoring, control, and surveillance entails observing people's activities within and outside the FMU to ensure that they follow the rules. Agreements among different agencies and groups can help mobilize resources that are already available. Seeking to adhere to the concept of public "ownership" of the FMU, stakeholders may be involved in monitoring and surveillance activities of the FMU. For example, resource users or community members may work side-by-side with professional enforcement officers in a joint patrol system.

STEP 3.4 FINANCE – Sufficient, timely, and sustained financial resources to support an EAFM are critical to achieve long-term sustainability of food security, livelihoods, and conservation of coastal ecosystems and biodiversity. Funds need to be available to support various on-going operations and facilities related to planning, implementation, coordination, monitoring, and enforcement, among others.

The EAFM program must be designed from the start with thoughts and plans for sustainable financing. Too much dependency on external sources alone will likely impact long-term sustainability. Several sources of financing may be required. Sustainable financing mechanisms should be considered and evaluated as an essential part of an EAFM plan, similar to a financing strategy within a business plan. The financing plan should be based on an evaluation of the costs of operations for activities in the EAFM management plan over both short- and long-term time horizons. A range of potential alternatives can then be identified as potential financing sources for an EAFM.

The choice of which financing mechanisms to utilize in a particular case should be based on analyzing several feasibility factors (Spergel and Moye, 2004):

- Financial (funding needed, revenue generation, revenue flow, year-to-year needs);
- Legal (legal support for financing mechanism, new legislation needed);
- Administrative (level of difficulty to collect and enforce, complication and cost; potential for corruption, staff requirements);
- Social (who will pay, willingness to pay, equity, impacts);
- Political (government support, monitored by external sources);
- Environmental (impact).

STEP 3.5 FINALIZE THE EAFM PLAN – The EAFM plan can be prepared based on the outline below. “An EAFM management plan is produced and owned by the stakeholders and is prepared with the assistance of the promoting agency. The plan lists the management actions or undertakings and those that require inputs from the promoting agency and other agencies. The EAFM management plan must be written in the local language in non-technical terms although it may be translated into English for the information of others” (SPC 2010). Once a draft EAFM plan is prepared, it is reviewed through consultative meetings with stakeholders, validated, and finalized.

EXAMPLE EAFM PLAN OUTLINE:

VISION

Broad goal of management

BACKGROUND

Description of the area and resources to be managed, including maps at different scales

The fisheries management area

Area of operation of the fishery, jurisdictions and ecosystem “boundaries” (including national/province/district jurisdictions). Map of FMU

History of fishing and management

Brief description of the past development of the fishery in terms of fleets, gear, people involved etc

Current status of the fishery

Description of the fishery resources and fleet/gears used

Resource status

Map of resource use patterns

Socio-economic benefits, including postharvest

Description of stakeholders and their interests (including socio-economic status)

Description of other uses/users of the ecosystem, especially activities that could have major impacts and arrangements for coordination and consultation processes

Social and economic benefits, both now and in the future

Special environmental considerations

Details of critical environments, particularly sensitive areas and endangered species

Institutional aspects

Legislative background

Existing co-management arrangements – roles and responsibilities

MCS arrangements

Consultation process leading to the plan and ongoing

Details of decision-making process, including recognized participants

Nature of rights granted in the fishery and details of those holding the rights

Maps of management interventions/ user rights/jurisdiction boundaries

MAJOR THREATS AND ISSUES

Ecological issues

Fisheries resources and general environmental issues, including both the impact of the fishery on the environment and vice versa

Social and economic issues

Issues relating to the people involved in fishing, the general public and at the national level, including gender issues

Governance issues

Issues affecting the ability to achieve the management objectives

GOALS OF MANAGEMENT

Higher level goals of where you want management to lead to

OBJECTIVES, INDICATORS AND BENCHMARKS

Priority issues, objectives, bench marks for the fishery, covering:

- Fishery resources
- Environment (including bycatch, habitats, prey protection, biodiversity, etc.)
- Social
- Economic
- Governance (ability to achieve the plan)

MANAGEMENT ACTIONS

Agreed actions for the to meet all objectives within agreed time frame, including by-catch, habitat protection, socio-economic benefits, good governance etc .

COMPLIANCE

For actions that required rules/regulations - Arrangements for ensuring that the management actions are effective.

DATA AND INFORMATION NEEDS

Data and information needs to monitor implementation of the plan. Clarify where the data are to be found and who collects, analyses and uses the information.

FINANCING

Major sources of funding

COMMUNICATION

Link to communication strategy

REVIEW OF THE PLAN

Date and nature of next review(s) and audit of performance of management

DO

STEP 4. IMPLEMENT THE PLAN

STEP 4.1 FORMALIZE, COMMUNICATE, AND ENGAGE – Once the plans and agreements have been approved, the implementation of an EAFM should be initiated as soon as possible in order to capitalize on the goodwill and excitement generated by getting the EAFM Plan approved. Implementation comprises the activities by which the EAFM Plan is carried out. The implementation process will involve numerous decision-making points and a different process from the one used to develop the plan and the many agreements contained therein. All the activities in the EAFM Plan must be implemented correctly and in a timely manner if the goals and objectives are to be effectively achieved. The EAFM implementation workplan (done annually) should clearly specify activities, timelines, and individuals or groups who will be responsible for each activity and for reporting on the progress being made to the stakeholders.

The implementation of the EAFM plan will require managers to be aware of the combined biological and ecological uncertainty under EAFM and the need to improve knowledge about the interactions between the fishery, the fisher, and the ecosystem. Especially in data-poor situations, managers will need to make increasing use of the precautionary approach and fisher's traditional knowledge and participatory approaches to data collection and analysis to overcome the constraint of insufficient knowledge and adaptive management.

The EAFM plan and all of the associated management actions must be clearly communicated to all stakeholders, especially those who will be directly impacted by it. A communication strategy should be prepared, including an audience analysis matrix identifying audiences and their characteristics, a strategy for how and where results will be delivered, a set of key messages, a timeline for release of key messages, and a strategy for adaptive changes to the communication strategy as an EAFM and feedback from stakeholders is received.

STEP 4.2 GOVERNANCE CHECK – The concept of good governance is discussed in Section 6 (h) above. While implementation is based on the EAFM plan and agreements, the quality and effectiveness of implementation are shaped by a number of governance issues or the “ability to achieve”:

- Institutions;
- A collaborative decision-making process;
- Legal authority to manage;
- Adequate and dedicated resources (personnel, funding, equipment) for management;
- Information and data to support monitoring and learning-by-doing;
- Key political support;
- Staff skills and commitment;
- Nested institutions and increased coordination and cooperation with government, external agents, resource user groups, and community members;
- Community support through participatory processes;
- Proper scale of management;
- Enforcement and compliance;
- External factors affecting governance: market forces, climate change, natural disasters, development.



Good governance is an element needed in implementation of EAFM. Good governance for EAFM should ensure both human and ecosystem well-being and equitable allocation of benefits as a condition for compliance. Following on the discussion of good governance (see section 6), several lessons about organizational behavior may be useful towards the attainment of good governance:

- Establish simpler, non-competing mandates for agencies;
- Provide information to many governmental and non-governmental actors;
- Restructure intra-governmental arrangements to reduce the opportunities for interagency jurisdictional conflicts;
- Restructure organizational incentives to create longer time horizons for agency leaders and personnel; and,
- Liberalize to reduce rent-seeking alliances that promote corruption.

The EAFM plan should, if at all possible, be given some legal formality to be widely recognized by the public and government agencies. The large degree of cooperation between and among government agencies, community groups, and non-governmental organizations required to effectively implement an EAFM makes this most important. The success of the EAFM plan and agreements depends not only on the research, organizing, and planning activities, but also on the enabling legislation providing the legal basis for the plan and agreements. Reviewing and confirming the legal basis for all plans, agreements, and proposed activities is an important activity for managers to conduct, with a focus within and across the local/municipal, provincial, national, and international levels. Each of the CT6 countries have released a national status review that contains an overview of the international treaties to which each country are party to, as well

as an overview of the federal legislation and policies that are in place which may apply to EAFM, as published on the following website (<http://www.apfic.org/modules/smartsection/category.php?categoryid>).

These national status reviews provide a starting point for assessing what legal and policy support frameworks are already in place. It is likewise important to conduct local assessments of traditional rights and by-laws that may relate to fishing and other coastal marine activities. Without such legislative frameworks, there is only limited basis within which policies can be formulated and actions taken. For the fisheries to be managed within an ecosystem context with some semblance of order, the basic principles of an EAFM should ideally be expressed in the form of laws and policies. Key national laws and policies, which should have been identified in the Legal and Institutional Assessment, are again analyzed to determine the existing and required levels of support for the activity. Where devolution to local governments has occurred, the mandates and authorities of the local government should also be analyzed.

STEP 4.3 CO-MANAGEMENT FOR IMPLEMENTATION – Given the importance of high stakeholder participation and cross-sectoral coordination, the EAFM plan implementation should include specific measures and mechanisms to continue engaging all parties throughout the management process. This can include such things as: participatory research, co-management, management councils and committees involving stakeholders in management decisions on a regular basis, and traditional and local knowledge, among others.

Since many of the problems (water pollution, introduction of exotic species, destruction of fish habitat due to coastal development, climate change) facing fisheries management fall outside the direct control of fisheries managers, the implementation of the EAFM plan will require fisheries managers to reach out and coordinate and integrate themselves within broader processes of integrated coastal management, integrated watershed management, conservation management, and integrated ocean governance.

STEP 4.4 CONFLICT MANAGEMENT – Conflicts over fisheries and marine resources have many dimensions including, but not limited to, power, technology, commercial, political, gender, age, and ethnicity. Conflicts can take place at a variety of levels, from within the household to the community, province, national, regional, and global scales and amongst government agencies or departments competing for resources or influence. The intensity of conflicts may vary from confusion and frustration over the directions fisheries management is taking, to violent clashes between groups over resource ownership rights and responsibilities. Conflict may result from power differences between individuals or groups or through actions that threaten livelihoods.

Conflict management is about helping people in conflict develop an effective process for dealing with their differences. The problem lies in how conflict is managed. The generally accepted approach to conflict management recognizes that the parties in a dispute have different and frequently opposing views about the proper solution to a problem, but acknowledges that each group's views, from the group's perspective, may be both rational and legitimate. Thus, the goal of people working in conflict management is not to avoid conflict, but to develop the skills that can help people express their differences and solve their problems in a collaborative way.

Developing a thoughtful toolbox of conflict resolution mechanisms in early phases of EAFM management planning will help to build trust and avoid significant, time-consuming, costly conflicts throughout the process and after deployment of the EAFM Plan. What's more, those marine and coastal management settings that include conflict resolution mechanisms tend to have far more success in achieving management objectives—ecological and social goals—than those without conflict resolution mechanisms.

STEP 4.4.1 AN ASSESSMENT OF POTENTIAL CONFLICTS – A first step in conflict management is conflict assessment. An analysis of a particular conflict can provide insights into the nature, scope, and stage of conflict and the approaches for its management, which are varied and range from multi-stake-

holder analysis and consensus building to managing conflict through negotiation, mediation, and arbitration. The objective of the former is to foster productive communication and collaboration prior to the outbreak of conflict by employing tools such as conflict anticipation and collaborative planning, together with the cultivation of alliances and mobilization of support. The objective of the later is to address conflict after it has erupted.

STEP 4.4.2 APPROACHES TO ADDRESSING CONFLICT – Choosing the correct approach through which to address a particular conflict is strategic and fundamental, as no single approach is effective in all cases. Parties to a dispute must first decide whether to seek resolution to a conflict through a non-consensual process or through more collaborative means. Once the decision has been made to use alternative conflict-management processes, the parties must decide on which specific approach to employ. The circumstances of conflict—and therefore the obstacles to agreement—vary from case to case. Disputes may involve many or few parties; the problem may be more or less urgent; emotional investment of the stakeholders may vary; the public interest may or may not be at stake; and the factors involved may be well understood or may be uncertain. Gaining expertise in conflict management includes learning about the specific advantages and disadvantages of the various approaches, and assessing which one is best in addressing a particular conflict situation (Rijsberman 1999).

Although there are considerable differences between approaches that can be employed in addressing conflicts, there are also significant overlaps. Most approaches involve some elements of relationship building, procedural assistance, and possibly substantive assistance or advice. The use of conflict prevention or consensus-building approaches does not imply that there have not yet been conflicts between the parties. Similarly, the use of arbitration does not imply that it will be more effective if the arbitrator manages to get the parties to cooperate as much as possible.

CHECK AND IMPROVE

STEP 5. MONITOR, EVALUATE AND ADAPT

STEP 5.1 MONITORING PERFORMANCE OF MANAGEMENT ACTIONS – At the simplest level, because specific objectives and indicators have been chosen to evaluate the ecological, social, and economic issues, assessing the status of each indicator against its benchmark should provide a snapshot of how well management is performing at the ecosystem level (FAO 2009). Monitoring allows for an assessment of the plan's activities performance in order to determine whether or not they are being achieved and what needs to be done to make improvements. Monitoring performance is a suite of activities involving designing a process to regularly gather information (including but not limited to scientific data) about the status of the resources, ecosystem, and people, and how well management is doing in meeting objectives specified in the management plan. The baseline data obtained in the FMU profile allows for a comparison of the results of the activity to be made against some benchmark. The comparisons that can be made in monitoring include:

- Comparing a group affected by the activity to itself over time by measuring how a given indicator changes as a result of the activity.
- Comparing a group affected by the activity to a group not affected by the activity over time by measuring how a given factor changes in a group affected by the activity relative to a similar group that is not influenced by the activity.

The plan is adapted based on the monitoring results.

“The co-management plan must also specify regular reviews in which the success of the management measures in attaining the objectives is appraised. These reviews will benefit from data that have been collected by an effective and well-directed research program and analyzed by appropriate technical experts. Such review should be carried out under guidance from, and making regular reports to, a designated stakeholder group. Short-term reviews, for example as part of an annual cycle, should make assessments of the status of key stocks, changes in catch composition, assessments of impacts of the fishery for other broader ecological aspects, and social and economic assessments. Longer-term reviews should also be conducted on a regular basis (three to five years). These reviews should include consideration of the full management arrangements including data collection/resource monitoring, comprehensive re-assessment, reappraisal of decision rules, and progress towards meeting longer-term objectives. Longer-term reviews may provide evidence that an objective set earlier (e.g. recovery to a certain species abundance level by a particular date) is no longer appropriate” (FAO 2009).

STEP 5.2 EVALUATE AND ADAPT THE PLAN – Managing fisheries resources is a continuous, iterative, adaptive, and participatory process comprised of a set of related tasks that must be carried out to achieve a desired set of objectives. EAFM plans must be monitored if they are to be kept on track, and evaluated if there is to be learning from successes and failures. The planning cycle includes the process of assessment, monitoring, and evaluation. Effective plan assessment and evaluation involves several steps: (i) preliminary appraisal; (ii) baseline assessment; (iii) monitoring; and (iv) evaluation. Information for each of these steps is essential to maximize chances that the plan will be effective for the adaptive management process and to acquire lessons learned.

Evaluation consists of reviewing results of actions taken and assessing whether these actions have produced the desired outcomes—this helps to adapt and improve by learning. Evaluation is a routine part of the adaptive management process and is something that most fisheries managers already do where the link between actions and outcomes can be simply observed. However, the links between actions and outcomes is often not so obvious. Faced with the daily demands of their jobs, many fisheries managers are not able to monitor systematically and evaluate the results of their efforts. In the absence of such evaluations, resources can be wasted on activities that do not achieve the objectives.

Monitoring and evaluation are processes which assist in answering the questions: Are the activities working or not? And what actions are needed to make them work? Monitoring answers the question: How are we doing? Evaluation answers the question: How did we do? If the plan has measurable objectives and indicators to evaluate the plan, ongoing monitoring can provide information required to evaluate effectiveness and performance of the EAFM plan.

Adaptive management takes the view that an EAFM can be treated as “experiments” from which managers and fishers can learn (Parks 2011). Adaptive management differs from the conventional practice of fisheries management by emphasizing the importance of feedback from the fishery in shaping policy, followed by further systematic experimentation to shape subsequent policy, and so on. In other words, it is iterative, repeating a process of steps (monitoring, analysis of data, evaluation of change against the goals) to bring the manager and fisher closer to a desired result. Each iteration should involve making progress in reaching established goals and objectives. The important point is that effective learning occurs not only on the basis of management success but also failures. However, learning from failures pre-supposes that what is learned can also be remembered. Organizations and institutions can learn as individuals do, and adaptive management is based on social and institutional learning. The mechanism for institutional learning involves documenting decisions, evaluating results and responding to evaluation. Institutional learning must be embedded in both fisheries managers and the fishers, and the knowledge held by each must be respected and shared.

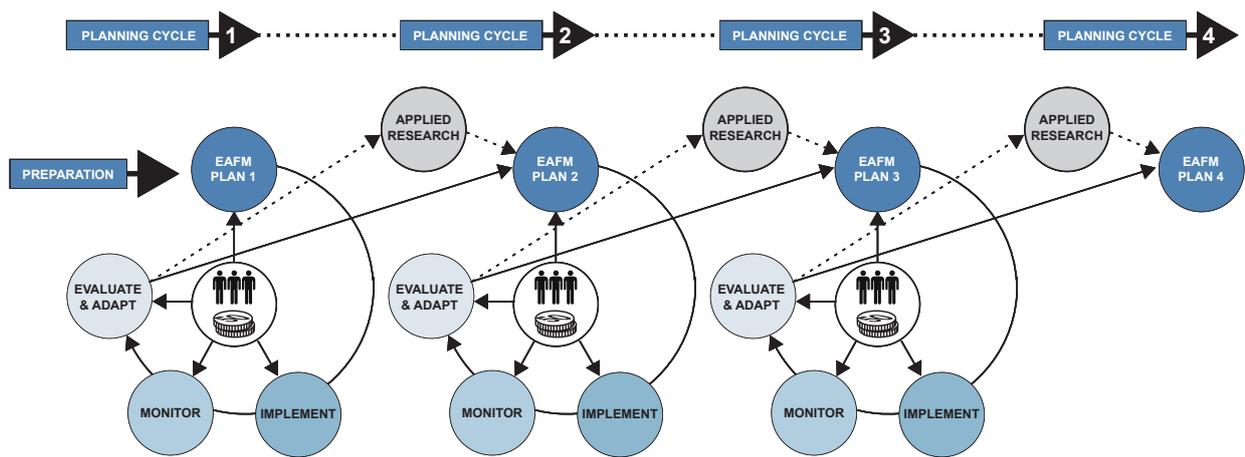


Figure 19: The iterative process of adaptive management. Stakeholder collaboration and sustainable financing feed into each phase of a planning cycle beginning with preparation, the development of the management plan, followed by implementation, monitoring, evaluation and adaptation of the plan. This leads to the next cycle, incorporating applied research and adaptation as determined necessary, and continues in a cyclical cycle (Image adapted from UNESCO 2009).

Adaptive management is undertaken in four steps: (i) develop a plan; (ii) take action; (iii) evaluate progress; and (iv) adjust future action. Each of these four steps has a recommended set of tasks that should be completed before moving on to the next step. Upon completion of these four steps, one cycle of the adaptive management process has been achieved, returning to step one with the cycle beginning again. This iterative process continues through time, with the aim of achieving outcomes (Figure 19).

The adaptive management framework involves first thinking about the situation of the fishery in the context of the ecosystem (including humans), collecting information about the fishery and ecosystem, and developing a specific assumption about how a given intervention will achieve a desired outcome for both the fishery and the ecosystem. The intervention is implemented and the actual results are monitored to determine how they compare to the ones predicted by the assumptions. The key is to develop an understanding of not only which interventions work and which do not, but also why.

Adaptation is about systematically using the results of the monitoring to improve the intervention. If the intervention did not achieve the expected results, it is because either the assumptions were wrong, the interventions were poorly executed, the conditions at the intervention site had changed, the monitoring was faulty, or some combination of these problems. Adaptation also involves changing the assumptions and the interventions to respond to new information obtained through the monitoring efforts.

Finally, it is important to systematically document the EAFM process that was followed and the results that were achieved at each step along the way. This documentation will help in the learning process and to avoid making mistakes in the future.



8. HOW CAN ISSUES OF SCALE BE ADDRESSED IN AN EAFM?

Transitioning toward an EAFM often involves “scaling up” or “scaling down” management, for example, from single-species fisheries management to management of multi-species assemblages; from looking at isolated drivers of change to considering broader environmental and human impacts; from design of individual protected areas to planning networks of protected areas; from conservation of a fragment of habitat to comprehensive spatial management; or from a larger national fisheries-management area down to a smaller-scale integrated management unit (IMU). Issues of scale include what is the appropriate scale of the marine ecosystem for fisheries management purposes and “scaling up” or “scaling down” from other management arrangements such as community-based management to an ecosystem scale. The issues of scaling up or scaling down refer to the transferability of concepts, methods and approaches, and organizational structures from one level to another in the dimensions of space, time, and governance. A number of factors constrain expansion including funding, resources, legal authorities, management structures, voluntary basis of participation, and many others.

Chua (2006) states that scaling up in integrated coastal management (ICM) refers to three different contexts: (1) geographical expansion, (2) functional expansion, and (3) temporal considerations. The same contexts hold true for scaling up to an EAFM. Geographically, a management area could scale up from a single small coastal community operating in a nearshore area to include a broader geographic dimension, for example, a bay or coastal area. Scaling up functionally involves taking into consideration new program interventions, for example, if the current intervention relates largely to enforcement, functional expansion could include adding new interventions such as conserving or expanding livelihoods and/or increasing educational opportunities. Scaling up could also include integration of fisheries management into broader

administrative programs of local, municipal, and provincial government agencies or departments. Temporally, scaling up could include shifting from focusing solely on near-term issues like annual catch limits to considering and incorporating long-term climate change and ocean acidification into the management process.

The initial scale for an EAFM will vary significantly depending on the geographic area, governance structures, socio-economic conditions, and the current priority issues. In general, starting at smaller spatial and governance scales (in terms of stakeholders, issues, and jurisdiction) may increase the likelihood of initial success that could be used to foster expansion. It is often easier to scale up once initial activities succeed and are sustained at demonstration sites. Scaling up may be undertaken to include more stakeholder groups, manage a larger jurisdiction or integrated management unit (IMU), and/or address new issues or a greater range of issues. In scaling up, a new EAFM plan and agreements will generally need to be developed or existing plans modified. Spatial expansion of the IMU will likely require the collection and analyses of additional information as the IMU profile is expanded. New stakeholder groups and organizations will likely need to be organized and coordinated with existing stakeholder groups. As an EAFM scales up, additional funding will likely be needed, though scaling up also provides opportunities to broaden the funding base and potentially increase inefficiencies as communities leverage capabilities and resources for the common good. If the new scale involves multiple political jurisdictions, new legal support may likewise be needed.

With an EAFM, there is a need to assure harmony between scales of governance and management and linkages between and among the various scales, particularly governance scales that likely range from individual communities to districts to provinces to national governments. For example, there is often a disconnection between national planning and policy goals and the practical goals and implementation through decentralized local government units. There are also often disconnects between the nearshore and offshore fisheries and their management; and similarly between how often different agencies deal with commercial fisheries versus artisanal/subsistence fisheries. One of the challenges of an EAFM is to establish ways to ensure that the actions of the coastal and fisheries institutions at each level of government are harmonized with one another and are consistent with agreed EAFM goals and policies.

Such harmonization across scales calls for consistent approaches across the levels between national and local government and reinforces the importance of having a legally authorized inclusive framework that allows for effective harmonization of policy and operational objectives. Management decisions that are matched to the spatial scale of the ecosystem, to the programs for monitoring all desired ecosystem attributes, and to the relevant management authorities are likely to be more successful in achieving ecosystem objectives.

9. HOW CAN MPAS BE INTEGRATED WITH AN EAFM?

With the move of fisheries management towards an EAFM, the use of spatial management tools will increase (FAO 2009). Spatial management can be applied in the FMU to achieve the protection of ecosystem structure, function, key processes, accounting for the interconnectedness within and among systems, and integrating across scales (see section 8). In line with the principles of an EAFM, it will become more common to designate spatial management areas within, or that overlap, the FMU, this spatial management areas can include seascapes, multiple-use MPAs (including no-take reserves), and MPA networks. Managed areas such as these will serve multiple objectives, covering both fisheries management and conservation considerations. Situations in which multiple-use MPAs or no-take marine reserves can prove to be particularly suitable in fisheries include:

1. Controlling fishing mortality of sedentary species in data poor situations;
2. Buffering against uncertainty;
3. Management of multispecies fisheries;
4. Minimization of by-catch;
5. Protecting habitat and biodiversity; and
6. Allocation/access to resources and reinforcement of user rights, e.g. LMMAs.

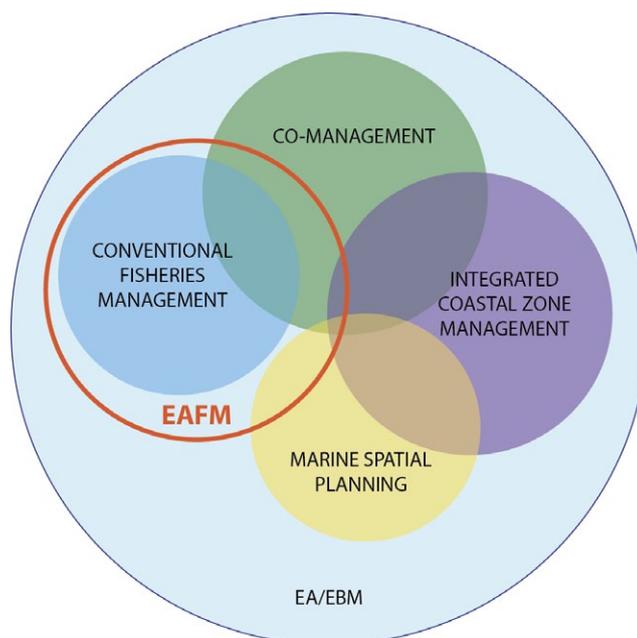


Figure 20: The overlapping nature of different management regimes within EBM.

MPAs need to be seen in a wider perspective and be designed and implemented in a holistic and integrated resource-management framework, not standalone. MPAs should not be considered to be exclusively no-take but also periodic or non-permanent closures in some cases. MPAs are not a “silver bullet” in terms of solving fishery management problems. They do not address some key elements of fisheries management, such as the assignment of fishing rights or overall management of an area beyond the boundary of an MPA. Neither do they address the major underlying problems with unsuccessful fisheries management stemming from improper institutional and incentives structures that in many cases has failed “to control the race for fish leading to overcapacity, overfishing, and economic loss” or from coastal development, pollution, and invasive species.

Once overfishing becomes chronic, the socio-economic and political costs of the tough decisions needed for significant improvement represent a major impediment to change. MPAs and marine reserves are a tool for specifying the locations for fishing and non-fishing; they do not affect the incentives, nor the institutional structures responsible for over-fishing” (FAO 2011). Depending of their goals and objectives, MPAs often have different effects on different species. If MPAs are used as the sole mechanism for limiting the amount of fish that can be caught with a view to sustain fish populations, the extent of the area that will need to be protected may be unrealistically large, particularly for mobile large fish species (Fernandes et al 2012). They are also, in many circumstances, inferior to other fishery management tools in terms of potential yield and economic performance. The best results will be achieved when spatial management approaches, such as networks of MPAs designed to address both fisheries and biodiversity concerns, are incorporated into an EAFM in a balanced way. If the design, placement, and implementation of MPAs and marine reserves follow accepted principles as set out by Greene et al. (2013), the potential benefits will be maximized.

10. HOW CAN CLIMATE CHANGE AND OCEAN ACIDIFICATION BE INCORPORATED IN AN EAFM?

Climate change in the Coral Triangle region is expected to affect fisheries and marine ecosystems through changes in sea surface temperature, changes in the strength of some major ocean currents, reduced nutrient supplies to the photic zone, rising sea levels, changes in precipitation and water availability, increase in frequency and/or intensity of storms, and drought (Daw et al. 2009; Bell et al. 2011). In addition, these ecosystems and fisheries are projected to be affected by ocean acidification. Although there is still much uncertainty about the exact nature and direction of all the likely impacts to coastal fisheries habitats as a result of climate change and ocean acidification, there is broad consensus that there will be further degradation of coral reef habitats in the CT region. This degradation is due to (1) the increased frequency of bleaching events from higher sea-surface temperatures, and (2) the weakening of coral skeletons caused by lower aragonite saturation levels resulting from ocean acidification (Bell et al. 2011). Impacts on fisheries associated with coral reefs are likely to follow habitat degradation, reduced ecosystem resilience, changes in species ranges and decreases in productivity. As climatic change increases environmental variation, more fisheries managers will have to explicitly consider such variations and move beyond static management parameters for particular stocks.

Investments in adaptive capacity and resilient fisheries systems are a good strategy to support future uncertainty. Such uncertainty creates an additional imperative to implement EAFM, which embeds precautionary approaches within integrated management across all sectors. EAFM plans can include an assessment (even a very general assessment) of the expected impacts of climate change and ocean acidification on fisheries and marine ecosystems in the fisheries management unit over time and allow for additional management measures to be considered to address these impacts. A risk assessment can then be used to prioritize the specific climate and non-climate threats and issues for fishery management, as there is a limit to how many issues can be dealt with by the management system. A fisheries risk assessment should be linked to a climate vulnerability assessment, which can be conducted at a national or more local level. A climate vulnerability assessment will include the full breadth of users and government agencies that might impact or be impacted by the EAFM plan in future changing conditions. The results from a climate vulnerability assessment can be used to help fishing communities assess their capacity to adapt and identify adaptive measures to reduce the risk of climate and ocean impacts. A more detailed overview of how climate and ocean change will impact fisheries in the Coral Triangle is provided in the addendum Incorporating climate change and ocean acidification into an ecosystem approach to fisheries management (EAFM) plan (Heenan et al. 2013). In the addendum additional activities are outlined, which, if incorporated in the planning cycle would help consider the impacts of ocean and climate change on fisheries within the EAFM plan.

II. SUGGESTED READING AND RESOURCES

WEB RESOURCES

Australian National Fisheries ESD website <http://www.eafm.com.au>

Bay of Bengal Large Marine Ecosystem Project <http://boblme.org>

Coral Triangle Initiative <http://www.coraltriangleinitiative.org/>

EAFnet <http://www.fao.org/fishery/eaf-net/en>

EBM Tools Network <http://www.ebmtools.org/>

International Institute for Sustainable Development <http://www.iisd.org>

Knowledge Management Toolkit <http://www.kstoolkit.org>

NOAA Fisheries Tools Website <http://nft.nefsc.noaa.gov/index.html>

NOAA Coral Reef Conservation Program <http://coralreef.noaa.gov/aboutcrp/international/ctr/>

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