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Diagnosis and the Management Constituency of Small-scale Fisheries

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ABSTRACT

Diagnosis and adaptive management can help improve the ability of small-scale fisheries (SSF) in the developing world to better cope with and adapt to both external drivers and internal sources of uncertainty. This paper presents a framework for diagnosis and adaptive management and discusses ways of implementing the first two phases of learning: diagnosis and mobilising an appropriate management constituency. The discussion addresses key issues and suggests suitable approaches and tools as well as numerous sources of further information. Diagnosis of a SSF defines the system to be managed, outlines the scope of the management problem in terms of threats and opportunities, and aims to construct realistic and desired future projections for the fishery. These steps can clarify objectives and lead to development of indicators necessary for adaptive management. Before management, however, it is important to mobilize a management constituency to enact change. Ways of identifying stakeholders and understanding both enabling and obstructive interactions and management structures are outlined. These preliminary learning phases for adaptive SSF management are expected to work best if legitimised by collaborative discussion among fishery stakeholders drawing on multiple knowledge systems and participatory approaches to assessment.

INTRODUCTION

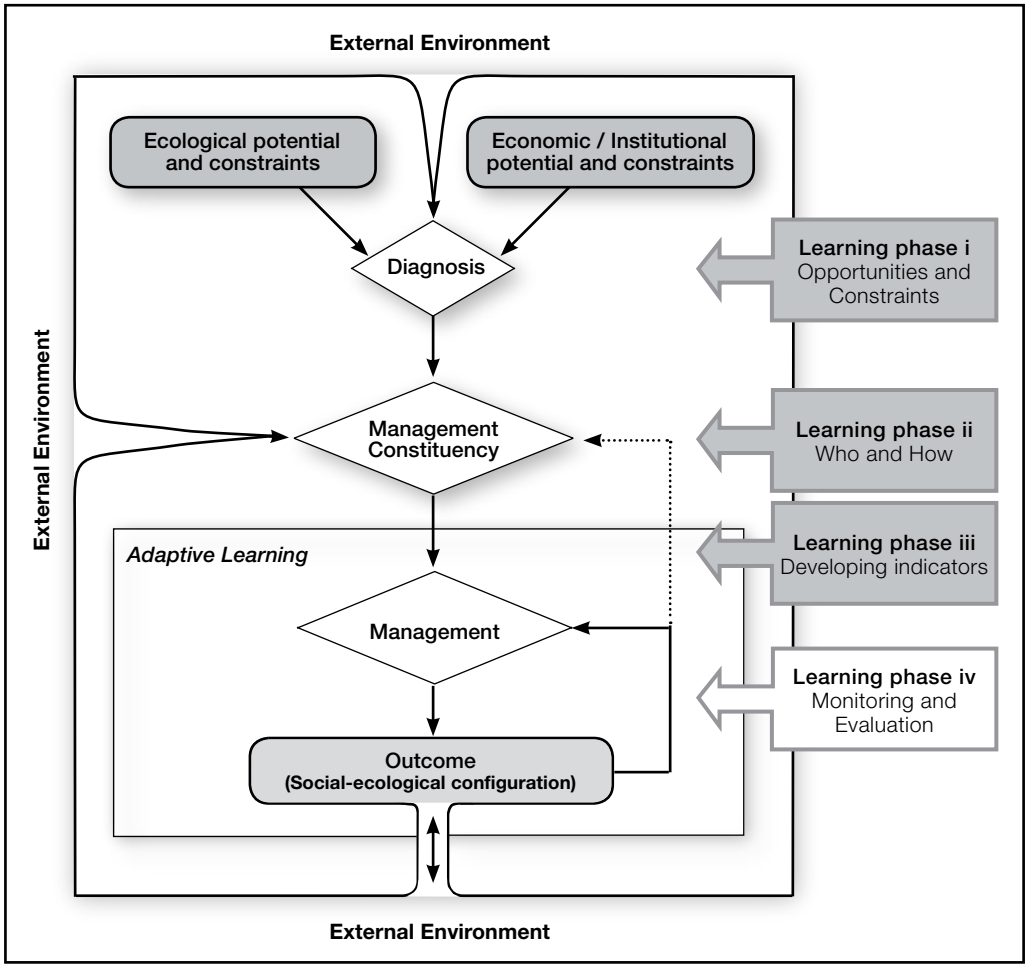
Small-scale fisheries (SSF) provide essential services to more than 180 million people living in developing country contexts characterized by poverty and food insecurity (Delgado *et al*., 2003; FAO, 2004; Pauly, 2006; FAO, 2007; Zeller *et al*., 2007; FAO, 2008). Management is widely regarded to have failed to deliver fisheries that contribute fully to economic and social development (FAO, 2003; 2004; Cochrane and Doulman, 2005). Small-scale fisheries present particular challenges for management in that they are diverse, in terms of participants, resources and ecosystem services, gears and contexts, and complex in their connectivity to other livelihoods, other ecological systems and across multiple scales (Berkes *et al*., 2001; Berkes, 2003). Small-scale fisheries are also vulnerable to drivers of change external to the fishery domain, but these factors have often been neglected in classical fisheries management (Andrew *et al*., 2007). Innovations in management that include wider system dynamics and enhance the ability to better cope with and adapt to both external drivers of change and internal sources of uncertainty are needed to facilitate a broader management focus.

Small-scale fisheries are diverse and not easily categorized. The constraints and opportunities they face demand a focus on getting the basics of management right, rather than on seeking to optimize benefits, as traditionally and narrowly defined in terms of yield. Widely recognized constraints include a lack of research and management capacity in government agencies, political marginalization of fishery participants, lack of quantitative data on trends in fish stocks and vulnerability to factors outside the fishery (Allison and Ellis, 2001; Charles, 2001; Wilson *et al*., 2003; Pomeroy and Rivera Guieb, 2006). Opportunities arise from the dynamic ecological and social environment of these fisheries, such as the capacity of the fishery system (including the people integral to it) to self-organize and adapt, and to change harvest patterns to suit fluctuating resources. Blueprint solutions or panaceas are inappropriate for the fisheries management problem and, instead, diagnostic approaches that seek to contextualize fisheries and seek appropriate entry points are proposed (Andrew *et al*., 2007; Ostrom *et al*., 2007; McClanahan *et al*., 2008b; Berkes, 2009). In this chapter we explore elements of one such framework, the participatory diagnosis and adaptive management (PDAM) framework (Andrew *et al*. 2007; Figure 1), which provides a flexible basis for implementation.

There is little in the PDAM framework that is, of itself, novel (see Walters and Hilborn, 1978; Allison and Ellis, 2001; Berkes *et al.,* 2001; Charles, 2001; Garaway and Arthur, 2004; among others for antecedent work). However, the framework emphasizes different aspects of the fisheries management problem. First, it emphasizes the factors arising from outside the fishery domain that may offer opportunities and act as constraints on the fishery system itself, so driving fishery change and influencing management performance and the livelihoods and well-being of fishery stakeholders. Second, the framework emphasizes the institutions that govern fisheries and, particularly, the nature and legitimacy of access rights as a central and distinct precursor to effective management. Third, it focuses on the potential of adaptive management as the primary vehicle for addressing uncertainty and sustainability.

The PDAM lays out four distinct opportunities for learning and acquiring the right information for better management, which include i) scoping threats and opportunities for management (diagnosis); ii) clarifying the management constituency (fishery beneficiaries and wider stakeholders) and how the constituents wish to manage their fishery; iii) developing management indicators to enable reflection and learning for adaptive management (phase one); and iv) monitoring and evaluation (adaptive management phase two). Although these opportunities for learning are laid out as sequential and progressive steps, the

Figure 1: A general framework for diagnosis and management of small-scale fisheries in the developing world (Andrew *et al.*, 2007). Learning phases i to iii are discussed in this chapter.



overall diagnosis and management process should be iterative and flexible, not linear. How effective this is will depend largely on the capacities and will of the fishery participants involved in the process.

Here, we focus on the diagnosis and management constituency phases of the PDAM framework (learning phases i and ii). In the sections below, we briefly discuss issues and questions, and the tools that might be used to address them. We do not discuss management itself in this chapter, except to briefly link objectives with the indicators that can be used in adaptive management phases to reflect upon performance. Our discussion, particularly with respect to the diagnosis or scoping phases, draws on the comprehensive overview of integrated assessment and advice provided in Garcia *et al*., (2008).

ASSESSMENT IN SMALL-SCALE FISHERIES

Before we break down the diagnosis and management constituency phases of the PDAM framework, it is worth taking a step back to consider the implications of assessment processes for SSF in developing countries. Traditional fisheries science and sophisticated management measures that require extensive monitoring and enforcement are unsuitable in developing country contexts that are generally characterized by data scarcity and relatively low capacity for intensive management (Johannes, 1998; Berkes *et al*., 2001; McClanahan *et al*., 2008b). Investment in diagnosis processes needs to be commensurate with the value of the fishery. Garcia *et al.* (2008) discuss this issue in detail. There are several points to note. The value of many small-scale fisheries, particularly those defined by small stocks (regardless of unit value)[1] and/or resources of low economic value will not support large investments in assessment and management intervention. However, evaluating the value of a fishery to determine how much investment is warranted is complicated. The value of SSF is multi-dimensional and does not necessarily manifest as only or primarily economic value. These values then benefit different stakeholders to different degrees influencing who is willing and able to participate in fishery assessment. Finally, the value of a fishery may not be fully realized in contexts where fisheries management is failing and the provision of ecosystem services is undermined. At the same time, while the potential value of the fishery may be high, capacity for diagnosis and management may be limited by the costs of mitigating current threats to the fishery and of reversing existing degradation, or by the funds available for investment.

At the very least, diagnosis and management of SSF in developing countries requires adaptive and collaborative forms of management whereby multiple stakeholders are involved in learning and action. Such management can benefit from assessment processes founded on multiple sources of knowledge and relatively cheap and accessible data and information.

Rapid and/or participatory assessment techniques, or participatory rural assessments (PRAs), are research tools specifically designed to elucidate the perspectives, knowledge, and values of local peoples affected by management decisions. Rapid assessments[2] use intensive team interaction *in situ* for data collection and interpretation to gain a preliminary, qualitative understanding of the context, from the stakeholders' perspective. Participatory methods aim to legitimize and increase the relevance of assessments and subsequent management. There are many approaches to PRA but all are founded on key principles: understanding multiple perspectives, encouraging group learning processes, and enabling self-mobilization and context-specific change (Pretty *et al*., 1995; Cambell and Salagrama, 2001). Methods designed specifically for participatory research include, among many others, transect walks, seasonal calendars, mapping (e.g., ecological processes) and ranking (e.g., wealth) exercises (Pretty *et al.*, 1995; Chambers, 1997, 2002).

Participatory techniques are well-suited to assessment of SSF, for example to answer questions of how fisheries stakeholders behave and why, what system change looks like and what is thought to drive it. This is important in fisheries contexts characterized by poor availability of formal data and information. Pido *et al.* (1996, 1997) provide early examples of how rapid participatory assessments can be used in SSF. Participatory techniques have typically been applied to understand the social and socioeconomic dimensions of resource use systems but can be used to gain local knowledge of fish and ecosystem trends, as well as to support

[1] Robin Mahon, personal communication.
[2] http://rapidassessment.net/

local collection of both ecological and catch data. The costs of participation in collating such information are less than those incurred in understanding these processes independent of the extraction process (McClanahan *et al*., 2008). Participatory techniques are suitable for clarifying and ranking issues from all the different domains of a fishery (human, ecological, institutional, external drivers). FAO has used participatory analysis for a range of assessments, including vulnerability analysis, stock assessment (ParFish), and market and value chain analysis. Organisations outside the fisheries sector are also engaging heavily with these techniques, for example the The World Agroforestry Center (previously ICRAF) (Beneist *et al*., 2000[3]). See Appendix 1 for more web-based references to rapid and participatory assessment.

While PRA is an improvement over more top-down, expert-driven approaches, the constraints on true participation have been well documented (e.g., Cooke and Kothari, 2001). How participatory approaches are used and combined with other sources of knowledge is important. A broad view that accounts for the multiple scales of ecological and social interaction needs to draw on perspectives from a number of resource-user groups to build up a balanced view of SSF dynamics, as well as on other research techniques and knowledge systems. A comprehensive diagnostic process should integrate different knowledge systems (research-based, local and state knowledge) and knowledge of different dimensions of the fishery (ecological, social, and institutional) at different scales.

[3] See http://www.worldagroforestry.org/SEA/Publications/files/book/BK0010-04.PDF for The World Agroforestry Center's Diagnosis and Design training manual on participatory tools.

DIAGNOSIS

We see the key tasks within this learning phase as: i) defining the domain of the fishery; ii) understanding the historical and current context of the fishery; and iii) projecting the future direction of the fishery. This latter task merges the diagnosis into the management constituency phase and ties in closely with understanding how adaptive fisheries management will be enabled and who should be involved. Most management implementation frameworks include a phase for scoping, assessment or diagnosis but differ in the extent to which this initial phase is reliant on data and expertise.

WHAT IS 'THE FISHERY'?

To understand the 'system' under management, to clarify and prioritize issues both within and outside the fishery domain, and to develop a constituency and set of rights and institutions that 'fit' the fishery (*sensu* Young, 2002), we need to be clear on a fishery's *identity*. Identity refers to a system's structure, function and feedbacks (Walker *et al*., 2006). Management aims to uphold the ecological, human[4] and institutional attributes that enable a fishery to absorb stress and reorganize following disturbance in order to retain its essential identity. How we define a fishery's identity is, therefore, important from both a technical and political point of view. For example, it can influence the effectiveness of management in terms of the fit between the ecosystem, the institutions developed to manage it and the indicators designed to monitor it. If a fishery's identity is poorly defined or evolves without consequent changes in institutions, power relations and indicators, then management is more likely to fail. It can also influence the legitimacy of actually trying to maintain the system identity as is. Understanding who benefits from the current fishery configuration is an important consideration in fisheries management. In general, defining the identity of the fishery begins to explicitly address the 'of what', 'to what' and 'for whom' questions that are raised in the more politically aware discussions of resilience (Carpenter *et al*., 2001; Lebel *et al*., 2006; Nadasdy, 2007)

Defining the boundaries of the fishery is an essential, but often neglected, first step in outlining a fishery's structure. These boundaries have implications for the scope and scale of management. Historically, fisheries have been defined by many criteria, including management or administrative unit, harvested species ('the tuna fishery'), ecosystem ('the floodplain fishery'), gear type ('the trawl fishery') and by the people who harvest the fish. All of these categorizations are valid, but none is sufficient by itself to fully describe the fishery. Charles (2001: 3) integrates the many dimensions of a fishery to describe a 'fishery system' as a web of "*interrelated, interacting ecological, biophysical, economic, social and cultural components*." We use the term 'fishery' as shorthand for Charles' 'fishery system'. Implicit in this general definition is a sense of place and a continuity of connections among different components (see also Cumming and Collier, 2005). Attributes of scale are also central to any definition and may range from a small reservoir to a river basin, or even larger. To paraphrase Cumming and Collier's (2005) working specification of a complex system, the definition of a fishery should contain/describe: i) an outline of system components; ii) the relationships between those components; iii) the location and spatial scale of the fishery, and the degree of constancy of this scale over time; and iv) the temporal outlook of the fishery.

For some fisheries, the boundaries of the system are obvious and there is a clear relationship between the natural resource and the people who fish it. Others are considerably more complex: they may encompass much larger scales, the people who fish may be difficult to determine or constantly changing, and in some, the fishery is only a small part of a diversified

[4] Human attributes include social, cultural, political and economic dimensions.

livelihood system, meaning that 'fisheries management' is not sufficient to improve the lives of people associated with the fishery. To give an example from each end of this spectrum:

- *The sea cucumber fishery in Kia community, Isabel Province, Solomon Islands*. This fishery is based on the holothurian resource and the people of Kia community who harvest it. The Kia community extends from the Bahana Fisheries Center in the north to Kesoa Primary School in the south, but excludes settlements on Barora Fa Island. This community is unified under a House of Chiefs which is responsible for its well-being and for managing the fishery. The fishery, an important source of cash in a largely subsistence local economy, has supplied benefits to the community for decades. This fishery provides a useful example of a clearly bounded and defined system.

- *The Lake Chilwa fishery, southern Malawi*. This is a diverse lake fishery in which fishers use a range of gear (including traps, fine-mesh seines and long lines from dugout canoes and, increasingly, planked boats) to target a large number of species, primarily *Barbus*, *Clarius* and *Oreochromis* spp. There are as many as 5,000 specialist and part-time fishers who also derive their income from farming and petty trading, and who enter and leave the fishery as catches and economic opportunities rise and fall. The fishery is co-managed by the Fisheries Department and the Lake Chilwa Fisheries Management Association, composed of 43 Beach Village Committees. Management focuses on controlling access through the issuing of licenses and enforcement of fines for violating the closed season or for using inappropriate gear. Chilwa is an endorheic lake[5] that recedes and expands with rainfall patterns in the basin (it last dried completely in 1995). Catches fluctuate with lake level and in good years account for almost half the total fish production in Malawi. The integrity of the lake system is dependent on the extensive wetlands that surround the lake and on ecological processes in the catchment. Lake Chilwa is an example of a more complex fishery because of the presence of migrant fishers and because it is strongly influenced by external drivers of change in the watershed. The fish themselves migrate up the rivers to spawn so further enlarging the scale of the fishery and the scope of management.

While defining boundaries of the focal scale of management will be partially arbitrary due to the multi-scale nature of any fishery, the process is necessary for devising appropriate management responses. The need to match management institutions to the ecosystems they manage is now widely recognized (Young, 2002; Dietz *et al*., 2003). Bohenski and Lynam (2005), in a study of multi-scale governance of water in southern Africa, suggest that management responses are most effective when awareness of an impact, and the power to act or influence responses, match the scales at which impact occurs (on whom, what, and for how long). If fisheries managers are not aware of key threats and opportunities because their perspective is too broad to understand local natural history or societal relations, or too narrow to appreciate global drivers of change, then management responses are likely to be less effective. In complex, multi-scale fisheries, such as those on the floodplains of the Mekong or the Ganges Rivers, clarity in the definition of 'the fishery' may lead to the conclusion that new governance institutions are required to get the congruence between fishery outcomes or impacts and management responses right.

The structure or boundary of a fishery, however large-scale and complex, and its function, if legitimate and mutually agreed to and understood by fishery stakeholders, make up the identity of a fishery, which

[5] Meaning it is a closed, internal drainage basin with no direct outflows of water.

in turn provides a key reference point for management. A fishery's identity is dynamic and likely to change over time. Nevertheless, once a fishery's identity has been defined for a particular point in time, the diagnosis process can: i) clarify and prioritize the key threats and opportunities that characterize a fishery; and ii) outline the desired future trajectory of the fishery at both the focal scale, and at levels below and above this, if appropriate.

THE FISHERY CONTEXT: CLARIFYING AND PRIORITIZING THREATS AND OPPORTUNITIES

Once the fishery is defined, assessment can focus on clarifying the social and political context of the fishery and the constraints and opportunities it faces. To fully understand the fishery, contextualize risk and identify opportunity, we have to consider not just its present characteristics but its history and potential future as well (Johnson, 2004; Walker *et al*., 2009; The Resilience Alliance[6]). One means of visualizing fisheries as dynamic systems is to discuss and assess fishery issues along timelines in order to incorporate past influences on current management. Part of this includes paying particular attention to some of the more covert political and socio-cultural processes that have and do underlie fisheries management and influence outcomes, including property rights, vulnerability and conflict.

In developing countries, the wider context of a fishery is often very different from that experienced in developed countries where mainstream fisheries science originates (e.g., North America and Europe). Research increasingly recognizes the extent to which cultural beliefs, traditional practices and even religion can influence the behavior of managers and other stakeholders in such contexts. For instance, some management strategies are more consistent with Islamic concepts of ownership and use of aquatic resources than others; younger fishers in parts of Africa are reluctant to challenge the authority of elder fishers and so do not put themselves forward for leadership roles; and women are often marginalized from decision-making as a result of cultural norms. A participatory diagnostic process that includes a diversity of local stakeholders is likely to have a better chance of elucidating some of these context-specific dynamics.

Understanding the historical and current context of the fishery will help clarify the threats and opportunities that characterize the fishery. Prioritizing these, in turn, provides a basis for developing management objectives and performance indices to track progress in reducing risks and capitalizing on opportunities. This is a critical step in preparing for management. In many SSF, unsustainable fishing is the greatest threat to the resource and the people dependent on it. In others, particularly inland fisheries, fishing may be relatively unimportant to ecosystems in which resources wax and wane and fishing is part of a diversified livelihood that people enter and leave as appropriate (Sarch and Allison, 2000; Jul-Larsen *et al*., 2003; Morand *et al,.* 2005; Welcomme and Marmulla, 2008).

Not enough is known about most SSF to reliably *assume* the threats that characterize them, although typically sedentary invertebrates, such as trochus, sea cucumbers and clams, as well as spawning aggregations of long-lived, slow-growing fish such as groupers, are more vulnerable to overfishing than many small pelagic fish or mobile invertebrates (e.g., Orensanz *et al*., 2005; Sadovy and Domeier, 2005; Rhodes and Tupper, 2007). On the other hand, infrastructure development, such as dams, irrigation schemes or roads, appears to be a far more important threat for many river and floodplain fisheries than typically small-scale, non-capital-intensive fisheries (Allen *et al*., 2005; Welcomme, 2008; Welcomme and Marmulla, 2008). For many of these river and floodplain fisheries, the external drivers can often overwhelm the capacity of fishery stakeholders and management structures to preserve the internal processes necessary for sustainability, renewal and reorganization, and adaptation (see also Cumming and Collier, 2005).

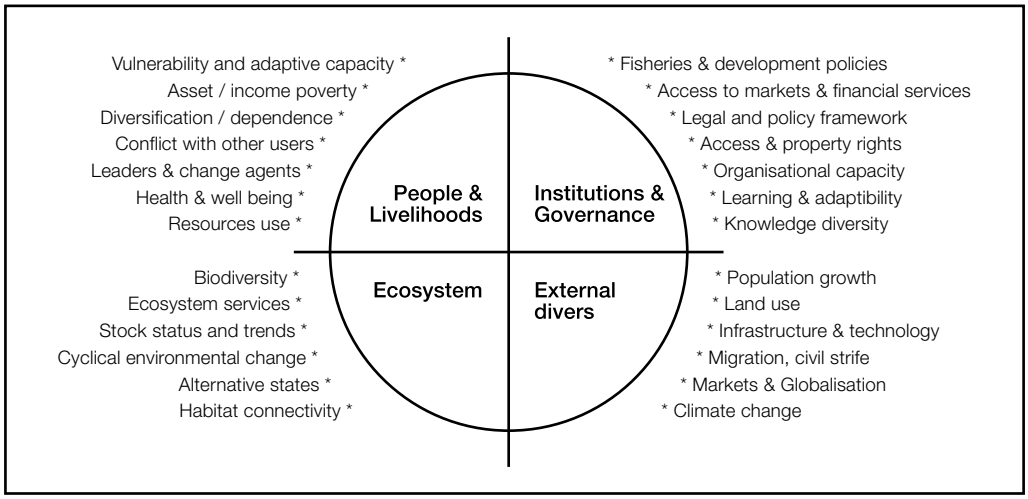
[6] http://www.resalliance.org/3871.php

It is important, therefore, to assess to what extent threats to the fishery arise from within or outside its boundaries. Clearly, investments in management institutions that focus on the dynamics of fish and fishing will be inappropriate in some instances (Jul-Larsson *et al*., 2003). In such cases, management responses might be better focused on conserving underlying adaptive capacity than on attempting to create institutions to limit harvests. In many other fisheries, however, reducing the fishing effort and changing fishing practices would clearly be the best route to improved management outcomes. Recognizing this, fisheries science and management has broadened its focus to include a wider range of drivers and, subsequently, the need for a more integrated approach to assessment has become clear (Garcia *et al*., 2008). This means that the range of issues to be addressed, the means of addressing them and the indicators used to track progress need to encompass more dimensions of the fishery.

Various frameworks that integrate different dimensions of these systems are available. Charles (2001) recognizes three basic dimensions to fisheries: ecological, social and economic. The sustainable livelihoods approach (SLA)[7] more broadly analyzes fishery-related livelihoods in terms of five 'capitals' (natural, physical, human, social and financial) and seeks to understand how they are influenced by processes, policies, institutions and external 'shocks' (Allison and Ellis, 2001; Pretty and Ward, 2001). More recently, Garcia and colleagues (2008) categorize issues according to four domains: livelihoods and people, the natural system, institutions and governance, and external threats and opportunities (Figure 2). This latter categorization emphasizes external processes to a greater degree. In the context of this discussion, these categorizations serve only to organize types of issues and act as an *aide-mémoire* to ensure that a broad sweep of issues is canvassed in fisheries diagnosis. The bullet points indicated beside each domain in Figure 2 suggest a range of issues to be covered, but are only examples and will not satisfy the needs of all types of fisheries.

These frameworks help us to think about multidimensional sources of risk and opportunity. The data required to clarify the issues characterizing a particular fishery can be gleaned relatively quickly from a variety of sources using data collection methods suitable for SSF in the developing world. These include secondary data from online databases (e.g., http://www.fishbase.org

Figure 2: Four domains for identifying issues in SSF with examples of the types of issues in each category (adapted from Garcia *et al.*, 2008).



[7] A recent extension of the SLA, CRiSTAL, provides a multidimensional framework to specifically assess threats related to climate change and the opportunities for adaptive capacity of communities. http://www.iisd.org/pdf/2007/brochure_cristal.pdf and http://www.cristaltool.org/

and http://www.reefbase.org), published research, independent assessments and grey literature (policy, legislation, management plans), participatory assessment and research, as well as more traditional but straightforward research techniques including questionnaires, key-informant interviews, focus groups or group interviews, and so on.

Once issues are identified, they need to be ranked for management purposes. Again, there are many frameworks available for developing lists of priorities, management objectives and indicators (see Garcia and Staples, 2000; Fletcher *et al*., 2002; Garcia and Cochrane, 2005; Reed *et al*., 2005; Rice and Rochet, 2005; Potts, 2006; Garcia *et al*., 2008; Pascoe *et al*., 2009 for examples and review). Most of them share common elements, which include: i) clarifying issues through participatory methods; ii) developing lists of candidate indicators; and iii) prioritizing and choosing indicators. The suitability of these frameworks depends on the fishery, the degree to which the process is driven by external experts or through participatory 'bottom-up' methods, and the ecological basis of the resource (Reed *et al*., 2005; Fraser *et al*., 2006).

Ranking and prioritization of threats and opportunities from the different domains of the fishery often involve trade-offs and possible conflict. Decision-support tools are available to assist fishery stakeholders in this phase of diagnosis. These methods are broadly categorized as multi-criteria approaches (MCAs) (see Mardle and Pascoe, 1999 for a review in a fisheries context and De Young *et al*., 2008[8] for an FAO review). Many are highly analytical and require a lot of data so are of limited application in the context of SSF. Two methods, however, are highly relevant to our context. The Australian ecologically sustainable development (ESD) assessment approach provides practical guidance for identifying and prioritizing issues in fisheries management (Fletcher *et* al., 2002; 2005; Fletcher, 2005). The ESD manual[9] provides an integrated and tested framework for identifying and prioritizing issues, which can be tailored to the context of each fishery (e.g., Cochrane *et al*., 2007). Central to the assessment is the use of 'component trees' to identify the full range of potential issues and a procedure that provides a qualitative assessment of risks and consequences. Another promising procedure is the analytical hierarchy process (AHP) (Saaty, 1980) that uses a series of independent, pair-wise[10] comparisons of indicators to rank objectives. Proponents of the AHP cite its analytical simplicity and ease of use in the field. Fishery-related applications of this tool may be found in Wattage and Mardle (2005), Himes (2007) and McClanahan *et al*., (2008).

Whichever diagnostic tools are used, the objective is to identify key threats to the fishery and opportunities to sustain provision of ecosystem services and enable renewal, re-organization and adaptation in response to change. As the prioritized list of issues should guide management responses, it is important that it have legitimacy and be 'owned' by those people carrying and managing risk (see also Freebairn and King, 2003). Leadbetter and Ward (2007) suggest criteria for evaluating assessment processes. They refer to: i) comprehensiveness: the process must evaluate a range of issues and include a diversity of stakeholders; ii) transparency and accountability: stakeholders must agree on the legitimacy of the diagnostic process and its outcomes; and iii) nature, use and quality of the data: there must be integration of different sources of knowledge.

8 ftp://ftp.fao.org/docrep/fao/010/i0163e/i0163e02.pdf

9 http://www.fisheries-esd.com/a/pdf/AssessmentManualV1_0.pdf

10 Pair-wise comparisons involve the ranking of the difference in importance of pairs of indicators, where each indicator is paired with every other indicator in the set.

PROJECTING THE FISHERY'S FUTURE: SCENARIOS AND OBJECTIVES

Without stakeholders developing clear and agreed upon objectives for management, the fishery is unlikely to move beyond repeated failures, no matter how clearly understood the threats and potential options for the fishery are (Charles, 2001; Degnbol, 2003; FAO, 2003; Degnbol and Jarre, 2004). Objectives for individual fisheries need to be developed within the context of broader international, regional, and national policy and law. Selecting the small number of indicators required to track management progress is as much a political process as a technical one, and requires a clearly defined and empowered group of stakeholders to reach durable decisions about management objectives and the indicators used to track performance. As with other steps in the diagnostic process, inclusion of stakeholders in this phase of diagnosis is necessary to legitimize and ensure ownership of decisions related, in this case, to the future trajectory of the fishery.

There are some fundamental questions that need to be asked of stakeholders at this stage (the 'hard choices' described by Bailey and Jentoft, 1990). Is the fishery to be managed primarily for human development or for conservation? Is the fishery to be managed for its role as a social safety net or as a national income generator? Is the cost of managing the fishery commensurate with expected benefits, or should the fishery be transformed into an alternative system? Should management focus on a future ideal or should objectives be more concerned with what to avoid and defend against (Jentoft and Buanes, 2005)? How can fishery stakeholders ensure and monitor the quality of management processes in terms of legitimacy, participation, degree of precaution, cross-scale networking, accountability and so on?

One way of experimenting with different management options is through the use of scenarios or storylines[11]. Scenarios are imagined alternative futures (optimistic and problematic), which present the likely outcomes of different development paths. Scenario planning has been used for a number of global and regional assessments, including the Millennium Ecosystem Assessment[12], Fish Supply and Demand to 2020[13], and Alternative Future Scenarios for Marine Ecosystems[14]. Typically scenarios describe two to four different trajectories over timescales ranging from five to ten years. Scenario planning can involve complicated quantitative modelling techniques or more simple qualitative storylines.

For small-scale fisheries management in developing country contexts, simple storylines that can be ranked by stakeholders could be developed to compare, for example: i) management of the fishery for national or local development; ii) various forms of governance: self-governance, co-governance, or hierarchical governance and their likely outcomes (Bavinck *et al.*, 2005); iii) and their likely outcomes; iii) protection of traditional authority and management structures versus modernization of fishing technology and governance structures; and iv) the outcomes if managing for different sets of drivers (internal/external). Building scenarios that map out divergent perspectives within a system and allow open and honest debate and learning is increasingly seen as more appropriate than consensus-based processes, which focus on changing the opinion of a particular person or group (Frame and Brown, 2008). Discussion of potential small-scale fishery trajectories within the context of global scenarios, such

[11] For methods on projecting the future see http://www.cifor.cgiar.org/acm/methods/fs.html and http://www.cifor.cgiar.org/Publications/Detail?pid=2137

[12] www.millenniumassessment.org/en/Scenarios.aspx

[13] http://www.ifpri.org/pubs/books/fish2020/oc44.pdf

[14] http://www.cefas.co.uk/Publications/techrep/afmec_techrep.pdf

as those developed for climate change (IPCC 2000[15]) could add extra dimensions to the debate.

Scenario planning usually involves consultation with a panel of experts. Visioning by fisheries stakeholders affected by management decisions is, therefore, also necessary. A network of international organisations (led by IMM Ltd) developed a set of guidelines for understanding people's visions of their preferred future livelihood strategies[16]. The method focuses on capacities, strengths and past successes, and outlines a simple process for scaling up individual and household visions to community level (and beyond). This involves (i) identifying the strengths and potential of individuals and households, (ii) articulating these as visions for common interest groups (e.g. female traders, young fishers, net fishers), and (iii) developing the visions of common interest groups into community visions. Participatory tools such as vision trees can support the scaling up of visions for fisheries and associated communities. This process is appropriate for SSF management to complement (or replace) scenario planning.

Once fishery stakeholders agree on a trajectory for a fishery, they can develop objectives and indicators. Translating normative principles and the newer, more innovative management approaches into practical management objectives can, however, be a major challenge. For example, to date there is little guidance on how to apply resilience as a concrete management aim. One considerable challenge is that the loss of resilience may only be recognized when the fishery has slid into an unsustainable (read undesirable) state (Scheffer *et al*., 2001; Carpenter *et al*. 2005). Few surrogates for resilience have been found to use as indicators to assess performance. Nevertheless, Folke *et al*., (2003) and, following them, Berkes and Seixas (2005) recognized four groups of factors that promote resilience:

1. Learning to live with change and uncertainty;

2. Nurturing various types of ecological, social and political diversity for increasing options and reducing risks;

3. Increasing the range of knowledge for learning and problem-solving;

4. Creating opportunities for self organization, including strengthening local institutions and building cross-scale linkages and problem-solving networks.

Many of the variables within these four clusters are concerned with building human and institutional capacity––through leadership, innovation, collaboration, and learning––to both self-organize and re-organize. These factors do not address biophysical, technical problems but rather social-political ones. These perspectives highlight the importance of including objectives for SSF management that capture the need to develop and nurture the capacity of fisheries stakeholders, and the institutions they form, to learn and re-organize. Innovations in developing objectives (and indicators to monitor progress) that result in resilient small-scale fisheries are still needed. Some useful suggestions may, however, be drawn from fisheries-related examples, including Marschke and Berkes, (2006) and McClanahan *et al*., (2008).

PERFORMANCE INDICATORS

Developing performance indicators, the third phase of learning in the PDAM, occurs once the diagnosis and management constituency phases are complete. However, in some instances (for example, when the participants in the fishery are clear from the outset and the diagnostic process is participatory), it may be possible to begin the process of moving from threats and opportunities to management objectives and then to candidate indices early in the

[15] http://www.ipcc.ch/ipccreports/sres/emission/index.php?idp=0

[16] Cattermoul *et al*., 2008. Sustainable Livelihoods Enhancement and Diversification (SLED): a manual for practitioners. IMM Ltd. http://go.worldbank.org/TDD9JAXK60

process. Performance indicators measure progress against the broader objectives of the fishery, and management revised accordiningly. Sustainability indicators for fisheries management have been used for many years (e.g., Caddy, 1999; Garcia and Staples, 2000; FAO, 2002; Degnbol and Jarre, 2004). Indicators are needed because a predictive understanding of the dynamics of a fishery system is rarely possible. As Garcia and Staples (2000: 400) state:

> "*Indicators are needed to simplify, quantify and communicate information, to structure and standardize reporting, and to facilitate integration of economic and social dimensions. They assist decision-making in problem identification, objective setting, identification of gaps in research and data, monitoring, and performance assessment.*"

The frameworks used to develop indicators and track management performance are essentially the same as those listed above for issue identification and prioritization. For indicators to be durable and useful to adaptive management, they should reflect the experience of those affected by management decisions and system change, as well as mirror broader management approaches and overarching international, regional and national policy and law, where possible (Freebairn and King, 2003; Fraser *et al*., 2006). Yet for SSF in developing country contexts, an ideal set of indicators accompanied by detailed monitoring data is unlikely to be feasible. More appropriate are indicators that can trace simple trajectories away from reference points (improving, stable, degrading) (desirable, undesirable, critical) (see also Berkes *et al*., 2001 for a discussion on reference directions), indicators that reflect perceptions of system change based on local ecological knowledge and participatory science, and indicators that reflect socially relevant impacts of change (e.g., income level related to fish catch).

MANAGEMENT CONSTITUENCY

The management constituency of a fishery refers to the *people*, *interactions* and *structures* that will influence management outcomes. How these are aligned in a particular fishery will determine how adaptive, collaborative and legitimate a management system will be. The overarching management approach taken will have implications for what organizations, institutions and people will manage the fishery. For instance, compared with conventional target-resource-oriented management, the ecosystem approach to fisheries (EAF; FAO, 2003) results in a larger pool of relevant stakeholders and may require more investment in institution building. In practice, when the management constituency does not appropriately reflect and enable the management approach and the fishery-specific objectives developed under that approach, the potential of alternative management options will fall short (Christie *et al*., 2007). Constructing an appropriate management constituency for a particular fishery is a vital link between diagnosis and effective adaptive management. For this reason, the PDAM framework places the issue of developing an appropriate management constituency at the centre of the management process.

People and organizations within a defined fishery system can be identified as stakeholders. Those with an interest in a defined fishery, who may actually sit outside the system in the wider governance context, for example donors, environmental groups, community organizations and tourist operators, may also be important stakeholders. Interactions refer to the relationships and networks among different stakeholders within and outside the SSF. Networks may reinforce the status quo, limit adaptation, or be enabling and empowering. Structures refer to institutional, political and economic guidelines that influence human behavior, and may constitute constraints or opportunities. Institutional structures will already exist, power relations will already be in play and past events will have left their legacy. This second phase of learning is, therefore, more about adjusting and aligning existing interactions and structures to better suit the fishery than about designing new ones.

PEOPLE

It is widely recognized that exclusive, centralized forms of management have failed, on the whole, to deliver sustainable and equitable fisheries (Berkes, 2003; Charles, 2001; Garcia, 2005; Varjopuro *et al*., 2008). Inclusion of a diverse, but appropriate, set of stakeholders is advocated by proponents of integrated, collaborative and adaptive forms of management (Brown, 2006; Wells and McShane, 2004), as well as by organizations such as the FAO. Benefits are expected to include better problem definition and ownership; a more diverse knowledge base for decision-making; greater legitimacy and, therefore, better compliance and commitment to agreed-on courses of action; and conflict resolution (Jentoft, 2000; Bryan, 2004; Rockloffe and Lockie, 2006). The question is how to identify the appropriate set of stakeholders.

Small-scale fisheries management, particularly if grounded in ecosystem-based approaches, sits at the nexus between fisheries, environmental protection and development. Some would argue that because of this, wider society has a right to participate in decisions regarding SSF and their associated ecosystems as global commons (see Gray and Hatchard, 2008). Identifying appropriate stakeholders and the strategically important ones is not straightforward. The role and contribution of different stakeholders are likely to be scale-dependent and to change over time. Nevertheless, once the boundary of the fishery is spatially and administratively defined, managers can begin to consider a range of questions to guide their stakeholder identification process (see Box 1).

A stakeholder analysis and various data collection techniques can support this process. Stakeholder analysis systematically identifies different stakeholders along a continuum of spatial scales and

Box 1: Questions to support a stakeholder analysis

- Which individuals and groups are involved in the SSF system at the different spatial and administrative scales included within the fishery boundary?
- Who should be included from a social justice perspective?
- Who should be included from a strategic perspective in order to work towards both effective management and resilience of the SSF to external sources of disturbance (including those outside the fishery system)?
- What types of relationships do different stakeholders have?

aims to categorize their relationships. Various typologies are available for classifying and differentiating stakeholders. For example, Brown and colleagues (2002) classify stakeholders according to attributes of influence and importance (adapted from Grimble and Chan, 1995), whereas Mikalsen and Jentoft (2001) prefer to use attributes of urgency, legitimacy and power (adapted from Mitchell *et al*., 1997). A stakeholder analysis can be conducted through document analysis, survey techniques, and/or key-informant interviews or through more participatory approaches including focus groups and participatory assessment techniques (e.g., PRA). Many international development agencies use stakeholder analysis as a preliminary scoping tool for research and development (e.g., The World Bank[17]). In general, the participation of people and groups offering diverse perspectives on the SSF problem can enhance stakeholder identification and classification.

Once stakeholders are identified, they need to be meaningfully included and engaged in actual management.

INTERACTIONS

Individuals and groups need to interact to make decisions about their behavior in relation to others. Interactions such as joint decision-making opportunities and forums, relationships, and networks can promote or hinder legitimate and effective management. To understand how interactions influence management, we can consider the existence of opportunities and channels for interaction (amount), the quality of interactions (type) (Mahon *et al*., 2005), and their outcomes (consensus/conflict, compliance/resistance). In simple terms, asking questions about whether different stakeholders are included in decision-making processes, and how and to what extent their knowledge and perspectives inform decisions can illustrate how collaborative or exclusionary the current management approach is. Alternatively, tools such as social network analysis can be used to map both formal and informal networks between stakeholders.

Adjusting and building productive interactions and useful networks is challenging. Several factors complicate processes of participation and collaboration in management. For instance, there are a variety of *functions* (policy, service delivery, research and monitoring, institutional design, enforcement), *stages* (planning, implementation, evaluation), *levels* (instructive to informative) and *scales* (spatial and administrative) at which stakeholder participation can occur (see Sen and Raakjær-Nielson, 1996 for a detailed scale of participation). Exactly how and when participation should occur remains a highly debated topic in natural resource management and development intervention. Who is included, in what type of interaction, and to what extent,

[17] http://go.worldbank.org/TDD9JAXK60

as well as the level of capacity building and institutional support they receive, will influence the quality of interactions and outcomes.

Participation is recognized as particularly problematic in developing country contexts due to inequalities in experience, capacity and power between different groups and individuals (Jentoft, 2005; Rockloff and Lockie, 2006; Varjopuro *et al*., 2008). In such contexts, decision-making processes should include attention to cultural sensitivities, insecurities and language. In parallel, there needs to be capacity building of local participants so that they are better equipped to self-organize, solve problems, communicate and defend their rights when interacting in multiscale governance processes. Outcomes of knowledge-sharing, conflict resolution, consensus-building and so on should not be assumed, since achieving them may require different approaches and often particular investments of time, resources and facilitation. At higher levels of decision-making, stakeholders need to focus more on issues of representation and accountability (downward) and how these can be supported (e.g. Agrawal and Ribot, 1999; Blaikie, 2006).

The stakeholder team (identified through stakeholder analysis) is best placed to negotiate the most appropriate ways of organising in order to address potential threats to the SSF and take advantage of opportunities. Several questions can be posited (Box 2).

An analytical framework (IBEFish) has recently been developed to evaluate participatory management (see Varjopuro *et al*., 2008 and the special issue of Marine Policy 2008 32:2). Unfortunately, most of the participation-in-fisheries literature is dominated by developed country examples. In developing country contexts, issues of power inequality, differences in knowledge and value systems, transparency and representation are more acute.

The stakeholder team also needs to consider the networks that characterize the SSF system. As argued by Adger and colleagues (2005), the structure of cross-scale networks plays an important role in determining the contribution of management to the resilience of a social-ecological system. Local social networks can function as assets that mediate access to information and benefits from research and development (Crona, 2006; Crona and Bodin, 2006; Hoang, 2006). Networks can foster coherence and strength within groups of people to both

Box 2: Questions for understanding social interactions

- At which spatial and temporal scales is it useful and necessary to involve different stakeholders?
- In which management functions and stages is it useful and necessary to involve different stakeholders?
- Are the costs of participation commensurate with the value of the fishery?
- Which stakeholders need support to participate meaningfully?
- Is it appropriate and viable to weight local voices to ensure they are not diluted by more vocal, powerful and experienced stakeholders?
- Are the different types of decision-making forums achieving the expected outcomes? If not, how can they be re-designed?
- Are different knowledge systems incorporated and taken into account in management decisions? If not, how can this be facilitated?

positive and negative ends, as well as open up new opportunities through cross-scale interactions. Developing networks that empower local resource-users and foster resilience (Berkes and Seixas, 2005) is a priority for SSF in developing country contexts. From a resilience perspective, networks that foster collaboration and enable adaptive learning are critical.

Social network analysis is often used to visually map relationships, portraying people and groups as nodes, and relationships as flows between nodes. It can identify the stakeholders that play key roles in connecting (or blocking) certain networks and linkages within and between scales. A network analysis can be simple and illustrative or it can entail complicated modelling with tailored software[18].

STRUCTURES

Management structures refer to the institutions, rights, power relations and incentives (economic and moral) that mediate human action. All of these can motivate or block collective action that may or may not facilitate more appropriate SSF management.

Institutions are the rules, norms and shared strategies that mediate human behavior (Ostrom, 2005; Scott, 2008). They range from legislated property rights and gear enforcement rules to community expectations for appropriate fisher behavior. They can be restrictive and regulative or enabling, for instance, in supporting collaboration, experimentation and learning. The design, functionality (Young, 2002) and enforcement characteristics (Scott, 2008) of institutions can determine their performance. Design refers to how well institutions 'fit' the ecological system they are expected to govern and the social dynamics of the system, and to what extent different institutions overlap within and across spatial and administrative scales. This becomes increasingly important for larger-scale, more complex, or trans-boundary fisheries. For instance, a fishery may be defined as a small-scale, multi-species fishery where fishers from nearby communities fish near landing sites using many types of gear. Institutions that govern this fishery may, however, need to account for migrating pelagic species that come inshore and make up a substantial proportion of the catch, and for part-time or foreign fishers who seasonally access the fishing grounds.

Functionality generally refers to the effectiveness of an institution in terms of strength, compliance, resilience and adaptability (Young, 2002). Robust institutions are usually identified as a necessary feature of a successful management system (Berkes and Seixas, 2005), and yet institutions that are too rigid (requiring a significant change in fishery users' behavior) may experience low levels of compliance. Importantly, enforcement of institutions has ethical and cognitive dimensions in addition to regulatory ones (Scott, 2008). Compliance and self-enforcement of gear regulations by local fishers can occur when fishers understand and agree with the purpose of the regulations (cognitive) and perceive them to be legitimate (ethical). More often, fishers disregard legislated rules even when they are aware of them and understand the regulative sanctions imposed on defectors; when these rules are not considered legitimate; and when they contradict the perceived rights of local fishers.

Institutions can be created to promote a shift towards ecosystem-based management and/or co-management, if these forms are appropriate for the focal SSF. Institutions can also foster integration of systems across multiple sectors and spatial boundaries to better address issues of upstream development in floodplain fisheries or of coastal zone management. Empirical research continues to assess the types of institutions that work towards these ends in certain contexts. For example, a recent review examined the pre-conditions for co-management to try to understand what should happen before implementation

[18] http://www.insna.org/insna_what.html and http://www.orgnet.com/index.html http://www.analytictech.com/networks/data.htm

Box 3: Questions for understanding management structures

- Do the institutions fit the ecological and social dynamics of the SSF? If not, how should they be modified?
- What types of institutions (formal/informal, rules/norms) are likely to work best in the context of this fishery?
- Is regulative enforcement adequate, fair, appropriate? What levels of (graduated) sanctions are appropriate for rule-breaking?
- How can other forms of enforcement be encouraged?
- How do different stakeholders perceive the legitimacy of current institutions?
- How can management benefit from linkages between institutions at different geographical (landing site, ecosystem, watershed) and administrative (district, province, national) scales?
- How can institutional and political structures and networks foster safe experimentation and learning?
- Are there conflicts, power struggles, or manipulation and domination among stakeholders? How can these be mediated?
- How can financial mechanisms support meaningful capacity building of different stakeholders, from managers to resource users?
- How is commitment and accountability fostered?
- How can stakeholders, from resource-users to managers, be motivated and incentivized to behave in an appropriate, collective fashion?

to improve the chances that suitable institutions emerge for successful co-management (Chuenpagdee and Jentoft, 2007).

In fisheries where the management constituency is relatively clear and can be quickly defined, stakeholders may consider questions, such as those in Box 3 below, to guide assessment of management structures.

Research tools are available to assess management structures. To understand management institutions, the institutional analysis and development (IAD) framework[19] and the 'diagnosis framework for social-ecological systems' (Ostrom, 2007) provide suitable, comprehensive approaches that have been used in many natural resource contexts (for example Yandle, 2008). The FAO also has a guide to institutional analysis in the context of local livelihoods[20]. More general frameworks, such as the sustainable livelihoods approach (SLA), would also be appropriate for understanding the processes, policies and institutions that influence fishers' livelihoods, as well as the power relations and incentives that drive collective action. Finally, the International Institute for Environment and

[19] http://www.indiana.edu/~workshop/
http://dlc.dlib.indiana.edu/view/subjects

[20] http://www.fao.org/docrep/006/y5084E/y5084e00.HTM

Development[21] has suggested a range of tools designed specifically to assess power and its influence in natural resource management. However, most of these are research frameworks. What are missing are operational frameworks, design principles, and guidelines for intervention that can suggest appropriate ways of building, adjusting and aligning institutions to scales of impact (Mahon *et al*., 2008).

Despite stakeholders' best intentions to mobilize an appropriate management constituency for their fishery, unanticipated outcomes can be expected in complex systems such as SSF (Mosse, 1997; Cleaver, 2000; Lewins, 2007). An adaptive learning approach has the highest potential to help stakeholders cope with the uncertainty that characterizes such systems (Mahon *et al.* 2005). However, adaptive management itself requires deliberate planning, design and facilitation. Capacity to adapt, reorganize and learn does not automatically result from integrated, participatory or precautionary approaches. DFID UK suggests a set of strategies to enhance learning in fisheries[22].

Besides fostering learning about the fishery and, in particular, the integration of different knowledge systems, adaptive management also promotes the use of trial and error learning-by-doing (which can include *safe-to-fail*[23] experimentation and subsequent reflection) (Lebel *et al*., 2006). Stakeholders can learn by experimenting with different regulations (spatial closures, different gear restrictions in different areas), different technological investments or market chains, and different alternative livelihoods. This creates options and opens up debate about their potential. Other disturbances, such as climate change, cannot be easily or 'safely' replicated, but large-scale comparisons of past events can illuminate the different responses of regions (McClanahan *et al*., 2008). In the longer term, funding, policy and legislative mechanisms may need to be altered to accommodate a more experimental approach to management.

[21] http://www.policy-powertools.org/

[22] http://www.research4development.info/ and http://www.fmsp.org.uk/

[23] Safe-to-fail experimentation is used in the adaptive management literature to suggest experimentation where even negative outcomes can be absorbed by the system without significant detrimental effect to human or ecological well-being.

CONCLUSIONS

Small-scale fishery management in the developing world is, above all, about getting the basics right while retaining the flexibility to change course if circumstances change. Recent efforts at reform are based on the assumption that fisheries management, as is, is not working, and that there is a general desire to update approaches and adopt others that account for ecosystem dynamics, function more democratically and look beyond intra-sectoral factors to account for drivers external to the system. As is clear in this chapter, many of the fundamentals of fisheries management are still relevant, including *assessment*, *setting objectives*, *designing performance indicators*, and *monitoring and evaluation* (not all of which are discussed here).

If a systems perspective is taken, the social and natural dimensions of a fishery cannot be separated. The diagnostic process may be used to canvass threats and opportunities from all fishery domains (natural system, people and livelihoods, governance and institutions, and external drivers). Key to a successful systems approach is the definition of 'system' boundaries. This allows us to distinguish and choose between perspectives that focus on management within the fishery and those that emphasize building resilience against external threats, including climate variability and infrastructure development. It also allows us to pay attention to the multiple scales at which fisheries management functions, and to clarify stakeholders, networks and institutions within and beyond the focal fishery, which aids decision-making.

It is widely recognized that the fishery systems and SSF in particular have non-linear and unpredictable dynamics. Given this complexity, 'management' must move beyond the control and manipulation of resources for productivity and stability, and beyond blueprint approaches. Instead, a diagnosis approach facilitates context-specific, tailor-made management of distinct small-scale fisheries. Threats and opportunities are clarified and prioritized, and a management constituency brings in stakeholders most concerned with issues specific to that fishery, so that the scales of impact are better matched to the scale at which action can be taken.

In addition to diagnosis, the PDAM advocates an adaptive approach to fisheries management. Three distinct learning phases are emphasized before the more formal management phase of monitoring and evaluation. Bringing management processes closer to the realities of a particular fishery system and including a diversity of relevant stakeholders will improve the speed and sensitivity of both environmental and social feedback mechanisms, a core property of adaptive management. Finally, the process of forming a management constituency includes the purposeful facilitation of interactions, supported by structures, which facilitate knowledge exchange, networking, learning and innovation. The inclusion of the appropriate set of stakeholders will contribute to the legitimacy and durability of management decisions and to overall social capital (trust). If nothing else, it puts some power back into the hands of local stakeholders to determine their own future. Rather than simply advocate for participatory and collaborative structures, the PDAM sets aside a specific phase for learning how best to achieve this, according to SSF requirements.

Implementation frameworks tailored to the special demands of SSF in the developing world can address some of the constraints outlined above, such as low research capacity, stakeholder marginalization, and vulnerability to external threats. The challenge is to support the opportunities that characterize these systems by enhancing flexibility, diversity, and sensitivity of feedback and learning. In many cases, the process will lead to incremental improvements in fisheries management when it enables more adaptive and legitimate management of fishery-specific risk (for instance, when fisheries extraction is the critical threat). In other cases, the diagnostic process will trigger transformation of fisheries management to focus more on reducing internal vulnerability and buffering against external threats that are beyond the control of fisheries managers.

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Appendix 1

Table 1: Web-based reference material on different analysis techniques.

Analysis techniques	Further reference materials
Rapid assessment	**FAO Guidelines** http://www.fao.org/docrep/W3241E/w3241e09.htm#rra%20definition http://www.fao.org/Participation/ft_more.jsp?ID=7283 **Rapid Appraisals in Fisheries: UBC and FAO (ParFish)** http://www.fisheries.ubc.ca/archive/projects/rapfish.php http://www.fao.org/DOCREP/005/X4175E/X4175E00.HTM **RA for Fisheries Management Systems (Dfid and WorldFish)** http://www.nrsp.org.uk/database/documents/2372.pdf
Participatory assessment	**General development policy, practice and research portal** http://www.eldis.org/go/topics/resource-guides/manuals-and-toolkits/participation-manuals **Social Analysis Systems** http://www.sas2.net/ **Network portal for participation and fisheries** http://www.onefish.org/global/index.jsp **FAO Guidelines** http://www.fao.org/participation/tools/PRA.html http://www.fao.org/docrep/006/W2352E/W2352E00.HTM ftp://ftp.fao.org/docrep/fao/009/w3596e/w3596e00.pdf http://www.fao.org/docrep/007/y1127e/y1127e00.htm **World Bank** http://go.worldbank.org/L84QLQN2V0 **International Institute for Environment and Development** http://www.iied.org/natural-resources/group-publications/publications http://www.planotes.org/
Other socio-economic tools	**FAO** http://www.fao.org/docrep/006/y5055e/y5055e00.htm **Overseas Development Institute: policy analysis** http://www.odi.org.uk/Rapid/Tools/Toolkits/ **Global Coral Reef Monitoring Network: socio-economic monitoring guidelines** http://www.gcrmn.org/publications.aspx

Diagnosis and adaptive management can help improve the ability of small-scale fisheries (SSF) in the developing world to better cope with and adapt to both external drivers and internal sources of uncertainty. This paper presents a framework for diagnosis and adaptive management and discusses ways of implementing the first two phases of learning: diagnosis and mobilising an appropriate management constituency. The discussion addresses key issues and suggests suitable approaches and tools as well as numerous sources of further information. Diagnosis of a SSF defines the system to be managed, outlines the scope of the management problem in terms of threats and opportunities, and aims to construct realistic and desired future projections for the fishery. These steps can clarify objectives and lead to development of indicators necessary for adaptive management. Before management, however, it is important to mobilize a management constituency to enact change. Ways of identifying stakeholders and understanding both enabling and obstructive interactions and management structures are outlined. These preliminary learning phases for adaptive SSF management are expected to work best if legitimised by collaborative discussion among fishery stakeholders drawing on multiple knowledge systems and participatory approaches to assessment.

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