

## 2. What is EAF?

### 2.1 BACKGROUND TO EAF

The adoption of the EAF resulted from an increased understanding of the interactions between human activities and ecosystems, a growing environmental awareness among the many different stakeholders, and lessons learned from fisheries management over the last 50 years. With an EAF, management systems are broader in scope in order to encompass the key interactions between fisheries, the resources they target and the wider ecosystems in which they operate. The broadening of scope is occurring in parallel with the recognition across all fields that natural resource management must be prudent, transparent and democratic.

The concepts underpinning EAF are reflected in a series of international instruments that were developed over several decades, such as the Law of the Sea (1982), the United Nations Conference on Environment and Development (UNCED), also referred to as the Earth Summit (1992), and the FAO Code of Conduct for Responsible Fisheries (FAO, 1995). The concept of “sustainable development” as an alternative approach to an approach simply based on economic growth, and which strives to “meet the needs of the present without compromising the ability of future generations to meet their own needs”, permeates through all these instruments. The agreements that resulted from the Earth Summit, such as Agenda 21, and the legally binding Conventions, including the Convention on Biological Diversity (CBD), had an overarching significance for all human activities. Of direct interest for aquatic resources use is the 1995 Jakarta mandate on coastal and marine biodiversity because this mandate builds on the platform provided by the CBD by specifically linking issues of biodiversity and conservation to fishing activities.

The Code of Conduct for Responsible Fisheries represented a milestone within fisheries for better implementation of the principles of sustainable use and the establishment of improved principles and standards for the conservation, management and development of all fisheries. Given the difficulties experienced in the actual implementation of the code, new impetus was given to sustainable aquatic resources use at the 2001 FAO Conference on Responsible Fisheries in the Marine Ecosystem (FAO, 2002) through a renewed political commitment to a broader understanding of sustainable fisheries and the adoption of the EAF. Immediately thereafter, and ten years after the Earth Summit, a commitment was made at the World Summit on Sustainable Development (WSSD, 2002) to implement an ecosystem approach to fisheries by 2010.

In 2003, FAO published guidelines to facilitate EAF implementation (FAO, 2003). These guidelines were presented to the FAO Committee on Fisheries (COFI) in the same year. The FAO guidelines indicate the general process by which policies containing ecosystem conservation goals are turned into operational plans, activities, outputs and outcomes. Within this general conceptual framework, the specific purpose of an EAF 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” (FAO, 2003).

## 2.2 CONVENTIONAL FISHERIES MANAGEMENT AND THE ECOSYSTEM APPROACH

The EAF as adopted by FAO is not considered a major departure from conventional fisheries management but rather an extension of it and with a greater emphasis on sustainability concepts as articulated in the Code of Conduct on Responsible Fisheries. Table 2.1 shows a comparison of key features of a management system using the conventional approach and a management system using an ecosystem approach, respectively.

**TABLE 2.1**  
**A comparison of conventional and ecosystem approaches to fisheries management**

Conventional approach to fisheries	Ecosystem approach to fisheries
Has few fisheries management objectives.	Expands scope of fisheries management to explicitly address ecosystem and socio-economic considerations.
Focuses mainly on fishery sector issues, i.e. sectoral	Deals more explicitly with the interactions between the fishery sector and other sectors, e.g. petroleum industry, tourism, coastal development.
Deals mainly with single (target) species.	Responds to concerns about the broader impacts of fisheries on the marine ecosystem, including impacts on the habitat, vulnerable species and biodiversity.
Addresses fisheries management issues at the stock/fishery scale.	Addresses the key issues at the appropriate spatial and temporal scales. These issues are often nested (local, national, subregional, regional and global).
Is predictive, with decision-making mainly based on results from mathematical or statistical models that assess the outcomes of different management strategies.	Given the uncertainty associated with many of the issues to be dealt with, the limited data available and poor understanding of relevant processes, recognizes adaptive strategies as being more useful.
Considers scientific knowledge the only valid knowledge as a basis for decision-making.	Recognizes that it is not possible to obtain scientific knowledge on all the issues to be dealt with and that alternative knowledge (e.g. traditional knowledge) can be utilized as a basis for decision-making.
Operates through regulations and penalties for non-compliance.	Encourages compliance to regulations through incentives.
Uses a top-down (command and control) approach.	Uses a participatory approach, e.g. various forms of co-management are a key feature of the EAF.

Source: The authors.

Given the broader scope of EAF as compared with conventional fisheries management, and the often limited resources of fishery administrations and research institutes, the implementation of EAF will require a process of prioritization to identify the issues which need most attention or pose greater environmental risk, i.e. it is not just a question of adding new elements to conventional management.

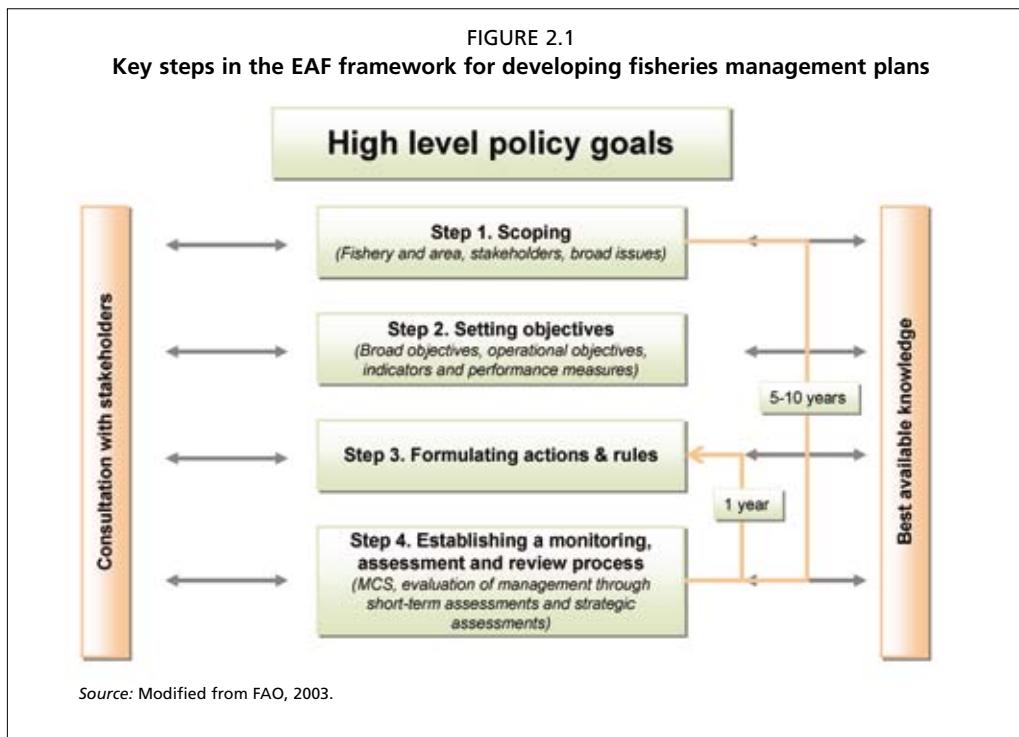
## 2.3 APPLYING EAF, A PRAGMATIC APPROACH

The guidelines developed by FAO provide a framework for the comprehensive implementation of EAF principles<sup>1</sup>. Implementation of the approach entails going through a systematic and participatory assessment and planning process that leads to the formulation of fisheries management plans consistent with EAF. The plans also include mechanisms for assessing management performance on a regular basis. The sequence of steps in the process is illustrated in Figure 2.1 and can be briefly described as follows (FAO, 2003 and 2005).

### STEP 1: Scoping

The spatial coverage of the management plan should be defined in such a way that it is most relevant to the fishery in terms of the area where the fishery takes place, the distribution area of the target resources, and the ecosystem where they occur, and that it allows identification of stakeholders having common or competing interests in relation to that resource or area. At this stage, relevant information on all aspects of

<sup>1</sup> A number of strategies have been suggested for EAF implementation (Busch *et al.*, 2003; Bianchi and Skjoldal, 2008; Fletcher *et al.*, 2002; Garcia *et al.*, 2003, and summarized in Garcia and Cochrane, 2005) but the authors chose to base their work on the approach adopted by FAO (2003).



the fishery or fisheries and the ecosystem, including people and livelihoods, should be compiled to serve as a basis for the following steps.

## STEP 2: Setting operational objectives

Setting operational objectives entails a series of tasks, including determination of broad objectives and translation of these objectives into operational objectives and associated indicators and performance measures.

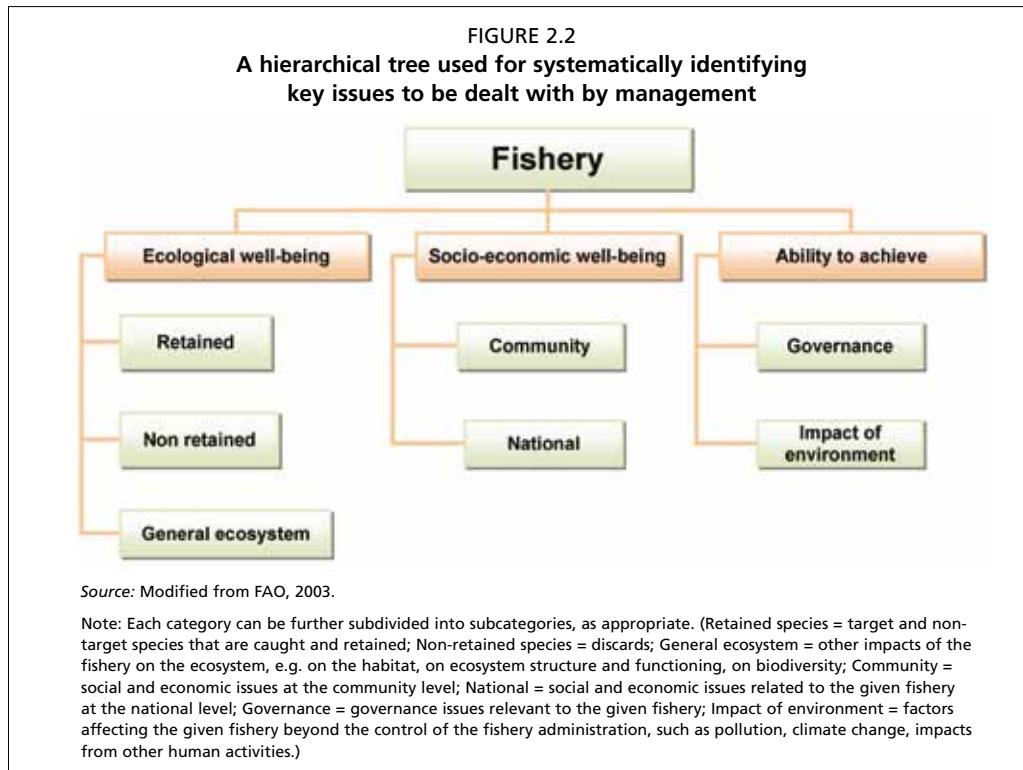
### *Set broad objectives*

Management objectives consistent with EAF principles must be defined explicitly, with attention to ecosystem sustainability objectives as well as social and economic objectives, and should be consistent with high-level policy goals that are likely to be found in national legislation. These objectives will direct the identification of issues to be dealt with by management and the formulation of operational objectives.

### *Develop operational objectives from broad objectives*

Specific operational objectives are needed to allow managers to implement specific measures and should, therefore, have a particular and practical meaning for the fishery being considered. The key tasks include:

- identification of detailed issues relevant to the fishery through participatory and structured methods, following key categories along the three main dimensions of a fishery system, i.e. ecological, socio-economic and governance, and including the influence of other drivers external to or beyond the control of the fishery (Figure 2.2);
- prioritization of issues through a formal process such as a risk assessment; and
- for each specific issue, formulation of an operational objective and associated indicators, reference points and performance measures.



### STEP 3: Formulating actions and rules

An overall plan of action must be implemented. This plan is likely to contain a mix of measures that are perceived as being appropriate to the specific fisheries ecosystem. All management requires the setting of rules by which the activity must function and these rules should be based on best available knowledge. Suitable management measures are identified, such as catch controls, effort limitation, and closed areas or seasons, and for each of these measures there will be local by-laws or rules that may need continual adjustment in response to the ecosystem's change. This step is particularly challenging in tropical multispecies fisheries as consideration has to be given simultaneously to the impacts of fisheries on species with varying degrees of productivity.

### STEP 4: Identifying monitoring, assessment and review mechanisms

#### *Evaluate management*

A monitoring and review process is needed to evaluate the extent to which management's measures are actually contributing to the broad and operational objectives, based on the selected indicators and agreed reference trends and directions. Usually the review process has a one-year cycle for tactical fisheries management and a longer (5 to 10 years) cycle for strategic planning and re-evaluation of the management plan.

#### *Set up a monitoring, control and surveillance system*

Successful fisheries management relies on a well-functioning monitoring and control system, particularly in the case of industrial fisheries. The introduction of a vessel monitoring system (VMS) opens the possibility for a more effective spatial management, which is particularly relevant to improve conventional fisheries management but also to address conservation concerns under an ecosystem approach.

Identification of the key stakeholders is fundamental to the successful development and implementation of the management plans. Although stakeholder identification can take place informally, more formal ways can be used (e.g. Renard, 2004; Vierros *et al.*,

2006). In addition to ensuring stronger legitimacy and transparency, a good process for stakeholder identification and analysis also provides the basic understanding of the social and institutional context relevant to the planning process.

A number of the key steps in the ecosystems approach planning and implementation cycle (as described above) would benefit from more explicit consideration of spatial information about ecosystem components and properties. Furthermore, because of the participatory nature of EAF planning and implementation, visualization of important ecosystem properties would greatly facilitate stakeholder consultation and decision-making. Within the scientific process, spatial data visualized within a GIS environment can help improve understanding of the ecosystem in question and allow for more spatially resolved analyses and hypothesis testing. The following sections will consider in detail the current uses of GIS technology in marine fisheries, the role of GIS in support of EAF planning and implementation, case studies which integrate GIS into EAF, opportunities and challenges of GIS in support of the EAF (Section 6) with explicit reference to the EAF implementation framework outlined above and in Figure 2.1.

