4. Situating the framework within the planning and management cycle

This chapter positions the IAA framework in broader processes of policy-making, development planning and operational management. It re-introduces general planning and management cycles and discusses the role of different individuals within assessment, planning and management processes. Finally, the importance of integrating the different phases of the IAA framework and incorporating this into the wider management process is emphasized.

THE POLICY AND MANAGEMENT CYCLE

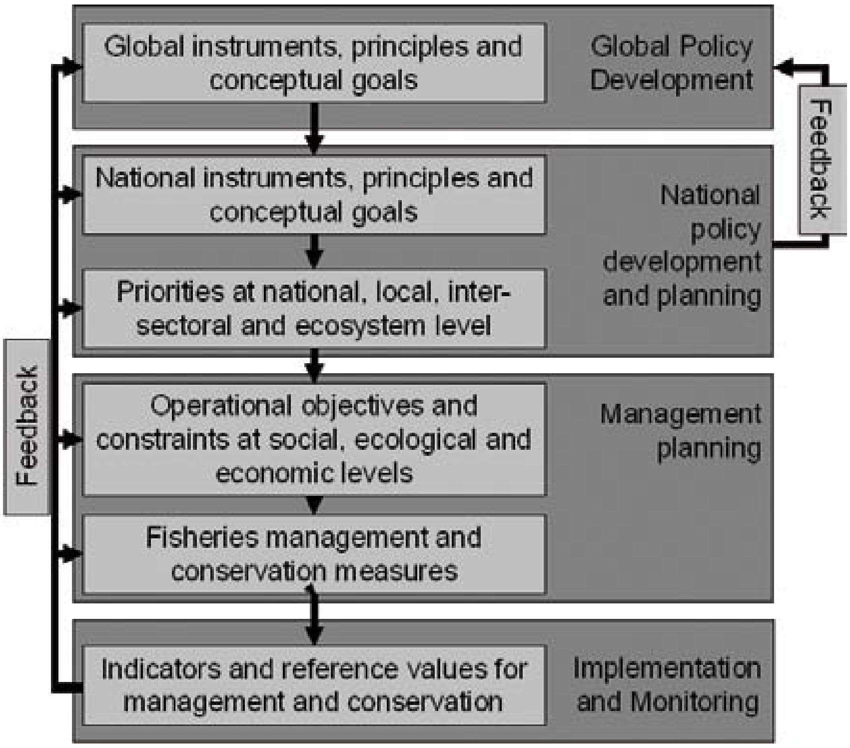
The integrated assessment of a SSF may be needed in support of short- to medium-term management or medium- to long-term planning for development or policy change.

Medium- to long-term planning involves either recurrent planning or the introduction of new initiatives and approaches. The first might involve, for example, the preparation of recurrent national economic development plans (five to ten years), which require a strategic assessment of the history of the fishery and performance of past planning strategies, a multidimensional profile of the SSF subsector, determination of the trajectory of the fishery and its status relative to other subsectors and identification, understanding and advice on constraints and opportunities for change. The second aspect of long-term planning might involve the introduction of a major change in the approach to developing SSF, which could occur as a result of broader contextual changes (e.g. a shift in government or donor policy) and also requires a strategic assessment.

Short- to medium-term management involves systematic planning and implementation of management initiatives as well as problem resolution in response to emerging issues. With regard to the first, which includes initial drafting or review of management plans occurring on a yearly or bi-annual timescale, the IAA process becomes both strategic and operational. It is strategic where it identifies suitable management approaches for the entire subsector, e.g. the EAF or the introduction of territorial fishing rights. It is operational when it deals with the elaboration of the management regime of a particular fishery, advising on specific measures designed for that fishery and type of resource with an *ex-ante* assessment of their impact. In both cases, the purpose of the assessment is to look at ways and means to translate national policy objectives into management objectives for the subsector and/or for specific fisheries, focusing on finer time and geographical scales. The recurrent assessment of management performance also belongs to this category of strategic assessments. Finally, resolution of emerging issues means that demand is associated with a particular issue, and time available for the assessment may be limited. These are short-term crisis-driven interventions. While the purpose of effective management is to avoid the emergence of crises, surprises are to be expected. It is also the reality that where management has been ineffective in the past, problem solving is often urgently required.

While presented above as distinct considerations, medium- to long-term planning and short- to medium-term planning are not mutually exclusive and there is considerable interaction and feedback between the different planning and management cycles. Connections between global and national policy development (i.e. at United

FIGURE 11
General policy and management cycle



Source: FAO, 1995.

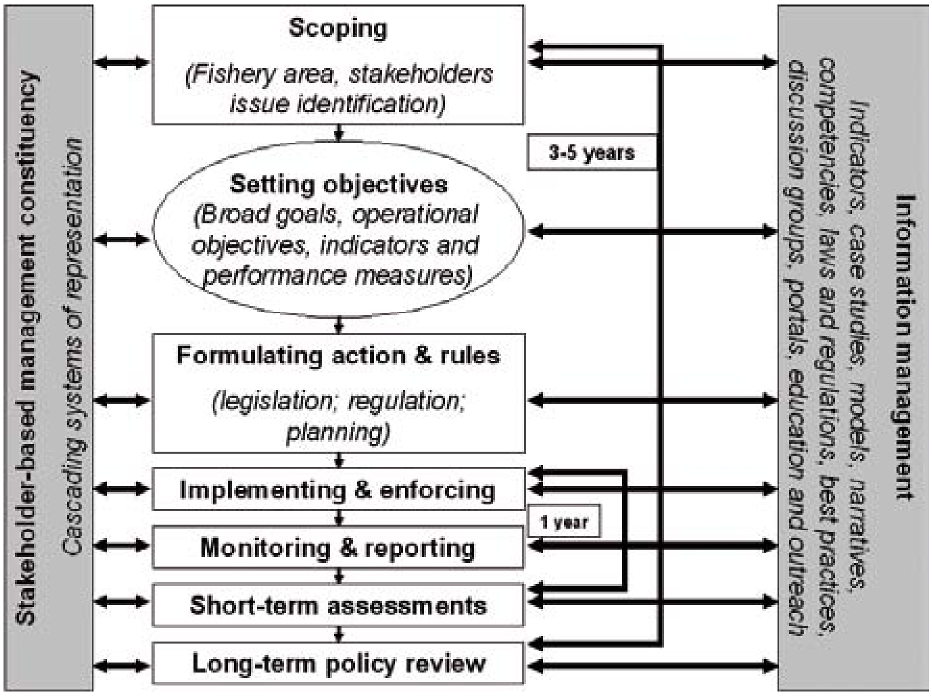
Nations or FAO levels) and between national policy development and management planning and implementation are important (a figure introduced by FAO in 1995 represents these connections – see Figure 11). Some form of assessment is needed at every step, e.g. to assist in selecting objectives and priorities, identify issues, assess likely consequences of different options, monitor implementation and assess performance. All feedback loops tend to involve some form of assessment. A more detailed representation of the management cycle (Figure 12) can be drawn in which the role of information (and stakeholder participation) can be reflected at every stage, from scoping the management plan through longer-term policy reviews (e.g. for performance assessment).

Conducting integrated assessment and advisory activities within the planning and management process, according to the fundamental principles outlined above (Chapter 2), is reliant on the interaction of a diversity of stakeholders. Defining different stakeholders and their roles in the assessment and advice process is important to maintain its effective and legitimate implementation. Further, the stakeholders involved and the roles they play will be different within different types of assessment so this feature of organization and integration will have considerable implications for the integrity of the process and its outcomes.

ROLES OF DIFFERENT STAKEHOLDERS

For an effective IAA process, it is important that the different actors concerned are aware of their respective roles and behave accordingly (Alverson, 1972; Jasanoff 1994). The actors involved in IAA are the key stakeholders, including: (i) the fishery management authority staff, decision-makers and advisers; (ii) the scientists and other components of the assessment group; (iii) the SSF communities or fishworkers in their

FIGURE 12
The management planning and implementation cycle



Source: FAO, 2003.

diversity; and (iv) the non-fishery stakeholders. non-governmental organizations, e.g. with interests in environmental or fishing sector matters, may play an important role in the IAA process. In the specific context of SSF in developing countries, a range of development-sector stakeholders are also implicated. Decisions on the location of schools and clinics, the power granted to local governments and the type of policies pursued for social protection and economic growth will all have implications for fishing communities. Stakeholders in these processes will include a wider range of governmental and non-governmental organizations, as well as traditional authorities and private-sector interests in other, potentially competing economic sectors. The roles of these potential stakeholders, particularly in relation to assessment and advice, are briefly specified below.

Who is the "manager"?

The "manager" is the entity or person charged with the authority and responsibility to manage the fisheries. Under current governance regimes, the ultimate authority is the State, which can delegate all of part of the authority and connected responsibilities to institutions below it and can comply with institutions beyond its jurisdiction (e.g. in regional and global governance regimes). The delegated authorities are accountable to the State, while States are accountable (usually voluntarily) in international law. While the term "manager" is thus used rather generally, it covers different realities in different countries. In some developed countries, a fishery manager is a single person in charge of managing a single fishery. In many developing countries, the responsibility is centralized and the "manager" is the Director of the Fisheries Department or even the Minister of Fisheries, whether at the national or provincial/state levels, e.g. in the case of many federal countries. With limited human resources, particularly in island countries, he/she may be "managing" the entire sector as a whole and at best a subsector, e.g. in the case of a person in charge of the whole small-scale fishery sector. SSF are rarely managed on a fishery-by-fishery basis. Instead, they tend to be managed on a geographical basis, for instance, by subregions or municipalities (as in the Philippines). In a co-management system, the manager responsibility is shared between the State and the community. In more devolved community-based management systems, the State remains ultimately responsible for the condition of the resources but all the management responsibilities might be devolved to the fishing or coastal community itself. Under an integrated coastal area management system, the authority might be the Minister for Planning, or Finance, or any coordinating agency specifically mandated. In a stakeholder-based management system, the "manager" is the stakeholder committee, accountable to the constituents it represents and is drawn from.

Who is the "assessor"?

In a conventional fishery management framework, the assessor is the scientist or group of scientists (usually fishery biologists) involved in undertaking the assessment,. In the more participatory management systems needed for SSF, the situation is more complex as the assessment may be conducted: (i) by a multidisciplinary team working in an integrated mode or (ii) with the active participation of the key stakeholders. The scientists may come from the national fishery research laboratory (depending on the Minister of Fisheries or the Minister of Science and Education) or from a university or research institute, or may be hired as consultants (e.g. in the Chilean artisanal fisheries). They may be contracted by the Ministry, a donor agency, a development bank, an environmental NGO or by the industry itself. In participative systems, stakeholders may therefore be involved both in the assessment and in the negotiation process leading to the decisions. In many traditional SSF, the "assessors" are the fishworkers themselves who develop an understanding of the system based on the collective wisdom inherited from the elders and their own experience.

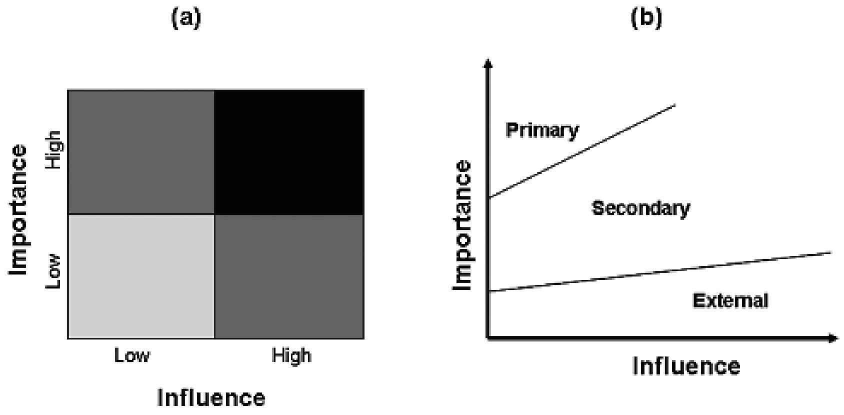
Usually, scientists assess and advise but do not have a role in the final decision-making process, in which other stakeholders and the authorities in charge negotiate over which implementation options among the ones elaborated through the IAA are most appropriate or acceptable. However, in some cases, the reality may be more complex. For example, the participation of scientists as stakeholders in the decision-making process might be useful in order to: (i) provide the explanations and clarifications other stakeholders may require during the final negotiation on the system "reality" or best scientific understanding; and (ii) assist in building consensus among groups of stakeholders with diverging understanding and objectives (Jasanoff, 2004). This is a role that social scientists may be comfortable with but which natural scientists are usually reluctant to play, concerned as they are, at least rhetorically, to keep the science process clear from political interference.

It is increasingly recognized that political processes and scientific ones are not as distinct as some natural scientists would like to believe. Conducting assessments in which scientists facilitate decision-making processes in addition to assessing and advising does not mean that rigour is necessarily jeopardized. Principles such as maintaining transparency and accountability, differentiating between collective knowledge and personal interests, and standardizing practices of reflexivity and adaptive learning can compensate where the line between assessors and participating stakeholders or decision-makers is less clear, as is likely the case in SSF in developing countries.

Who are the stakeholders?

The stakeholders are all those with a stake/role in decision-making. *All those affected, positively or negatively, by an activity, or the people who can influence the process of impact of an activity. Broadly defined, stakeholders in fishery regimes include fishermen, the fishing industry and institutions involved in the management system, all those who rely on fishery habitats for a living and those interested in conservation of fishery*

FIGURE 13
Common templates for the classification of the relative importance and influence of the different stakeholder groups



resources and habitats (compiled from Walmsley, Howard and Medley, 2005). It can be noted that in top-down management systems, there is a clear distinction between managers and other stakeholders. In fully devolved (bottom-up) management systems, the roles of managers and the other stakeholders overlap, as the latter also participate in the management process.

Wide stakeholder involvement is predicated in the context of the IAA framework. A key task then becomes that of managing the power relationships between stakeholders during the assessment process, so that the interests of primary stakeholders (fishworkers who may lack power) are not overridden by the powerful advocacy lobby of some external stakeholders, who may have the ability to muster impressive science-based analysis to support their position and thus influence the agenda of key government decision-makers (secondary stakeholders). Therefore, while there is much preoccupation with the technical integration of different knowledge systems, far more important is the way in which differential power is exercised in determining "whose reality counts" (Chambers, 1997). A stakeholder based assessment therefore requires careful attention to managing power relationships – a task requiring skilled facilitation and arbitration. Stakeholder participation in the assessment is likely to be more effective when the management itself also calls for their participation (Brown, Tompkins and Adger, 2001).

Various methods of classifying stakeholders have been proposed. The most common uses two criteria – influence and importance – to classify stakeholders into four categories (Figure 13a).

Brown, Tompkins and Adger (2001) develop a stakeholder analysis which defines importance as the degree to which the stakeholder is considered a focus of a decision to be made, while influence is presented as the level of power a stakeholder has to control the outcome of the decision-making processes or the decision itself. The level of influence stems from the power which stakeholders have to control, persuade or coerce others into making a decision and following a certain course of action. As Salancik and Pfeffer (1974) have said: "power may be tricky to define, but it is not difficult to recognize: [it is] the ability of those who possess it to bring about the outcomes they desire". Importance is often relational rather than absolute and can vary according to the objectives of the decision-makers. Groups or issues can also rise in importance under certain circumstances (Brown, Tompkins and Adger, 2001). A slight modification to this classification matrix uses the influence and importance criteria to classify stakeholders as primary, secondary and external (Figure 13b), where:

- **Primary stakeholders**: people directly affected by management – they are important beneficiaries of management but may have low influence, e.g. fisherfolk, migrants, fish traders
- **Secondary stakeholders**: people not directly affected by management, but directly involved in the process – may have high influence, e.g. traditional authorities, landlords, government officials, FAO fisheries field programme personnel.
- **External stakeholders**: not directly involved, but can be influential, e.g. fish consumers, scientists and conservation and development interests (national and international, such as FAO Fisheries and Aquaculture Department).

In their discussion on issues emanating from the use of a stakeholder approach in fisheries management, Mikalsen and Jentoft (2001) use a classification of *legitimacy*, *power* and *urgency* originally developed in a business studies context to suggest that stakeholders can be differentiated between: (i) groups that have a legal, moral or presumed claim (legitimacy); (ii) groups that are in position to influence decisions (power): and (iii) groups whose claims demand immediate attention from managers (urgency). Based on these criteria, stakeholders could be grouped in the following categories:

- **Definitive stakeholders**: groups or individuals whose demands and needs managers must attend to because they possess legitimacy, power and urgency, e.g. fisherfolk, fish processors, enforcement agencies.
- **Expectant stakeholders**: groups or individual that only possess two of the three attributes, e.g. local communities, environmental groups.
- **Latent stakeholders**: groups or individuals who possess only one of the attributes and to whom there is little incentive for the manager to respond to their claims until, for instance, they demonstrate legitimacy or acquire power (e.g. the media, future generations).

In a real world, however, experience shows that stakeholders having "only" power (political and financial) may be able to capture the attention of the managers and even control the system.

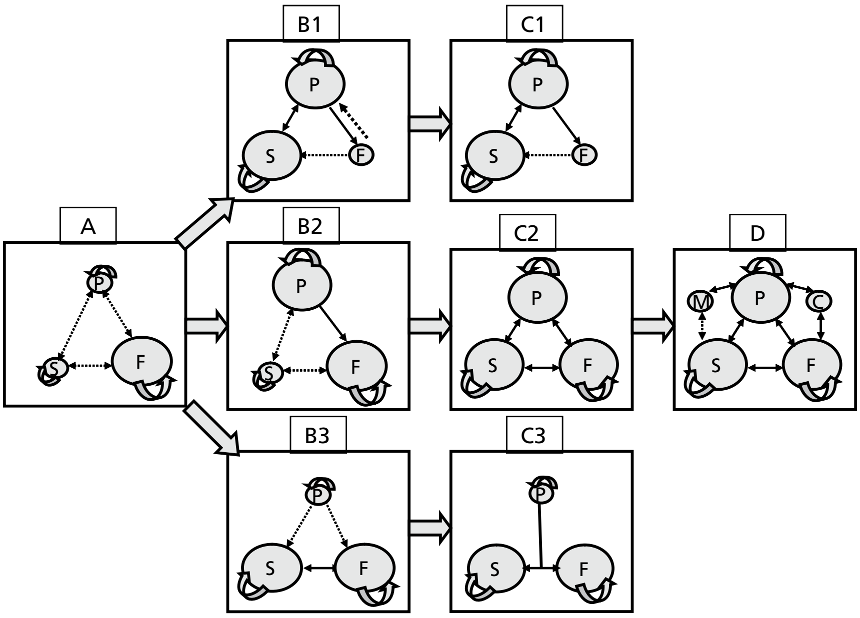
Understanding the different stakeholders in a SSF social-ecological system is important. When the demand for an assessment arises, either within strategic or operational contexts, the next step is to then assign roles and decide on the relative powers of the different stakeholders, which effectively represents the level of participation, interaction and collaboration that will define the IAA process. See Figure 14 for an overview of how different stakeholder relationships can be categorized.

It is essential for the sustainability of multistakeholder processes and effective IAA and management decision-making that stakeholders are aware of their different roles (at different scales in different cycles of assessment) and that they behave accordingly, working within the boundaries of their mandates and responsibilities (Alverson, 1972; Jasanoff, 1994), with transparency and accountability.

The boundary between the manager and other stakeholders is evolving rapidly as participatory management systems are put in place with part of the decision-making power being devolved to the stakeholders through appropriate institutions. Many of the decisions which, in any other sector, would belong to the industry and fishers (e.g. type and size of gear to use, area and season to fish, investment to make) are decided by the manager because of the vulnerability of the resource to overfishing and depletion and the conflict between the individual and collective interests. In devolved fishery systems, the manager tends to keep an oversight role (e.g. on stock sustainability), expressed by the imposition of norms, indicators and reference values, leaving operational details to the sector. That approach is certainly preferable for small-scale fisheries.

The boundary between scientists and other stakeholders in the development of scientific conclusions also depends on context. While in conventional fisheries management fishers are seen as data providers and decision implementers, in modern times the sector itself can commission scientific analyses, establish collaboration schemes with scientific institutions

FIGURE 14
Interaction between policy-makers or managers (P), scientists (S), fishworkers (F), media (M) and courts (C)



Notes:
The figure shows the configuration of relationships between policy/management (P), science (S) and fishworkers (F) that can evolve.

1. (A) may represent the system before the emergence of Nation States, when self-sufficient communities auto-generate their knowledge, rules and processes. Elements B1 to B3 represent three possible paths for the evolution of the system.
2. (B1) reflects the development of a strong government-science link in support of a top-down management system with an indirect role of fishworkers through lobbies.
3. (B2), on the contrary, reflects a situation in which a strong directive state develops a top- down, regulatory system (essentially for conflict resolution among fishworkers) with minimal scientific support. The sector provokes and influences the decisions through lobbying. Many fisheries around the world were managed in this way in the 1970s with little or no attention and lip service paid to science and conservation (Alverson, 1972). This is still the case for many large-scale fisheries in the developing world.
4. (B3) reflects a system in which strong links are established between science (often academic, non-governmental) and fishworkers in a situation of neglect or non-intervention from the State.
5. (C2) sees a balanced development of the three linkages and may reflect a true integrated knowledge-based management as seen for instance in the Northern prawn fishery of Australia.
6. (C3) would be an evolution of B3 in which the benevolent State limits its role explicitly to overseeing the relationship between F and S, making sure that it is informed by it.
7. (D) is the modern evolution of C2, with the emergence of a significant role for the media (M), advocacy and the courts (C), the latter becoming an instance for conflict resolution and an alternative path to conventional negotiations.

The types of decentralization likely to happen in SSF are best represented by elements A, B3 and C3.

and participate directly in the research and the interpretation, contributing also empirical or local knowledge. In order to investigate (or at least inform) the multiple dimensions of the system's likely response to potential measures, the scientists may feel compelled to straddle the boundary between science and policy, between what they can demonstrate and what they are convinced of. They may have to use participative research methods in which indemonstrable consequences of an action might be conventionally agreed as likely by all stakeholders. This situation is typical of decision-making under uncertainty. In such a process, most scientists would prefer to leave the full responsibility of the decision to the manager, voluntarily not constraining the decision. Many managers, on the contrary, would wish to get as "hard" and clear an advice as possible, particularly when political costs may be high, with a substantial part of the responsibility and risk being taken by scientists. However, under different circumstances, managers may want many options to select from based on their own perceptions or the lobbying and political pressures they are subjected to. In a fully participatory advisory process, the decision is jointly reached and the responsibility and liability are therefore shared.

THE INTEGRATIVE CHALLENGE

While the process of assessment and the choice of assessment procedures and methodologies are deliberately flexible, a key requirement of the IAA, as envisioned, is the need for integration on many levels. The process of assessment is as important to an effective and legitimate assessment and advice activity as the specific outcomes and recommendations. Interaction of actors, integration of knowledge, linkages between assessment and decision-making and merging of assessment outcomes from different time scales are essential components of the IAA proposed.

Integrating perspectives

Both the natural and social sciences have distinct but complementary contributions to make to the assessment process and the formulation of advice for decision-making (Jentoft, 2006). The IAA itself, as well as its embeddedness in the management and planning cycles, enables ongoing fusion of these disciplines, through holistic issue recognition, iterative and adaptive learning processes and feedback structures, and stakeholder interactions and participatory processes. Further integration of disciplinary perspectives occurs within a complex and dynamic environment, in which boundaries are blurred. The form that interdisciplinarity will take within the IAA process will be determined by the formal demand, practical questions, time schedules, deadlines, research positions and budgets that are agreed and allocated to achieve problem-oriented disciplinary integration.

Beyond different disciplinary perspectives, a consequence of fishery system complexity is that the same information may be interpreted differently by different stakeholders. Conversely, the same action may lead to different outcomes -- in different places or in the same place at different times. It is a requirement of managers that the assessment may not be open to multiple interpretations. However, in a multiple use, multistakeholder context, it is impossible to ensure that assessment outputs cannot be re-interpreted in a different manner. It is more precautionary to accept the fact that many causes may lead to the same effect and one factor may yield different results. In addition, in a multidimensional assessment, blending quantitative and qualitative information opens the way to re-interpretation or reformulation of the qualitative information, potentially affecting the conclusions. The solution to the dilemma for managers is not in ordering the scientists to elaborate iron-clad conclusions (artificially hiding part of the uncertainty), but in institutionalizing a highly participative, adaptive learning system. In such a system, it is important to recognize all possible interpretations that have been scientifically validated (possibly with some objectively determined degree of likelihood) and to consider them all when designing a potential response, hopefully robust, to the uncertainty. One of the elements of the response should indeed be to seek additional evidence in order to resolve the ambiguities as soon as possible. Resolution of differing interpretations and consensus on strategic decisions is ultimately necessary to maintain the spirit of partnership. It may be advantageous, in such cases, to have the scientists participating in the final stage of decision-making, where the ambiguity will need to be faced and the conclusions shown to be supported by the data and their analysis.

Integrating knowledge

The principles of integration (Chapter 2) allude to the need to broaden perspectives for the IAA as well as for more effective and legitimate SSF management. The challenge is then to integrate the knowledge systems that inform broad perspectives in a way that maintains the integrity of the collective, integrated knowledge and the shared visions and values. Scientific rigour and integrity of knowledge are, among others, considered dependent upon effective participation of target-groups in problem identification and solving, on building institutional capacity and on stakeholder ownership of the development process.

BOX 6

Defining and using traditional and local ecological knowledge in fisheries

Traditional ecological knowledge (TEK, also known as local ecological knowledge or LEK)[1] refers to the cumulative body of knowledge, practice and beliefs, evolving by adaptive processes and passed down through generations by cultural transmission (Berkes, 1999; Neis and Felt, 2000). TEK contains empirical and conceptual aspects, is cumulative over generations and is dynamic, in that it changes in response to socio-economic, technological and other changes (Berkes, 1999). Berkes (1993) clarifies that traditional ecological knowledge differs from scientific ecological knowledge in a number of substantive ways: (i) TEK is mainly qualitative as opposed to quantitative; (ii) it has an intuitive component as opposed to being purely rational; (iii) it is holistic as opposed to reductionist; (iv) in TEK, mind and matter are considered together (as opposed to a separation of mind and matter); (v) it is moral (as opposed to supposedly value free); (vi) it is spiritual as opposed to mechanistic; (vii) it is based on empirical observation and accumulation of facts by trial and error as opposed to experimentation and systematic, deliberate accumulation of fact; (viii) it is based on data generated by the users themselves as opposed to that by a specialized cadre of researchers; and (ix) it is based on diachronic data, i.e. long time series on information on one locality as opposed to synchronic, i.e. short time series over a large area.

The field of TEK is grounded on a number of practical examples, as can be seen in a recent volume that contains an authoritative summary of the use and importance of fishers knowledge in fisheries assessment and management, and, in collaboration with scientists and managers, for advising on fisheries governance (see Haggan, Neis and Baird, 2007 for different examples worldwide).

There are already many initiatives towards complementary use of scientific and traditional local ecological knowledge around the world that seek to develop collaborative assessment of small-scale fisheries. Johannes (1981) details the biological/ecological evaluation of fisheries TEK in Oceania and volumes of selected studies of local-based marine resources management systems in Asia and the Pacific illustrate this topic (Johannes, 1989; Ruddle and Johannes, 1989; Freeman, Matsuda and Ruddle, 1991). In Brazil, studies have reported different aspects of fishers' knowledge, including their understanding of the environment of Pantanal wetlands (Calheiros, Seidl and Ferreira, 2000). Fishers in many coastal areas and in the Amazon river have a nomenclature system for fish species, usually classifying key species in a detailed way according to their ecology and behaviour. The use of fishers' knowledge in deciding about optimal fishing strategies of coastal islands (Begossi, 1992; 1996), in the management and assessment of fisheries in the Amazonian floodplain (Isaac, Ruffino and MCGrath, 1998; Castello, 2004), in coastal fisheries of northeastern Brazil (Cordell and McKean, 1992; Christensen et al., 1995) and in coastal lagoons in southern Brazil (Seixas and Berkes, 2003; Kalikoski and Vasconcellos, 2007) have been key for sustainable management of the resources.

[1] We refer here to all forms of knowledge available to SSF, whether based on well established tradition (also referred to as traditional knowledge or traditional ecological knowledge, TEK) or more recently acquired (also referred to as local ecological knowledge, LEK) (Berkes, Mahon and McConney 2001).

The successful application of the IAA framework and its use in planning and management cycles will be influenced by (i) the extent to which managers, assessors and stakeholders more generally appreciate the validity of each others' knowledge and understanding and (ii) by the extent to which collective knowledge and shared visions and values are developed and the different systems validated by other stakeholders.

To facilitate both these process a short review of the potential contributions of local knowledge is provided.

The findings of Wilson, Raakjaer and Degnbol (2006) in the small-scale fisheries they examined in Zambia and Viet Nam might be considered a useful proxy (to be checked in each case) of the type of issues affecting the use of fishers' knowledge:

1. Except for some key climatic factors (e.g. water levels or rainfall), traditional knowledge tends to be directly related to the geographical and time scale of the daily and seasonal operations of fisheries and rarely relates to the longer-term considerations of interest to fisheries management. The consensus emerging between fishers, in the various case studies, appeared to vary, depending on the subject, the place and the countries examined. There was good consensus among fishers in relation to fish abundance, size and species composition, the role of destructive fishing methods (and the need to ban them), the importance of juveniles and habitat for productivity. There was less agreement regarding the evolution of catch rates and very poor or no agreement at all when considering changes in water quality.
2. Fishers do not easily conceive the use of an indicator and many doubt that any observation today would tell anything about future catches, for instance.
3. Knowledge available with and interpretations of trends by older fishers may differ from those given by younger ones, indicating age-related differences in perceptions and interpretations. In addition, users of a wide range of small-scale gear had better ecological knowledge than those using large-scale gear.
4. Views of fishery officers and fishers could be very different, e.g. fishers may relate declining fish abundance to habitat degradation (or climate, in developed countries) while officers may relate it to overfishing. Differences relate to both the scale at which the fishery system is perceived (locally for fishers, more regionally for officers) and the nature of the drivers.
5. Disagreements about impacts of fishing and necessary management measures are often observed between subsectors of the SSF exploiting the same stock (shrimp) in the different areas (e.g. inshore versus offshore) but at different ages (e.g. juveniles versus adults) and with different gear (e.g. small versus large mesh size). This reflects a classical expression of conflict and competition in cases where management measures have an impact on the distribution of resources, opportunities and wealth.
6. Despite these divergences, the authors indicate that scope for agreement can be found, e.g. on local technical measures to be taken, but that traditional knowledge alone would be too weak to be used for the design of an effective management system.

As noted earlier, the situation and contexts of SSF vary greatly between and within countries and all generalizations are dangerous. In relation to item 6 above, for example, Mahon et al. (2003), working on a small and simple sea urchin fishery in Barbados, found that the fishers could devise a very reasonable management approach based on what they knew but did not have the capacity or authority to implement it.

Most quantitative scientists (whether biologists or economists) would likely agree that, in order to be utilized for a scientific enquiry and more specifically in a model, traditional knowledge on the functioning of nature (TEK or LEK), as well as on the social relationships within or between groups, the pertinence and efficiency of institutions, the economics of their industry, etc., needs to be validated. Wilson, Raakjaer and Degnbol (2006) indicate that this could be done by as follows:

- Checking (e.g. using consensus analysis) that it is really "traditional knowledge", i.e. a knowledge shared by the community or at least by the most knowledgeable elements of the community, in order to avoid taking a personal view of an informant.

- Looking for elements, facts, rules, informal models that could be used to verify and check the consistency of the knowledge.

Verification and consistency checks are intended to separate fact-based knowledge from myths, perceptions or values. The role of these latter in management is important, but their interference with factual analysis should be minimized. Scientific verification is made against available scientific theories, observations, models and literature. Social scientists can check coherence with general social theories, situations described elsewhere, etc., while overall conclusions are elaborated jointly by social and natural scientists.

Traditional knowledge can be identified through stakeholder interviews, using open-ended questionnaires, map drawing and/or historical timelines of climatic events or series (e.g. of changes in the fisheries). One can also collect stakeholders' statements about their own fisheries (alleged factual observations and assumed causal relationships). Such interviews may lead to the identification of candidate indicators that are meaningful to the stakeholders themselves.

Recent work by the International Council for the Exploration of the Sea (ICES) to cross-check the traditional understanding of fishers with the formal scientific findings of scientists using structured questionnaires, indicated a substantial agreement between the positions, sometimes after reformulation of the question. In many cases of apparent disagreement, it appeared that the difference was one of scale (e.g. the perception of local abundance trends in the short term by fishers did not match the longer-term trends of global abundance by scientists) (Prigent *et al.* 2007).

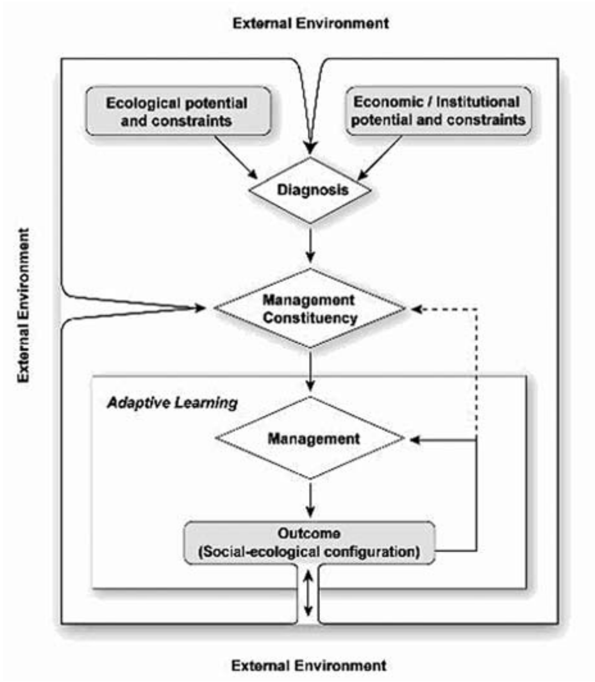
Effective integration of scientific and traditional knowledge requires active participation of stakeholders in the assessment process. In the preparatory phase, additional efforts should be made to identify the key stakeholders and establish channels of communication, ideally planning with them the following phases of the process. A stakeholders' analysis is added to identify formally stakeholders, their different interests, influence and potential role as well as their knowledge and perceptions about the fishery system and the issues at stake. Efforts are made to encourage their active participation in the whole process. The issue analysis is participative, looking for stakeholder confirmation or reformulation. The approach, models and methods used in the assessment are explained and discussed, along with their intended outcome and assumptions. During the main assessment phase, traditional knowledge is validated and integrated as appropriate. The results of the analyses are interpreted in a participative mode aiming at reaching a common understanding. The potential options available are jointly identified and analysed before results are presented to decision-makers (at central or community levels) and the broader stakeholders group.

Integrating scales

A major cause of fisheries management failure lies in the lack of coherence between management objectives selected and measures taken in the short term and development objectives adopted for the long term. It is therefore imperative to connect explicitly the assessments conducted at both scales, ideally nesting the short-term assessment in the longer-term one. On the long-term strategic time scale, the assessment may relate to the whole sector, a sub-sector, the sectoral development policy or governance, or the analysis of overall objectives, constraints and indicators. Its purpose might be planning, scenario development, management strategy development or performance assessment. On the short-term operational time scale, the assessment may relate to seasonal or annual management measures, in support of recurrent management schemes (fine tuning) or crisis resolution. The performance evaluation undertaken from time to time (e.g. in conjunction with medium-term planning) could be the occasion for establishing the longer-term, more strategic connections.

In highly complex systems, an analysis undertaken at the lower, operational level may be of little relevance for higher strategic levels of consideration (e.g. at cross-sectoral

FIGURE 15
General diagram for diagnosis and management of SSF



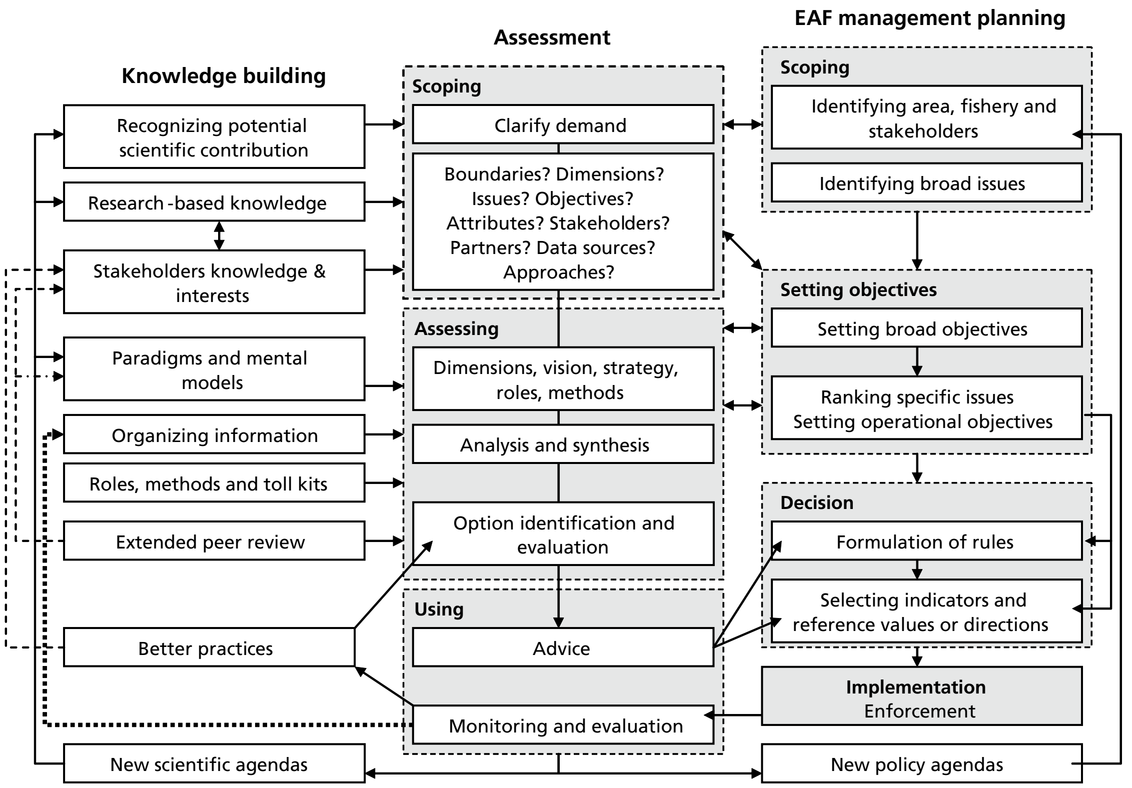
Source: from Andrew *et al.* 2007.

or national level). Conversely, strategic analyses undertaken at high level are very relevant in terms of understanding the global effects of the fisheries environment and for long-term scenario projections, but lose relevance and could be even dangerously inaccurate if their conclusions were extrapolated to the operational level. Efforts will therefore be needed to look for implications at all relevant levels, even though this might not be easy with the elements of information and within the time frame stipulated for the assessment.

Tools for integration

Collapsing some of the steps between assessment and management, Andrew et al. (2007) focus on the linkage between the enquiry (diagnostic) and decision-making process in an adaptive management approach (Figure 15). This representation highlights: (i) the role of external drivers (e.g. institutions, other policies, climate); (ii) the ecological and economic constraints

FIGURE 16
Integration of knowledge-building, assessment and policy management processes for an ecosystem approach to fisheries IAA



Source: adapted from Lebel, 2006.

to be accounted for in the diagnosis; (iii) the explicit connection between the diagnosis and the management constituency; (iv) the adaptive management concept (apparently limited to the short-term learning loop); and (v) the ultimate outcome of the process as a particular "social-ecological configuration" (sensu Berkes and Folke, 2000).

The close connection between knowledge building, assessment and policy/ management processes is also represented in much more detail in Figure 16. Three processes are identified: knowledge-building, assessment *sensu stricto* and management. The role of stakeholders is very clear in the assessment but is only implicit in the management box. The simplified connections (usually transfers of information, norms or rules) are indicated by arrows. This conceptual figure highlights the fact that science and policy interact in the various phases of the assessment process (scoping, assessing and using) and that information does not flow unidirectionally or linearly through these phases (as often assumed under conventional assessment) but emerges from convoluted interactions among scientists, policy-makers, stakeholders and the wider public that are continually reframing, reassessing and reusing the assessment (Lebel, 2006).

SYNTHESIS

This chapter has clarified the position the IAA process in the broader processes of policy-making, development planning and operational management. For the purpose, it stressed the strong connections between the policy, development planning and operational management cycles, operating on different space and time scales. It clarified also the role of the different types of stakeholders (fishers, scientists, managers, policy-makers, etc.) stressing the importance and challenge of the integration of points of view and requirements.