THE Rockefeller Foundation

EVALUATION OFFICE

SYNTHESIS REVIEW

Key Factors Supporting Small-Scale Coastal Fisheries Management

September 2013

FOUNDATION CENTER
Knowledge to build on.

IMM Ltd

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THE ROCKEFELLER FOUNDATION

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THE Rockefeller Foundation EVALUATION OFFICE

For this synthesis review, the Rockefeller Foundation provided financial support, the Foundation Center was involved in project and technology development and IMM authored the report.

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Acronyms

ADB	Asian Development Bank
ASSIA	Applied Social Sciences Index and Abstracts
CAOPA	African Confederation of Small-Scale Fisheries Professional Organisations
CBO	Community-based organization
CBRM	Community-based resource management
CBCRM	Community-based coastal resource management
CBNRM	Community-based natural resource management
CBFM	Community-based fisheries management
CFDO	Community Fisheries Development Office of the Fisheries Administration of Cambodia
CI	Conservation International
CMSP	Coastal and Marine Spatial Planning
CMT	Customary marine tenure
COBSEA	Coordinating Body on the Seas of East Asia
COFI	Committee on Fisheries (FAO)
CRM	Coastal resource management
DFID	Department for International Development (UK government)
DOAJ	Directory of Open Access Journals
EAF	Ecosystem approach to fisheries
EbA	Ecosystem-based adaptation
EBA	Ecosystem-based approach
EBM	Ecosystem-based management
EEZ	Exclusive economic zone
FAO	Food and Agriculture Organization of the United Nations
FiA	Fisheries Administration, Cambodia
FIRME	Financial Institution for the Recovery of Marine Ecosystems
GDP	Gross domestic product
GEF	Global Environment Facility
GSSF	Guidelines for Small-Scale Fisheries (FAO)
HDI	Human Development Index
ICCAS	Indigenous and community conserved areas
ICM	Integrated coastal management
ICSF	International Collective in Support of Fish Workers
ITQ	Individual transferrable quota
IUCN	International Union for the Conservation of Nature
IUU	Illegal, unreported and unregulated fishing
LME	Large marine ecosystem
MEY	Maximum economic yield
MJY	Maximum job yield
MMA	Marine management area
MPA	Marine protected area
MRAG	Marine Resources Assessment Group

MSC	Marine Stewardship Council
MSW	Minimum sustainable whinge
MSY	Maximum sustainable yield
NGO	Non-governmental organization
OECD	Organisation of Economic Cooperation and Development
PAF	Partnership for African Fisheries
PPP	Purchasing power parity
TAC	Total allowable catch
TNC	The Nature Conservancy
TURF	Territorial use right in fisheries
UK	United Kingdom
WBFM	Wealth-based fisheries management
WCS	World Conservation Society
WFFP	World Forum of Fisher People
WWF	World-Wide Fund for Nature

Preface

This synthesis review of key lessons in the management of small-scale fisheries is part of a collaboration between the Rockefeller Foundation and the Foundation Center, aimed at helping organizations and individuals build more effectively on each other's experience. With financial support from the Rockefeller Foundation, the Foundation Center is engaging in synthesis reviews such as this one, as well as the development of related practices and supportive technologies that facilitate the collection, synthesis and sharing of the sector's collective knowledge.

Our goal and hope is that such efforts can support the development of programmatic and funding strategies that start with a more inclusive and comprehensive understanding of what has worked, what hasn't, and why. We encourage you to make use of this report, to explore its online components at fisheries.issuelab.org, and to share it widely with colleagues across sectors.

This synthesis review was produced by a team from IMM led by Jock Campbell. IMM is a leading research, development and consultancy group providing innovative solutions to global development problems. Jock Campbell is a policy, institutions and planning specialist with many years of development experience. He holds a BSc in Zoology with Marine Zoology from University College of North Wales and an MSc in Sea-Use Law, Economics and Policy-Making from the London School of Economics and Political Science. Team members included Philip Townsley, Emma Whittingham and Jessica Marsh.

Nancy MacPherson
MANAGING DIRECTOR, EVALUATION
THE ROCKEFELLER FOUNDATION

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Executive summary

This synthesis review of key factors supporting small-scale coastal fisheries management was commissioned by the Rockefeller Foundation through a contract with Itad Ltd. The work was carried out by a team based at IMM Ltd, in Exeter, UK, from July to September 2013.

It was designed to provide an evidence base on the success factors in small-scale coastal fisheries management in developing countries and, in turn, to assist the Rockefeller Foundation in developing its strategy for its Oceans and Fisheries Initiative. In doing so, it identifies and describes some 20 key factors believed to influence success in small-scale coastal fisheries management.

The synthesis first presents an outline of the methods used in the study followed by a background of coastal fisheries, an introduction to fisheries management themes, and a review and discussion of some of the critical factors that influence success. It then offers some conclusions and possible ways forward.

The review process

This report was completed via a rapid review of key sources of knowledge from formal published literature, institutional literature, key informants and Internet searches. The focus was on key success factors in achieving a balance of social, economic and ecological benefits from the management of small-scale coastal fisheries.

Background to coastal fisheries

Small-scale coastal fisheries is an important sector. It contributes very significantly to food and nutrition security, employment, income and providing livelihoods for many very poor people. The diversity of coastal resources creates opportunities for these people, and the ease of becoming a fisher means that many people depend on fisheries for all or part of their household livelihood strategies.

However, as people are often able to enter the fishery with ease, many fisheries are over-capitalized with too much investment in fishing capacity, some are over-exploited and their contribution to wider economic development is being poorly used. Today, 87.3 percent of fisheries are either over-exploited or fully exploited (FAO, 2012a). These issues are compounded by a number of other human activities that result in coastal pollution and habitat destruction, further depleting resources. Subsidies to the fisheries sector in the past have increased the excessive pressure on resources, and destructive fishing methods are threatening wider ecosystem functions in many coastal areas. Growing global demand for fish by a variety of users and the penetration of global marketing chains to almost all corners of the world are also creating incentives to over-exploit fisheries.

Climate change is also beginning to affect coastal habitats, such as coral reefs which are under severe threat. These are some of the richest habitats and provide a wide diversity of opportunities for coastal people.

Climate change is likely to have other effects on both the ecology and the livelihoods of people who live near the coast, including increasing their exposure to natural hazards. The climate is only one of a number of factors that are changing. Today's fishers are faced with fuel and food price rises, changes in demand for fish and changes in market structures which are forcing fisheries and fisheries management to confront issues in the much broader contexts of the wider ecology and local and national economies.

Fisheries management

Much of the current situation of poorly managed fisheries results from past policies and practices. On the back of historic views that fisheries could not be depleted, national governments and intergovernmental organizations promoted the expansion of fisheries and subsidized expansion in capital, technology and skills. The momentum of this growth meant that fishing capacity has now expanded beyond that required for full and efficient utilization of the fisheries.

Many different forms of fisheries management have evolved, depending on the perceived aims of the management process. Early forms of customary marine tenure focused on the locally controlled management of resource access and benefits. As fisheries developed, yield maximization approaches were adopted which, in turn, gave rise to concerns for the environment and for maximizing sustainable economic returns from fisheries management. Thus, approaches have been added that confer rights – individual, community and human – on the people in the sector to achieve both efficiency and equity gains. This recognition of the wider ecological and economic implications of poor fisheries management also has stimulated an interest in more holistic approaches that go beyond fisheries and include ecosystem-based approaches and integrated coastal management. Such approaches are increasingly looking closely again at community involvement in fisheries management through co-management arrangements, under which the community and government share roles and responsibilities.

Impacts

The social, economic and ecological impacts of fisheries management are hard to measure. However, in the big picture, it can be said that a balance of sustainability, efficiency and equity goals have not been achieved. In fact, with the current state of the world's fisheries, most people would conclude that, overall, the management process has largely failed.

Key success factors

In spite of this rather negative picture of the management process, there are indications that some elements of fisheries management – in some locations and under some circumstances – have contributed to success. While there is no single approach or management system that addresses all the problems facing fisheries management globally, there is a growing belief that if enough of the factors affecting success are brought together, they have the potential to reverse fisheries' downward spiral.

This report identifies 20 of these key success factors, grouping them under three broad headings: i) factors affecting policy and planning, ii) factors affecting technical implementation and iii) factors affecting community engagement. This division is more for ease of presentation, as there are considerable overlaps between levels. In many cases, these overlaps are as important as the factors themselves. The key factors are summarized below.

Factors affecting policy and planning

These factors tend to operate at the policy and planning levels, but also can influence what happens at the policy implementation and community engagement levels.

1. ***Embracing complexity and integration.***
   Fisheries encompass interactions among people, the environment, political and social institutions, and markets, making for a complex system. In the past, t he focus tended to be on simplifying fisheries in order to understand them, e.g. using single species models of management from temperate fisheries on multi-species small-scale fisheries. However, this did not fully address the complexity of these fisheries and the biodiversity upon which they tend to depend. These small-scale fisheries are also very closely linked to local economies, which greatly influences the movement of people in and out of the fishery. At the same time, this complexity is rapidly changing as climate change and other global pressures affect the way fisheries operate – all of which indicates that engaging with complexity is becoming more urgent. If the management of small-scale coastal fisheries is to be successful, then a greater emphasis needs to be placed on understanding and responding to this complexity rather than externalizing it. Fisheries management must embrace that complexity and integrate with the wider local and national economies and development process.

2. ***Addressing conflicting aims.***
   The inherent complexity of fisheries has been compounded by confusion over the aims of fisheries management. The aims of fisheries, and therefore fisheries management, are often diverse and mixed. Different stakeholders have different objectives, as is often reflected in contradictory policies and management plans. Effective means of linking the aims of the sector to the wider development aims of resolving conflicts between different objectives and prioritizing those objectives are usually lacking. This leads to confusion as to what the management process is trying to achieve, and contributes to the lack of success of fisheries management approaches. It is important to recognize and address these conflicting and contradictory aims if fisheries management is to be successful and contribute to national development aims.

3. ***Recognizing the importance of context.***
   Part of the complexity of fisheries is that each fishery has developed within, and responds to, the local ecology, culture, economy, social patterns and political forces that operate around it. Efforts to seek a common solution are bound to be frustrated by this local diversity. This does not mean that solutions cannot be found, but they must take the local context into account. A key part of this

process will be the full and meaningful engagement of local communities in the management process.

4. ***Operating at multiple scales.***
Although the local context is important, there is also a need to understand the interconnectedness of different local situations. This interconnectedness operates through ecological, economic, social, cultural and political structures and processes at local, national, regional and global scales. Increasingly, it is recognized that working at multiple scales is needed to understand the wider context and to accommodate it in the fisheries management process. A variety of approaches to this are being piloted and used, including large marine ecosystems (LMEs), Seascapes, Marine Ecoregions, Regional Seas and Integrated Coastal Management (ICM). ICM has been used most extensively in the context of linking coastal fisheries to wider development processes, but all these approaches have wider and more holistic elements that attempt to integrate fisheries more realistically with other ecological and economic development areas.

5. ***Ensuring institutional coherence.***
Recognizing the complexity of fisheries management and the need to link fisheries much more closely to other economic, social, ecological and political processes at different scales indicates the importance of ensuring institutional coherence across these processes and at different levels. This is particularly so in terms of policy coherence, legislative coherence and the incentives provided by policy instruments. For example, where the establishment of well-defined rights to access fisheries resources is seen as an important part of fisheries management, it also needs to be recognized in policy and legislation at all levels.

6. ***Ensuring the viability and sustainability of ecosystem function.***
Fisheries cannot survive if there are no fish to catch. Ensuring the viability and sustainability of ecosystem function underpins the long-term survival of fisheries and the benefits that flow from them. Management measures such as marine protected areas have an important role to play in this process. However, it is important to understand this role in terms of the local ecological as well as socio-economic context. In particular, environmental management measures will have different effects on different groups of stakeholders in the fishery. In many situations, fishing opportunities will decline in the short to medium term for at least some people, and the fishers' abilities to react will also differ. Thus, management interventions should pay particular attention to sequencing interventions and measures to support fishers during transition to better management.

7. ***Adapting to external pressure and change.***
Even under the best fisheries management system, change is inevitable. This is becoming more pronounced as climate change takes effect and the forces that drive markets for labor, capital and fish become more globalized. In addition, in the face of outside opportunities, local economies are rapidly changing and coastal populations are increasing. With global media reaching even the

most remote parts of the world, people's perceived needs and aspirations are changing. Adapting to all of these external pressures and changes must become an important part of the fisheries management process. Efforts to address change by incorporating more adaptive planning and processes into fisheries management are increasing. This can be facilitated through greater recognition of the inherent adaptive capacities of fishing communities and using these capacities to support greater community resilience in the face of change.

Factors affecting technical implementation

These are factors that address more of the practical implementation aspects of fisheries management.

8. ***Establishing legal group rights and responsibilities.***
   There seems to be widespread agreement that the allocation of clearly defined and limited rights in fisheries is essential if we are to stop further over-capitalization of the fishery and provide a basis for rebuilding many fisheries into viable, sustainable and equitable entities. Although there is less agreement about the form of those rights, there is increasing recognition of the value of group-held rights in developing countries where peer pressure can be a valuable force for improved management. Establishing group rights and responsibilities in fisheries can create clear incentives and a sense of commitment to making management work and stimulate a sense of responsibility for the sustainable use of those resources. However, a group's right to harvest can also become the group's right to over-exploit if adequate checks and balances are not in place. This would suggest the importance of users and the state sharing roles and responsibilities through some form of co-management structure. These rights should not just be rights to harvest resources but should also include the right to a livelihood, good health care and education, and other human rights so often unavailable to the poor.

9. ***Incrementally changing to allow for capacity, reflection and negotiated response.***
   Changes in both policy and policy implementation will require substantial changes: in the way fisheries are managed; in the skills, attitudes and knowledge for management; and in new institutional structures, processes and linkages that can facilitate that change. This will require both the courage to make significant changes in what is often a knowledge vacuum, and the humility to accept that other groups of people may have something important to say about fisheries management – including the young, the old, women, processors, traders and shopkeepers. Such massive changes cannot occur quickly, they need time for reflection, experimentation, negotiation and acceptance. It is important to adopt change incrementally to assist this process and provide space for change.

10. ***Institutional fit and subsidiarity.***
    This change process also requires allocating institutional roles and responsibilities at different levels, although decisions should ideally be made as close to the

fishery as is possible while remaining effective. This will often link closely with the administrative devolution processes increasingly being adopted in developing countries. Getting the right institutional fit and the right level of subsidiarity for different roles and responsibilities is important, as is recognizing that it is an iterative and adaptive process that evolves over time.

11. ***Incorporating politics and political choices.***
In the past, many of the political influences on fisheries were externalized and left unresolved. Even today, fisheries management remains a contested area, with access and benefits often decided for political reasons, some for the public good, others for the private benefit of politicians or other powerful elites. Incorporating politics and political choices into the planning and implementation of fisheries management is important for achieving a balance between social, economic and environmental objectives. It is also important for gaining access to government funding and support for implementing change, and for achieving coherence between national development policies and sector policies.

12. ***Sustainably and equitably addressing costs and benefits.***
Even when there is a budget and political commitment for reform, it is still important to implement management efficiently and to share the costs and benefits of fisheries management in ways that are fair – and seen to be fair. Addressing costs and benefits sustainably and equitably is vital if fisheries management is to gain support from the community and wider society. However, at present, the understanding of costs and benefits is poorly documented. More needs to be done to improve understanding in order to allow informed decisions at all levels, such as by investigating the role of fishers in the funding of the management process based on the improved gains and how that links into local economic growth.

13. ***Getting market measures right.***
There is potential for the markets to improve the livelihoods of fishers through better returns for fish caught sustainably and equitably. With the public's increasing awareness of the damage poorly managed fisheries can inflict on coastal ecosystems, their willingness to pay for such damage is being tested through certification schemes and eco-labeling. However, changes in the way fish harvesting is carried out generally has costs, particularly for producers, making it important to introduce these market-driven measures in support of better fisheries management in the correct sequence and in ways that avoid having adverse effects on poor and vulnerable producers. Given women's important role in fish processing and trade, it is important that they are fully engaged in all decision-making around this and other fisheries management decisions.

Factors affecting community engagement

These factors are concerned with engagement at the community and household levels. They will influence, and be influenced by, technical implementation factors and those concerned with policy and planning.

14. ***Understanding dependency.***
A key factor that affects the way people behave in response to management decisions is their level of dependency on the resource. Some people are full-time fishers and have no other income source. Others are part-time or seasonal fishers, or use the resource as a safety net. For many poor people, fisheries will be part of a portfolio of household livelihood activities which may involve more than one household member. Understanding how different stakeholder groups depend on the fishery is essential to ensuring fair and sustainable management decisions.

15. ***Balancing exclusion, livelihoods alternatives and the local economy.***
Ultimately, fisheries management decisions will involve some people being included in the right to fish and some being excluded. Those excluded may be current fishers or future generations that may wish to join the fishery. There need to be alternative livelihood options for those who are excluded because, otherwise, they are likely to become impoverished or will try to circumvent entry regulations. Fisheries are generally closely linked to the local economy in which they operate, making it essential that they become a well-integrated part of the local economic development process. Getting the right balance among exclusion, alternative livelihoods and local economic growth is important to the sustainable and equitable development of small-scale fisheries. It is also important to get the sequencing of decisions around controls over entry requirements and livelihood alternatives right.

16. ***Building capacity.***
If fishing communities are to play a greater role in both decision-making and management implementation, then many will also need support in building their capacity to take on these new roles. Good leadership skills are essential, especially those which encourage inclusiveness and negotiation. Bringing communities together to work in collaboration is important, as is clearly defining what their roles and responsibilities are under the law and how far they extend geographically. Ensuring that the poor are fully included in this process is important.

17. ***Engaging with fishers' motives and preferences.***
While many assumptions have to be made about the social, economic and ecological development factors surrounding fisheries management, perhaps one of the most important areas of knowledge to get right is understanding and engaging with fishers' motives and preferences. Many fisheries management efforts have gotten into trouble because managers have made assumptions about the way fishers will behave that have proved to be wrong. For example, considerable conflict arises over time preference – fishers, managers, politicians and funders all have different time horizons and meshing them is particularly difficult.

18. ***Addressing commitment, compliance, conflict and enforcement.***
Addressing many of the factors above will encourage a greater commitment of fishers to the management process. However, there also will be a need to

address compliance, conflict and enforcement in order, for example, to enforce regulations quickly and effectively, and to develop conflict resolution processes. A greater emphasis on co-management of small-scale coastal fishers is likely to increase group pressure to comply, but enforcement is likely to remain with government and must be recognized as effective.

19. ***Ensuring participation and inclusion.***
Implicit in all of these factors is a greater level of participation and inclusion of fishers and their wider communities in decision-making around fisheries management. This should include fish traders and processors, money lenders, gear suppliers and those responsible for wider community and local economic development. Men and women, the poor and the well-off, the old and the young, ethnic and religious groups, all have different perspectives and need to be involved. This will make for more representative decision-making while also supporting a more empowering process.

20. ***Linking different knowledge management systems.***
An important part of inclusion is recognizing the value of both traditional ecological knowledge and experience-based knowledge in the management process. A sharing of roles and responsibilities across formal and informal systems of knowledge generation, sharing and use is likely to reduce costs and, at the same time, increase the relevance of knowledge used. The linking of knowledge management systems will provide a very important reflection of mutual trust and cooperation.

Discussion, conclusions and ways forward

As this research has shown, there is no simple universal cure for the problems that small-scale coastal fisheries face in many developing countries. It is likely that this is also true for fisheries more generally. However, this does not mean that fisheries cannot achieve a much more balanced equitable and sustainable trajectory into the future. The 20 factors identified in this report could help to achieve this, and there are doubtless others that would emerge from a more comprehensive study. Already, a number of these factors are starting to combine and to have a positive effect in some fisheries. There is also increasing recognition that a greater emphasis on getting the process right for specific contexts, rather than adopting a uniform approach for all fisheries, is likely to lead to better outcomes.

Efforts to distill some of these factors into principles for management began with the *Code of Conduct for Responsible Fisheries.* The specific needs of small-scale fisheries that go beyond the Code have been progressively recognized and the United Nations Food and Agriculture Organization (FAO) is currently producing the *International Guidelines for Securing Sustainable Small-Scale Fisheries* which address many of the emerging issues associated with fisheries management. These Guidelines are intended to enhance the contribution of small-scale fisheries to poverty alleviation, food security and economic growth.

It is important to recognize that achieving success in fisheries management will take a long time, a substantial financial commitment, enhanced sharing of knowledge and experience, political support and a commitment to building capacity at all levels.

1

Background to the synthesis

As part of its new model of operation, the Rockefeller Foundation is undertaking synthesis reviews to strengthen its knowledge and evidence base of what works and what does not work in its key areas of interest. The primary purpose of synthesis reviews is to enable Foundation initiative teams and their grantees to build on what is known, avoid the pitfalls of others and add value to the area of endeavor by not duplicating efforts.

The Foundation's Oceans and Fisheries Initiative aims to determine effective ways to integrate natural ecosystems into their economic and social systems. Research undertaken by the Foundation shows that oceans are in a state of crisis due, in large part, to rampant overfishing that has occurred for several decades. Millions of people, particularly the poor and vulnerable who depend on the productivity of marine resources for their food security and livelihoods, are seeing these eroded because of declining ocean health. Efforts to emphasize resource conservation and sustainable management while addressing the social and economic vulnerabilities of fishing communities will have high potential to deliver joint benefits for ecosystems and for people. The Foundation's body of work aims to shift paradigms in the environmental community in order to incorporate powerful new approaches including innovative financing, approaches and diffusion, and more purposeful planning for scale.

Oceans and Fisheries is a new Initiative in Development for the Rockefeller Foundation. Consistent with the Foundation's operating model, the dual objectives of Initiatives in Development are to quickly synthesize a wide variety of knowledge to inform internal decision-making for larger-scale investment while contributing significant public goods to the field, regardless of the Foundation's potential future investment in this space. In its Search process (the stage prior to Development), the Foundation explored the potential for grant making in the areas of fisheries, aquaculture, poverty and food security as a means of improving the lives of poor and vulnerable populations. In addition to generating significant knowledge, the results of the Search concluded that this area of work had significant potential. As a result, the Foundation approved a 15-month Initiative in Development spanning late March 2013 until April, 2014.

To learn quickly from existing knowledge in the field, the Initiative team wished to learn from "a synthesis of knowledge and evidence of critical success factors for in-

terventions aimed at improving natural resource management and their potential scalability, with a particular emphasis on the field of coastal/near shore fisheries management and the links to poor, vulnerable, or marginalized populations" (the Rockefeller Foundation, internal document). The objectives for this synthesis are built upon the Foundation team's latest understanding of the field and, to the extent of its knowledge, reflect insufficiently studied areas of inquiry. Its focus is on integrating the socio-ecological factors in the management of coastal small-scale fisheries in developing countries and their effects and impacts.

Thus, in order to undertake a rapid review[1] of key formal and informal knowledge sources and identify factors influencing the success, failure and potential scalability of fisheries management that combine ecological and socio-economic objectives, this report:

- synthesizes key lessons from past and on-going ecosystem-based community management efforts and programs, with a focus on fisheries and, where possible, other sectors
- identifies key insights in terms of factors contributing to the success and failure of ecosystem-based community management (ECM) and their implications for the Foundation's work
- provides a preliminary assessment of critical success factors for their potential to be catalytic in achieving (or inhibiting) impact at scale
- identifies outliers of interest to the Foundation
- identifies key players and their areas of expertise in relation to key lessons.

It focuses on the lessons learned regarding key success factors from past and ongoing work on managing small-scale fisheries in developing countries to achieve a balance between social, economic and environmental benefits in sustainable and equitable ways, and presents a synthesis of the lessons emerging from the key documents reviewed and interviews held around this area of work.

The report starts with an outline of the methods used in the synthesis work. This is followed by a background section on coastal fisheries, an outline of key fisheries management approaches and the impacts that fisheries management has had. It then identifies 20 critical factors that influence success in coastal small-scale fisheries management. These factors are reviewed at three levels: i) factors affecting policy and planning, ii) factors affecting technical implementation and iii) factors affecting community engagement. These factors are then discussed, conclusions drawn and ways forward briefly outlined.

[1] The study took place over a 10-week period from July to September 2013.

2

Research process and methods

The research process was organized into four stages: study design, formal knowledge search and screening, informal knowledge search, and analysis and report writing. The elements of each stage are outlined in the sections below.

2.1 Stage 1: Study design

The study design was developed from Terms of Reference (TORs) drafted by the Rockefeller Foundation and based on an analysis of knowledge gaps around fisheries management that needed to be addressed to inform its development strategy for engagement with the sector. On the basis of the TORs, IMM's research team prepared a research protocol. The study design outlined in the research protocol proposed a search strategy focusing on both formal and informal knowledge sources.

Formal knowledge search

This search focused on documented knowledge from two key areas: academic peer review literature and institutional grey literature.

The academic literature search was based on five electronic reference databases:

- Web of Knowledge: Web of Science
- Aquatic Sciences and Fisheries Abstracts (ASFA)
- Applied Social Sciences Index and Abstracts (ASSIA)
- Directory of Open Access Journals (DOAJ)
- Scirus.

The institutional grey literature search was carried out using institutional website search engines and online library databases. To guide the search, an institutional map was developed of key institutions likely to be involved in the areas covered by the synthesis. These included academic institutions, donors and funding agencies (including foundations), intergovernmental agencies, regional fisheries management organizations and NGOs.

Informal knowledge search.
This search focused on the experiential knowledge of key informants working in the field of fisheries management. Key informants were also asked to identify important formal knowledge resources, which were obtained through online searches or sent directly to us by the informant.

2.2 Stage 2: Formal knowledge search and screening

Keyword search strategy

The search of formal knowledge sources applied a keyword search strategy based on the principal topics of relevance to this synthesis (see Table 1).

TABLE 1: **Principal topics and keywords search strategy**

TOPIC 1		TOPIC 2		TOPIC 3
Fish* Ecosystem Natural Resource	AND	*Manage* Community-based Adaptive NEAR *manage	AND	Coast*

* / AND / NEAR represent Boolean search operators

Initially searches combined Topic 1 and 2 keywords and applied this strategy to the whole document. To further narrow the search (for searches yielding over 6,000 results), Topic 3 was applied. Then if necessary, the search was applied to fewer document fields (e.g. title or abstract). Once a search yielded less than 6,000 results, it was exported to EndNote, a library software package.

The keyword search strategy was applied consistently to all five electronic reference databases. Where possible this strategy was also adopted for the institutional grey literature search. However, if a searchable library database was not available, a manual search of publication lists for relevant topics (e.g. fishery management and governance, co-management, ecosystem approach to fisheries) was undertaken. In total, 26 institutional websites were searched. In addition, the IMM office library and reference libraries of team members were searched to identify additional grey literature that, from experience, was considered useful.

All searches were recorded in a search log which indicated the number of results for each search and which searches were downloaded into EndNote (see Annex 1).

Inclusion criteria

An initial set of inclusion criteria, developed to ensure the documents compiled for the review were accessible and relevant, included:

- **YEAR OF PUBLICATION:** the study must be published in or after 1990
- **LANGUAGE:** the study must be published in English
- **GEOGRAPHIC RELEVANCE:** the study must be based on evidence from developed countries
- **TOPIC RELEVANCE:** the study must pertain to management initiatives and factors of their success/failure in relation to coastal marine fisheries, including articles that examined relevant management concepts or theories.

For the institutional grey literature searches, documents were screened for inclusion criteria based on their title, and only those meeting the criteria were exported to EndNote. In total, 141 accessible and relevant documents were identified from the institutional grey literature search. Further grey literature documents were identified from the IMM and team libraries.

For the academic literature searches, the year of publication criteria was combined with the initial keyword search. In total, 16,923 academic references were compiled from the five electronic databases. Of these, 7,304 were identified as duplicates and removed, leaving a library of 9,619 documents to be screened for language and relevance inclusion criteria.[2]

Inclusion screening was applied to the title and abstract of each document. A coding system was used during screening to identify the reason for exclusion. This provided an outlier library resource, containing documents which may have potential insights for the synthesis but may be outside the geographical relevance (e.g. developed country) or topic relevance (e.g. inland fishery or forestry management). Following inclusion screening, a total of 1,166 documents were identified as accessible and relevant for the synthesis.

Included academic literature documents were further screened to identify documents of particular relevance to the synthesis. These included overviews or reviews of fisheries management initiatives at multiple sites. In total, 195 documents were identified as key documents, with snowball sampling from citation lists of key documents also yielding further documents.

The overall formal knowledge search and screening yielded 1,379 relevant documents for review, as summarized in Table 2.

TABLE 2: **Summary of formal knowledge search results**

ACADEMIC LITERATURE SEARCH RESULTS				
Keyword search results	**Included documents**	**Key documents**	**Excluded: Developed country**	**Excluded: Relevant off topic**
9,613	1,166	195	2,940	1,045
GREY LITERATURE SEARCH RESULTS				
Website search results		**IMM library search & snowball sampling**		
150		63		

2.3 Stage 3: Informal knowledge search

From the institutional grey literature search and from the research team's experience of the sector, a number of key informants were contacted to take part in semi-struc-

[2] Due to the export functionality of the Directory of Open Access Journals (DOAJ) and Applied Social Sciences Index and Abstracts (ASSIA) databases, inclusion screening for language and relevance criteria was carried out as documents were exported to EndNote. This yielded 45 documents.

tured interviews. Interviews were conducted in person, by telephone or email, and were guided by a checklist of topics and questions (see Annex 2).

In total, the team contacted 55 individuals, of whom 20 were interviewed and 4 replied to an email checklist, as summarized in Table 3 below. Approximately half of those contacted were unavailable, or failed to respond, which may be explained by the fact that the synthesis was conducted during a holiday season.

TABLE 3: **Summary of the informal knowledge search**

INSTITUTIONS	CONTACTS MADE	INTERVIEWS CONDUCTED		
		In person	Telephone	Email
Intergovernmental/multi-lateral organizations	7	2	-	1
International development banks	3	-	3	-
Government organizations	2	-	1	1
Regional fisheries management organizations	3	-	-	1
Research institutions	18	-	5	-
Non-governmental organizations	15	-	6	
Fisher organizations	7	-	3	1

2.4 Stage 4: Analysis and report writing

Analysis of documents initially focused on the full text of key documents identified from the academic literature search. As the review progressed, documents identified through snowball sampling of citation lists and from the institutional grey literature search were also analyzed. This analysis revealed a number of preliminary key success factors, which were reviewed and revised to fit more closely to the available evidence as the analysis developed. These factors were finally grouped into three areas: i) factors affecting policy and planning, ii) factors affecting technical implementation and iii) factors affecting community engagement. This analysis was cross referenced against the results of the informal knowledge search in order to triangulate the results. This provided the basis for the report's results and discussion.

Given that the study had only two months to complete the search and analysis, only a limited number of documents could be reviewed in the time available. Ultimately, the scope of knowledge included in the report reflects the limitations imposed by this time schedule. In total, approximately 170 documents were reviewed. As such, it is recognized that a continued review of the formal knowledge search results would reveal additional information that may be of benefit. However, the level of repetition in the results suggests that the synthesis represents an acceptable level of convergence of thought.

3

Background to coastal fisheries

This section provides a brief summary of the global fisheries sector: its importance, its current state, the effectiveness of fisheries management measures and the potential of the sector.

The coastal environment is one of the most diverse parts of the planet with many ecosystems and species. This diversity, combined with the dynamic and changing nature of coasts, creates conditions for the provision of a wide range of ecosystem services which benefit humans as individuals and societies including: food from fish, building materials from reefs and mangroves, storm protection for coastal communities, medicines and cultural traditions, as well as wider regulatory support services.

Fish are harvested from all coastal countries throughout the world. In developing countries, fisheries are particularly important for providing food and nutrition security, income and employment. The diversity of species and habitats in coastal areas provides a range of opportunities for the livelihoods of men, women and children, and the open access nature of many resources provides opportunities for the poor.

However, the vital role of coastal ecosystem services is being undermined by over-fishing, habitat destruction and pollution. As a consequence, many of the world's fisheries are at, or beyond, their sustainable limits of harvesting. Fisheries management has been used to try to halt or reverse this adverse situation, but overall it has failed to improve matters significantly. If fisheries can be successfully managed, then their potential contribution to food, employment, foreign exchange generation and poverty reduction can be both large and sustainable. This is discussed in more detail below.

3.1 The importance of coastal fisheries

The coast is one of the most ecologically diverse ecosystems – a diversity that creates many livelihood opportunities for different groups of people. Because of the relatively open access nature of coastal fisheries and the low cost of entering, these opportunities attract many poor people into the fishery and, in turn, the fishing supports many different forms of livelihoods for different groups of people. The main attraction of the

coastal waters is the ability to harvest fish for food and to sell, but this is only part of the engagement of the community with the coastal system.

Fisheries ecology

The sea covers 71 percent of the surface of the earth and constitutes 96.5 percent of all water by volume. It is one of the most biologically diverse parts of the planet in terms of both ecosystem diversity and species diversity. Much of that diversity is concentrated in coast fringes where small-scale fisheries often operate (Campbell and Beardmore, 2001). Key habitats include:

- open sea
- deep ocean floor
- continental slopes
- sea mounts
- mud/sand banks
- inshore coastal areas
- coral reefs
- mudflats
- sandy beaches
- kelp forests
- estuaries
- mangroves
- deltas
- lagoons

These different habitats are often mutually supporting with, for example, reefs providing shelter for sea grass areas and sand for beaches. The habitats also link the different lifecycles of fish, some as nursery areas and others as adult feeding and breeding areas. Connectivity between these is important in the wider ecological balance.

Although coral reefs cover less than 0.1 percent of the ocean (250,000 km^2), they are the most productive and biologically rich ecosystems on earth with around 25 percent of all known marine species (Burke *et al.*, 2011). They occur mainly in coastal areas where fisheries are particularly important.

Fish production

The Food and Agriculture Organization of the United Nations (FAO) monitors the world's fisheries on a regular basis. Capture fisheries and aquaculture supplied the world with an estimated 154 million tonnes of fish in 2011 (with a total value of $217.5 billion), of which about 131 million tonnes was utilized as food for people (FAO, 2012a) (See Table 4). Fish production maintained a growth rate of 3.2 percent per year in the period 1961–2009, outstripping population growth.

TABLE 4: **Global fish production by year and source in millon tonnes**

	2006	2007	2008	2009	2010	2011
CAPTURE						
Inland	9.8	10	10.2	10.4	11.2	11.5
Marine	80.2	80.4	79.5	79.2	77.4	78.9
Total	90.0	90.3	89.7	89.6	88.6	90.4
CULTURE						
Inland	31.2	33.4	36	38.1	41.7	44.3
Marine	16.0	16.6	16.9	17.6	18.1	19.3
Total	46.3	49.9	52.9	55.7	59.9	63.6
TOTAL WORLD PRODUCTION	**137.3**	**140.2**	**142.6**	**145.3**	**148.5**	**154.0**

Source: FAO, 2012a

Table 1 shows that while wild capture fisheries have remained relatively static in recent years, aquaculture has grown considerably. Aquaculture now makes up 41 percent of total fish availability compared with 51 percent from marine capture fisheries (FAO, 2012a).

The global fishing fleet is comprised of 4.36 million vessels, of which 74 percent work in marine fisheries. Asia has the largest fleet with 73 percent, Africa has 11 percent and Latin America and the Caribbean has 8 percent (FAO, 2012a).

Food and nutrition security

World per capita food fish supply increased from an average of 9.9 kg (live weight equivalent) in the 1960s to 18.4 kg in 2009 and is set to increase further (FAO, 2012a). In 2010, fish production provided a global fish consumption rate of 18.7 kg/person/year with consumption rates varying across the globe from 9.1 kg/person/year in Africa to 24.6 kg/person/year in Oceania. Fish makes up 16.6 percent of all animal protein consumed and 6.5 percent of all protein consumed by people. Globally, fish provides about 3.0 billion people with almost 20 percent of their intake of animal protein, and 4.3 billion people with about 15 percent (FAO, 2012a). Fish also provide other benefits such as micro-nutrients (MRAG *et al.,* 2013) that are particularly important in the diets of the poor.

In most developing countries, fish is sold mainly in live or fresh form (representing 56 percent of fish destined for human consumption in 2010). Cured forms of fish (dried, salted, smoked or fermented) still remain important in developing country markets, although the share of fish that is processed is declining (FAO, 2012a).

Fish and fishery products are among the world's most traded food commodities. In 2010, fishery trade represented about 10 percent of total agricultural exports (excluding forest products) and 1 percent of world merchandise trade in value terms (FAO, 2012a).

Fisheries livelihoods and poverty reduction

There are some 54.8 million people involved in the production of fish. An estimated 660–820 million people, or 10–12 percent of the global population, depend upon fisheries and aquaculture for their livelihoods: 87 percent of them in Asia, 7 percent in Africa and 3.6 percent in Latin America and the Caribbean (FAO, 2012a). Of the people directly employed in capture fisheries (production and processing), 97 percent live in developing countries and 90 percent work in small-scale fisheries (Hall and Andrew, 2011). It is thought that, on average, 30 percent of people employed in fisheries overall are women mainly in fish processing and trade (FAO, 2012a).

Many of the people involved in small-scale fisheries in developing countries are poor, marginalized or vulnerable to adverse change. According to Pomeroy (1994, 3), "[i]n many parts of the world, rights to common property are all that separate the poor from destitution." While many of these people are poor, vulnerable and marginalized, an important question is "are they poor because they are fishers, or are they fishers because they are poor?" (Béné, 2003). The answer is complex and is probably a mixture of both.

Coastal fishers live in one of the most dynamic and contested parts of the world where risk is a part of their livelihood strategies (Campbell *et al.*, 2006). This creates opportunities for poor people that others may consider too costly or unpredictable, but it also creates threats to life, assets, income and savings, which means there is considerable movement into and out of poverty in fishing communities.

Fishers often live adjacent to areas of high biological diversity which creates a diversity of opportunities to employ different combinations of labor, skill, experience-based knowledge, capital, technical knowledge, risk-avoidance strategies, market knowledge and access, and seasonal time allocation (Campbell and Townsley, 2013). This diversity often, at least initially, reduces competition from other fishers that require the economies of scale afforded by less ecologically diverse environments. Increasingly, however, such biological diversity is attracting tourism which offers both threats (land acquisition, pollution, habitat destruction) and opportunities (markets for seafood, alternative employment opportunities). Where barriers to entry are low, such as open access fisheries, where there is low competition or where entry requires little investment in, e.g. skills or equipment, poor people can often find niches as individual fishers or as hired crew. While there is high gender differentiation in most fisheries (generally with men catching fish and women processing and trading), some habitats, such as coral reefs, provide opportunities for women to glean food for domestic consumption or trade, an activity which often provides an important social and cultural function (Whittingham *et al.*, 2003). In addition, women in many parts of the world play an important role in owning and financing fishing operations.

However, while open access coastal fisheries attract poor people, they often remain poor, because:

- they have inherent risks working in such difficult environments, where catch predictability is low
- they have few enforceable rights over land and fish resources
- they have competition in harvesting combined with pollution, habitat destruction, increasing climate change and decreasing catches
- they may be marginalized to poorer parts of the fishery or excluded at certain times
- they are dealing with highly perishable products, where market access is difficult and market knowledge poor
- their investment in boats, gear, fuel and labor is often dependent on loans from middle men and women who are able to charge high costs for their services
- their lack of rights over land and access to fisheries resources (especially for the very poor, migrant workers, certain classes and castes of people, and ethnic minorities) often means that their activities fall outside of the law and the decision-making processes (Béné, 2003; Campbell *et al.*, 2006).

For small-scale processors and traders, increasing competition for supply, changing market and quality-control demands, concentration of landings in fewer landing sites, and changes in investment levels in processing and trade are often leading to significant shifts in the structure of the post-harvest fisheries sector – changes that often marginalize small-scale operators. In some areas where women previously played key roles in post-harvest fisheries, more men may be found entering processing and trade, which is leading to reduced opportunities and increased competition for small-scale female traders and processors (IMM and ICM, 2003).

3.2 The state of coastal fisheries

There can be little doubt that the world's fisheries are in suboptimal condition (see Box 1). In 2009, 29.9 percent of global fish stocks were overexploited, 57.4 percent were fully exploited and 12.7 percent were not-fully exploited (FAO, 2012a). Most of the fully exploited stocks are at their maximum sustainable yield (MSY) and therefore not achieving their full economic potential. FAO (2012a, 200), in its analysis of global fisheries in 2012, stated that the results "are troubling from a resource exploitation perspective and suggest a global system that is overstressed, reducing in biodiversity and in imminent danger of collapse."

In addition, many key ecosystems on which the health of marine fisheries depend are being degraded. Mangrove forests have been widely depleted and, over the past 50 years, approximately one-third of the world's mangrove forests have been lost (Alonghi, 2002), 29 percent of sea grasses have been lost (Waycott *et al.*, 2008) and more than 75 percent of coral reefs are under immediate threat from local and global forces (Burke *et al.*, 2011). In addition, 60 percent of coral reefs are threatened by local pressures such as over-fishing, destructive fishing, coastal development, watershed-based pollution, or marine-based pollution and damage (Burke *et al.*, 2011).

BOX 1:

Overfishing in Asia

An Asian Development Bank (ADB)-funded, WorldFish-implemented regional fisheries project in Bangladesh, India, Indonesia, Malaysia, the Philippines and Sri Lanka identified the central issue of fisheries as drastically depleted resources – resulting from overfishing and compounded by environmental degradation. All fisheries had harvesting rates that were greater than those required to achieve maximum sustainable yields or maximum economic yields.

Overfishing was found to be intimately linked to poverty among fishing communities, where fishing was seen to be the income of last resort. The de facto open access regime of the fishery allowed more and more people to join the fishery.

Source: Stobutzki *et al.*, 2006

In addition to pressures on species and ecosystems, there are also significant economic losses from the sector. World Bank-FAO (2009) estimated global losses of net economic benefit at some US$50 billion, due to excess harvesting capacity and effort, linked with capital and operating-cost subsidies. In 2003, subsidies primarily to support overfishing were estimated at $16.2 billion out of a total of $27 billion globally (Sumaila *et al.*, 2010). In addition, illegal, unreported and unregulated (IUU) fishing is now a major concern for many fisheries, with global losses estimated at between $9 billion and $24 billion annually, representing between 11 and 26 million tons of fish or between 10 percent and 22 percent of total fisheries production (MRAG, 2009). These losses impact directly on the availability of fish for small-scale fishers.

Marine and, in particular, coastal habitats and resources are under increasing threat from a variety of sources (Campbell, 1996; Bryant *et al.,* 1998; Whittingham *et al.,* 2003) (see Box 2) including:

- habitat loss, destruction and fragmentation as a result of agriculture, aquaculture, fishing, urban growth, port developments and tourism
- pollution from industry, mining, farming, aquaculture and urban development
- changes in water sediment loads from agriculture, forestry and mining

- changes in water flows as a result of deforestation, abstraction for irrigation and human consumption, and hydroelectric dams
- excessive or inappropriate exploitation of resources
- inappropriate genetic manipulation and selection in aquaculture
- introduction of exotic species from aquaculture, the aquarium trade, ships ballast tanks
- climate variability resulting in periodic coastal shocks
- climate-related changes such as changes in sea level, sea temperatures and predator-prey relations.

The reasons for the poor state of global fisheries are complicated (Rudd *et al.,* 2003). They are complex systems that combine social, economic, ecological and political forces which are difficult to reconcile. Fisheries management has been a major component of the wider sector development process that has been used to address some of these issues. However, fisheries management has not been very successful across global fisheries. According to Bromley (2009), "the imperiled status of global fish stocks offers clear evidence of the comprehensive failure of national governments to provide coherent management to protect those stocks." This reflects the complex nature of fisheries management as will be discussed later. As Hilborn noted, "fisheries management isn't rocket science, it is actually quite a bit harder" (Western Star, 2009).

BOX 2:

Reef destruction

Coral reefs are seen as an important source of food and income through the sale of fish in many coastal communities. However, there are also examples where the sustainability of this ecosystem service is being threatened by coral mining.

In Tanzania, live and dead coral was extracted for lime production in the 1990s. On Mafia Island, coral mining was ranked third among income-earning activities, in terms of the number of people involved. After commercial lime production was made illegal this fell rapidly.

Source: Tobey and Torell, 2006

3.3 The potential of coastal fisheries

In spite of these management issues, the potential of fisheries, if managed well, is considerable. What form that potential will take will depend on how and why fisheries are managed.

The ability of depleted fisheries to recover and achieve their maximum potential will depend, to an extent, on how that potential is measured, i.e. in terms of production maximization, economic return maximization, environmental protection or employment maximization. The length of time required to return fisheries to their desired state will also vary, depending on the current state of the stocks and the species concerned. Even with management, multiple-species stocks are likely to evolve gradually towards an equilibrium which may or may not be the same as before exploitation.

There is, however, broad recognition of the potential of fisheries to bounce back from the current state of mismanagement and to continue to provide benefits into the future. What those benefits are and who benefits from them are largely political decisions that countries will have to decide. The following section reviews a variety of management themes that have been used in the quest to achieve that potential.

4

Fisheries management approaches and themes

This section discusses the concept of fisheries management, its evolution and how it manifests itself in modern fisheries. It looks at the broad management themes that have been adopted and briefly discusses each of these.

Fisheries management has been defined as: "The integrated process of information gathering, analysis, planning, consultation, decision-making, allocation of resources and formulation and implementation, with enforcement as necessary, of regulations or rules which govern fisheries activities in order to ensure the continued productivity of the resources and the accomplishment of other fisheries objectives" (Cochrane, 2002, 3).

In the past, there was widespread discussion of the different merits of economic, social and biological objectives and management strategies for fisheries. Much of the focus was on the maximization of productivity and production targets, which remains the key indicator of success used by many governments around the world. However, as the realization has grown that fish stock harvesting cannot be continuously increased, the focus has increasingly shifted towards environmental management. The social aspects also have taken a more prominent role in strategies, due to a greater focus on reduction of global poverty and recognition that fish and fisheries play an important role in the livelihoods of many poor people.

The conflicts among the different management schools of thought continue. However, efforts are being made to bring these disparate threads together into a management process that harmonizes different aims and strategies to achieve a balance across social, economic and environmental sector objectives.

In reality, a fishery is a complex system which links individual human endeavor, enterprise, risk, culture, the physical world, technology, the natural world, the political economy and wider society's beliefs, aspirations and values (Campbell and Cattermoul, 2009). According to Ostrom (2009a), all human-used resources are embedded

in complex, social-ecological systems composed of multiple subsystems and the internal variables within these subsystems at multiple levels.

Scientists have often responded by developing simple theoretical models to analyze aspects of the resource problems and to prescribe universal solutions (Ostrom, 2009a). In their attempts to understand and interact with fisheries, scientists have often tried to simplify or break down the complexity. Thus they can work with its separate parts by, for example, focusing on specific components of fisheries, such as gear/vessel classification, or over-simplifying relationships implicit in bio-economic models. As the crisis in world fisheries deepens, the pressure to find workable solutions increases. The combination of complexity and urgency has created a market for quick and technical solutions to management problems (Degnbol *et al.*, 2006). But these rarely do more than explain a part of what is happening in localized situations at a given time. As Dengbol *et al.* explained, these "fixes" often lead to tunnel vision.

The responsibility for the management of fisheries has been disputed for many years. In many traditional communities, management has been a function of the community itself. In the Pacific, for instance, the rights to resources are often part of a complex web of social and cultural relations between and within communities and kinship groups. More recently, and particularly as fisheries have come under increasing pressure, the state has taken on a greater role in their management.

However, governments are no longer the only source of decision-making in fisheries or other environmental fields (Armitage *et al*., 2012) where collaborative approaches involving a number of stakeholders are becoming accepted. This is important because different groups of people want different things from the resource, at different times and collected in different ways. Armitage *et al.* (2012) argued that while "command and control" management systems have yielded success in terms of flows of ecosystem services, they have done so at social and environmental cost – social cost related to compliance, enforcement and conflict, and environmental cost due to declines in regulating and providing ecosystem services. They noted that management and governance systems are not mutually exclusive and suggested that cooperative models of governance are more likely to work effectively within an enabling system of government regulation.

However, the very concept of management is sometimes questioned and the broader approach of governance, which considers the wider processes and institutions through which society makes decisions, is often seen as more appropriate (Armitage *et al*., 2012). Governance of resources raises questions that go far beyond narrow management concerns and start to address more philosophical issues about wider benefit flows to society and to future generations. The form and function of governance often reflect the wider changes in society's approaches, concerns and priorities, the market realities, and the cost-cutting motives of government to hand over responsibility for that management.

While there are no clear-cut or separate models of fisheries management, there are broad approaches or themes that reflect the emphasis of a particular management process in a particular situation. Some are suited to some circumstances, others to other circumstances. Management methods developed for single species fisheries in temperate waters, for example, may be unsuited to tropical multi-species inshore fisheries (Rudd

et al., 2003) where ecological and fish landing data are poor, where there are few formal property rights, where many operators compete for resources with different gear from many sites, and where people regularly move in and out of the fishery. Often these approaches or themes are combined, as in the use of marine protected areas with co-management, to address different aspects of the management process.

These management themes can be grouped in numerous ways. We have identified seven broad themes reflecting different aims: i) customary marine tenure, ii) yield maximization, iii) conservation of resources, iv) economic maximization, v) rights-based approaches, vi) ecosystem-based management and vii) co-management. There is much overlap between them, and which ones are used depends very much on the local context. These are reviewed in the following sections.

4.1 Customary marine tenure (CMT)

Traditional community-based resources management systems have been documented across the world by, e.g. Ruddle *et al.* (1992) and Kuemlangan (2004). Berkes *et al.* (2000) noted that resource monitoring has been a regular feature of traditional systems that note and act upon the abundance of different species. Sacred sites may have provided some protection to species much as a marine protected area does. For example, Berkes *et al.* (2000) recalled how some indigenous people "rested" their fisheries on a periodic basis, and that traditional fisheries sometimes used methods that are only beginning to be adopted by more formal systems. Some traditional communities have tended to conceptualize their fisheries as multi-species, rather than single species, and also to view the interconnectedness of land and water systems. In their review of the similarities among some 30 traditional fishing societies throughout the world, Acheson *et al.* (1998 cited in Berkes *et al.*, 2000) suggested that the similarities indicate some geographic transfer of knowledge.

Many customary marine tenure (CMT) arrangements may have resulted in the sustainable and equitable use of fisheries resources, in part because there was limited fishing pressure. Many continued to operate when resources declined and effort substantially increased, but with varying degrees of success. However, it needs to be remembered that these CMT systems are often primarily mechanisms that govern exchange and social relations within and between traditional communities and groups, rather than explicitly protecting resources.

While customary marine tenure may have been associated largely with traditional systems, there is increasing recognition that it also has a role to play, albeit in modified form, in modern management systems. For example, Kuemlangan (2004) noted that a "[a] cursory examination of PIC (Pacific Island Countries) Constitutions, fisheries legislation and general natural resource management practice indicate that the PICs have the necessary minimum legal basis for application of CMT, and are receptive to or already practise participatory approaches to fisheries management including those based on CMT."

Today, there is renewed interest in learning from these approaches and applying them to rights-based approaches at the community level. But, it is also recognized that community-based approaches more generally are not a panacea for resource management (Pomeroy, 1994).

4.2 Yield maximizing approaches

As mentioned above, in the past, the focus of fisheries management and development tended to focus on ways of maximizing production. Speaking at the opening of the 1883 International Fisheries Exhibition in London, the biologist Thomas Huxley famously stated that "The world's fish and fisheries are inexhaustible" (Link, 2010). It was only in the 1900s that people began to fully realize that the world's fish were exhaustible.

More recently, there have been concerns about maintaining stock size, retaining biodiversity and ensuring ecosystem function – with significant tension between those approaches adopted to maximize productivity and those for achieving biological conservation. For example, the Plan of Implementation of the 2002 World Summit on Sustainable Development targeted the restoration of fish stocks to maximum sustainable yield (MSY) levels by 2015. While MSY is a useful concept in a single species stock, it becomes less useful in a multi-species stock with inter-species interaction (Leal, 2010). In addition, limited governmental capacity may limit the ability to assess what MSY actually is. The World Bank-FAO report, *The Sunken Billions: The Economic Justification for Fisheries Reform,* suggested that MSY should be considered a minimum target (World Bank-FAO, 2009).

The drive to maximize production from fisheries has been, in large part, behind the massive over-capitalization of fisheries and the perverse incentives that now are the norm. As a result, there have been many attempts to control fishing efforts at MSY. These have often involved a series of technical measures including direct gear and fishing effort restrictions, including limits on vessel numbers (e.g. by license), vessel types, engine power, vessel length and gear used. Gear restriction may include mesh size restrictions, hook size, net length and the use of excluder devices. Restrictions may also be on species, fish length or age, total weight taken, weights landed (and thus discards) and breeding state. Fishing activities may be limited by physical areas which may range from zones where no fishing occurs at any time of the year to lesser restrictions that allow certain gears by certain people at certain times. These might include inshore fishing areas for small-scale fishers. Such spatial restrictions, often called marine management areas (MMAs), are discussed in more detail below. In some fisheries, total allowable catches (TACs) of different species are designated and, in some cases, quotas are allocated within that. They may be allocated directly (free of cost or for a fee) or through an auction system.

These different measures have come into favor and gone out of favor in different fisheries at different times. In Scott's (2010) useful chronology of such changes, he identified a general movement from gear restrictions, through licenses, to quotas and to property rights with a move towards stronger qualities of rights including: greater exclusivity, greater permanence, greater transferability, greater divisibility and greater security.

4.3 Conservation of resources

Approaches to conserve resources have adopted a number of measures to limit the ability of fishers to harvest resources. While technical measures (as outlined above)

have been adopted, marine conservation areas, habitat and stock restoration, and precautionary principles have been a key part of this approach (Hilborn, 2007).

The precautionary approach uses foresight to avoid unacceptable or undesirable situations, taking into account that changes in fisheries systems are only slowly reversible, difficult to control, not well understood, and subject to change in the environment and human values (FAO, 1996). As Hilborn (2003, 387) noted "[t]he precautionary approach is built around the concept that managers should not wait until they have unequivocal evidence that fishing effort needs to be reduced before acting, and it is intended to protect fisheries from overexploitation in the face of uncertainty."

Even where fisheries are being managed effectively, there is likely to be a need to ensure that forces from outside of the sector do not degrade habitats and stocks. These include land-based pollution, marine pollution, coastal development and climate change. Restoring habitats and stocks to their original condition and limiting external pressure are important components.

BOX 3:

Soufrière marine management area in St Lucia

The Soufrière Marine Management Area in St Lucia, created in 1995, had a rapid impact on the combined biomass of five commercially important fish families in the adjacent fishing area. Mean total catch per trip per fisher increased by between 46% and 90% over a five-year period with stable fishing effort.

Source: Roberts *et al.*, 2001

Marine conservation areas are often referred to as Marine Protected Area (MPAs), including those which are no-take zones and thus have the benefit of protecting the species and individual fish that remain inside the protected area (see Box 3).

FAO (2007) listed eight common reasons for establishing MPAs: i) to protect a specific life history stage, ii) to control fishing mortality, iii) to handle the spillover effect of fish migrating across the boundaries of an MPA so they can be fished, iv) to serve as a source and/or sink for fish eggs and larvae to improve recruitment, v) to protect habitat, food web integrity and biodiversity, vi) to reduce by-catch, discarding and other negative impacts on harvested species, other species, endangered species and other species society wants to protect, vii) to reduce competition between user groups or to enhance opportunities for certain groups of users (by establishing rights), and viii) to serve as a potential hedge against uncertainty. However, MPAs take many forms around the world and the language used to describe them differs from place to place, which can lead to considerable confusion (Christie and White, 2006).

The effectiveness of MPAs depends in part upon the size and ecological sufficiency of the enclosed area, its level of exclusion and its connectivity to other MPAs. While very large MPAs which are enforced no-take zones effectively eliminate fishing pressure, there still may be other pressures from climatic conditions, non-fisheries pollution or habitat destruction. A review of the experience of inter-coastal management (ICM) in the Philippines by White *et al.* (2006) determined that MPAs, as part of wider ICM processes, protect and enhance near-shore habitats and fisheries for

BOX 4:

Impact of marine protected areas (MPAs) in Tanzania

The impact on abundance of harvested fish around MPAs in Tanga and Mafia, Tanzania, was perceived to be positive, but impacts were perceived as negligible or negative in other MPA sites. Fishers' focus group meetings in Tanga and Mafia sites corroborated that MPA efforts have improved the fisheries. The changes in Mafia were further verified by key informant marine experts who knew the condition of the fisheries in the early 1990s and at the time of the study. Finfish, octopus, endangered species such as marine turtles, and even whales and dolphins were returning.

However, social and economic changes were less obvious, with only a small impact on household involvement in decision-making, negligible or negative effects on employment, and negligible impact on incomes.

Source: Tobey and Torell, 2006

the benefit of coastal communities, and they attract marine tourism which contributes to the local economy. Key benefits include i) enhanced local biophysical quality of coastal habitats and improved fish catches inside and outside of MPAs, ii) enhanced revenues to communities and local governments derived from tourism within and outside of MPAs, iii) revenues from marine-based or eco-tourism enterprises to local communities, and iv) improved planning and implementation of ICM through 100 municipal and city governments. However, benefits can be mixed, as shown in Box 4.

In addition to conserving existing resources, there has been considerable interest in enhancing fish stocks. Bell *et al.* (2006) stated that the key challenges for capture fisheries are i) reducing fishing effort, ii) removing excess fishing capacity, and iii) building the institutional arrangements needed to restore spawning biomass to more productive levels and reverse degradation of supporting habitats. They suggested two options from the cultured production of juveniles to enhance this process – restocking and stock enhancement – although they also recognized the difficulties of doing so. Examples of success include scallop stock enhancement in Hokkaido, Japan, and giant clam restocking in the Philippines.

4.4 Economic maximization

The over-exploitation of fisheries resources is often associated with significant economic losses. When the World Bank and FAO (2009) calculated the current state of fisheries from an economic perspective, FAO reported that "economic losses in marine fisheries resulting from poor management, inefficiencies, and overfishing add up to a staggering US$50 billion per year ... Taken over the last three decades, these losses total over $US2 trillion, a figure roughly equivalent to the GDP of Italy."

The focus of economic approaches calls for the maximization of economic yield (MEY) and the reduction of these losses. MEY – the value of the largest positive difference between total revenues and total costs of fishing – generally requires less fishing effort than what is required to achieve maximum sustainable yield (MSY). Many fisheries managers hope that some of this economic return may be captured by wider society as a resource rent that will provide a return from giving fishers the opportunity to profit from the nation's fishery. Economic approaches often include some of the technical measures discussed above and the use of rights which are outlined below.

BOX 5:

An economic approach in practice

The Partnership for African Fisheries (PAF), operated under the auspices of the African Union, is currently piloting an approach to the economic rationalization of the fisheries of Africa through wealth-based fisheries management (WBFM). This will inform fisheries policy across the continent.

Source: DFID, 2012

Resource rents can be captured, for example, through charging for the right to fish, either directly on landed catch or by selling licenses for access or selling quota access.

One approach to fisheries management which emphasizes the potential economic returns is referred to as wealth-based fisheries management (WBFM). WBFM calls for using the allocation of fishing rights to capture the wealth that is currently being dissipated through poor management practices (Cunningham *et al.*, 2009). While this has occurred in, for example, Norway, Iceland and New Zealand, there are few examples in developing countries where small-scale, labor-intensive fisheries operate (see Box 5). A key problem is that this approach depends on the capacity of resource managers to assess how much fish catch is sustainable in a particular fishery and establish quotas based on that amount, which can be challenging in developing country fisheries that may lack such information and the capacity to collect it.

4.5 Rights-based approaches

In recognition of the adverse effects of the often open-access nature of fisheries, fisheries authorities have been developing a series of approaches to fisheries management that confer specific rights to some groups of fishers but exclude others. This is an increasing trend in fisheries and other natural resources (Pearse, 1992).

Rights-based management of fisheries, in its most basic form, refers to bundles of entitlements that confer both privileges and responsibilities. For example, since the 1980s, countries have established Exclusive Economic Zones (EEZs) through which they claim exclusive rights up to 200 nautical miles from baselines. Such rights-based approaches are evolving to address more complex issues, and discussions referring to "rights-based management" or "rights-based approaches" are now expanded to include human rights (Charles, 2008; FAO, 2010; Charles, 2011) to reach, for example, adequate livelihood and poverty-reduction criteria (Willmann, 2010).

Rights are an emotive issue that is much misunderstood. A "right" can be thought of as an entitlement assured by custom, law or property, and defined by legal, social or ethical principles. Some rights have been described as universal, natural, permanent and inalienable while others are thought to be more culturally specific or limited to specific groups. Rights may be defined by international or national law or custom, and may be changed or removed by society. Rights generally involve two parties: those that hold the right and those that have responsibility to uphold the right. The effectiveness of the right is in large part dependent on each party fulfilling its role (Donnelly, 2003). Rights in fisheries have tended to refer to a legally defined ability to do or to own something, e.g. to catch a quota of fish, to access an area of water or to harvest a certain species.

Pomeroy (1994) noted that rights and rules, or incentives and sanctions are essential for the effective operation of any fisheries management system. Rights to harvest resources have taken a number of forms that include licenses, individual transferrable quotas (ITQs), and territorial use rights in fisheries (TURFs). In most cases, fisheries rights also have associated responsibilities that need to be adhered to, as reflected in the *Code of Conduct for Responsible Fisheries* (Charles, 2011). Informal rights are being recognized more and more, and are being converted into formal rights in developing fisheries especially in co-management systems. These informal property or use rights, which have tended to be based around community ownership of resources, are becoming more formally recognized. The draft *International Guidelines for Securing Sustainable Small-Scale Fisheries* (GSSF) currently being prepared by FAO (FAO, 2012b, 7) recognizes that "[r]ights and responsibilities should be bestowed on small-scale fishing communities to restore, protect and manage local aquatic and coastal ecosystems on which they depend for their wellbeing and that they have used traditionally for their livelihoods."

For example, individual transferrable quotas (ITQs), used in a number of developed fisheries across the globe, receive much attention in the literature. They can be seen as part of a rights-based approach where the right to a certain part of a total allowable catch (TAC) is transferrable and tradable. They are based on a TAC being established for a fishery and the quotas within the TAC limits being allocated to individuals, vessels or groups. Key questions around the specific design of ITQs include i) method of allocation and charges for a accessing a quota, ii) length of time of ownership of the quota, iii) its transferability between users, iv) divisibility of quotas, v) the ability to assess the TAC and vi) enforcement.

4.6 Ecosystem-based management

Ecosystem approaches to fisheries (EAFs) represent a move away from management systems that focus only on the sustainable harvest of target species or the management of fishers' behaviors, to a system that also considers the major components of the ecosystem and the social and economic benefits that can be derived from them (FAO, 2012a). EAFs also follow the direction established by the 1993 Convention on Biological Diversity and can be seen as an attempt to reverse the divergence of two management goals that call for i) conserving the structure, diversity and function of ecosystems and ii) satisfying societal and human needs for food and economic benefits (Zhou *et al.*, 2010). But it also recognizes the wider importance of ecosystems services and the long-term benefits of their continuation.

FAO's EAF, adopted by FAO's Committee on Fisheries (COFI) in 2003 as the most appropriate management framework, was explicitly indicated as the target framework by the World Summit of Sustainable Development (WSSD, 2002). FAO (2008) suggested that ecosystem approaches to fisheries management should be implemented with the following features:

- adopting participatory approaches at all levels of the planning and implementation steps
- ensuring that all key components of the fishery system are considered (including those related to the ecological, social, economic and governance dimensions) and also take account of external drivers such as climate change

- encouraging the use of the best available knowledge – both scientific and traditional – in decision-making
- promoting the adoption of adaptive management systems
- building on existing institutions and practices.

FAO promotes EAF as the most recent stage in a process of fisheries management which includes the *Code of Conduct for Responsible Fisheries* and guidelines for EAF's implementation developed in 2003. EAF is recognized as an important guiding principle in FAO's *Guidelines for Small-Scale Fisheries* (FAO, 2012b). To date, the most extensive applications of the EAF have been in developed countries such as Norway, Australia and the EU.

Although the concept of the EAF may seem relatively straightforward, its implementation may require the involvement of a large number of stakeholder groups, particularly if the implementation is across sectors. This implies a need to find improved ways of defining and sharing responsibilities. The importance of stakeholder participation in EAF has implications for the type of governance arrangements required to implement that approach (FAO, 2008). As regards existing fisheries management procedures, FAO recommends supporting current management systems, enabling them to evolve and adapt in order to become EAF compliant. In many ways, the ecosystem approach is designed to address the complexity of fisheries management, especially with respect to small-scale fisheries (Mahon *et al.*, 2008). In order to understand this complexity, Hall and Mainprize (2004) suggest the need for ecosystem performance measures and reference points for a diversity of metrics to provide an overall picture of the ecosystem.

BOX 6:

Ecosystem-based adaptation (EbA) in the Philippines

In the Philippines, Conservation International (CI) is targeting the Verde Island Passage marine corridor, specifically its coastal ecosystem where 830,000 people live and depend on its marine resources for livelihoods including fishing, aquaculture and tourism.

With increasing population, pressures such as overfishing, clearing of mangroves for aquaculture, development and logging will result in erosion and degradation of the natural coast. The vulnerability assessment for this region, completed in 2009, resulted in a series of recommendations. Based on this, CI is working with partners to implement two initiatives: to enhance coastal protection and strengthen fisheries resilience. Key actions include mangrove reforestation, training local communities and government in EbA coastal management techniques, application of best fishing practices and technologies, and income diversification strategies.

Source: Conservation International, 2011

Integrated coastal management (ICM), which aims to bring together a wide diversity of sectors, interests and groups in a large area, is one management approach that complements the wider approach of EAF. Likewise, marine protected areas (MPAs) can play an important role in EAF.

The concept of ecosystem-based approaches is now being extended to address a much wider set of issues where fisheries management concerns are embedded in the local economic, social and environmental situations and designed not only to improve existing resource use but to address future issues such as climate change. Conservation International (2011) describes its approach as ecosystem-based adaptation (EbA), "which capitalizes on the ability of natural systems to

assist in human adaptation to climate change." CI defines EbA as "the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change" (see Box 6).

The interpretation of ecosystem approaches is also becoming increasingly sophisticated – with more attention given to the interlinkages among different ecosystems, with more recognition of marine and coastal management in terms of "from the deep-sea to the ridgeline", and with more recognition of the ways ecosystems interact with each other (Silvestri and Kershaw, eds., 2010). The added complexities of these "expanded" ecosystem approaches clearly has important implications for the decision-making processes, policies and institutional structures required to support them.

4.7 Co-management

Co-management systems are becoming popular in many parts of the world and are demonstrating considerable levels of success (see Box 7).

The greater involvement of fishers in the management decisions of fisheries not only builds on traditional systems of resource management in many parts of the world, it reflects both an increased awareness of the need to empower and engage fishers in the management process, and a recognition that it is potentially less expensive than trying to manage from the center (Alpízar, 2006). Berkes (2008) discussed the opportunities and challenges of using indigenous and community conserved areas (ICCAs) for conservation practice, noting that they have a role to play in ensuring that conventional conservation approaches become more inclusive and pluralistic.

In its simplest form, co-management can be described as fisheries management where roles and responsibilities are shared between the government and the users (Pomeroy, 1994; Sen and Raakjaer Nielsen, 1996). Sen and Raakjaer Nielsen (1996) differentiated this from community-based resource management (CBRM) because with co-management, government is also involved in the decision-making process concerning the management of the fishery. Abdullah *et al.* (1998, 106) found that "co-management is a middle course between pure state property and pure communal property regimes," while Guttiérrez e*t al.* (2011) referred to co-management as community-based co-management where fishers and managers work together to improve the regulatory process.

In many respects, co-management and community-based management are separated by the degree of government involvement and community centricity (Alpízar, 2006). However, in the wider context of Exclusive Economic Zones (EEZ), markets, infrastruc-

BOX 7:

Co-management in inland water bodies in Bangladesh

During a ten-year period, the Bangladesh Department of Fisheries, in partnership with the WorldFish Center and 11 NGOs, established community control over 116 water bodies. Over 130 poverty-based community-based organizations (CBOs) were involved in the management of these water bodies.

In return for the right to operate these fisheries, the CBOs had to embrace the principles of sustainable fisheries management.

Source: Dickson, www.worldfishcenter.org

ture, safety and rescue, and the associated policy and legislative environment in which fisheries exists, it is difficult to conceive of any fishery which is not co-managed. Abdullah *et al* (1998, 106) noted that "[s]trictly speaking, pure communal property systems and community-based coastal resource management (CBCRM) are always embedded in state property systems and derive their strength from them."

Sen and Raakjaer Nielsen (1996) provide a useful classification within the broader scope of co-management as follows:[3]

- **INSTRUCTIVE:** where there is only minimal exchange of information between government and users (e.g. co-management arrangements in inland fisheries in Bangladesh)
- **CONSULTATIVE:** where mechanisms exist for government to consult with users but all decisions are made by the government (e.g. the fisheries committees established on Lake Malombe in Malawi and the bay management council in San Miguel Bay in the Philippines)
- **COOPERATIVE:** where government and users cooperate as equal partners in decision-making (e.g. customary rights areas in Fiji)
- **ADVISORY:** where users advise government of decisions to be taken and government endorses these decisions
- **INFORMATIVE:** where government has delegated authority to make decisions to user groups who are responsible for informing government of these decisions (e.g. the mechanized seine fishery in Inhassoro, Mozambique).

While co-management covers a broad spectrum of relationships between government and users, others such as environmental advocacy groups and scientists may also feel they have a role to play in the process. The level of participation by non-state actors can often reflect the cultural or political preferences of the country concerned (Sen and Raakjaer Nielsen, 1996).

Co-management, in addition to being regarded as a management approach on its own, is also key to other approaches, such as integrated area management, ecosystem-based management, protected area management and adaptive management (Evans *et al.*, 2011a).

The developing focus on co-management in fisheries is, in part, a response to the failure of other, more top-down forms of management. But, as Wamukota *et al.* (2012) noted, there has also been considerable debate about whether co-management has provided the expected benefits. There seems to be widespread agreement that co-management has a growing role to play in fisheries management globally, especially in small-scale tropical coastal fisheries. However, the evidence to support this still remains elusive, largely because of the complexity of the processes involved and the long-time frames often required to see clearly distinguishable impacts. Evans *et al.* (2011a, 1938), carried out a meta-analysis of 29 case studies in 90 sites, noting that "overall fisheries co-management delivers benefits to end-users through improvements in key process and outcome indicators. However, the dataset as a whole is constituted primarily of data from the Philippines. When we exclude this body of work, few generalizations can be made about the impact of fisheries co-management."

[3] The examples given were from a sample of 22 case studies on fisheries co-management.

5

Impacts

The success of different fisheries management systems can be measured in terms of their impact. This section discusses impacts, how they might be measured and what has been achieved through fisheries management.

Impact has two sides. One concerns the achievement of the objectives established in the management regime, the second defines the actual, objectively measurable impacts of the management regime on the resource, environment and people's lives, i.e. the intended versus the actual. The impacts identified in the literature are often selective and may be biased towards social, ecological or economic perspectives (Bennett, 2005b) or even biased to demonstrate effectiveness selectively (Wamukota *et al.*, 2012). Even when one of these biases is adopted, it may have bias within it, e.g. the type of sociological indicators selected may be those of the researcher rather than those of the people who are impacted. This needs to be kept in mind when assessing impact. In the Philippines, for instance, community-based coastal resource manage-

BOX 8:

Assessing community perceptions of impact in Cambodia

In Cambodia, the decision to introduce community-based fisheries management was a political one. The government had its perceptions of what it wanted to achieve in terms of improving people's livelihoods but it also wanted to see what perceptions the communities had.

It adopted a process of participatory impact assessment to evaluate policy effectiveness. Different stakeholders were asked to identify the impact on their livelihoods and to score them. Initially, the policy reforms generated improvements in poverty reduction, reduced fishing costs, improved income and improved food security, but these started to decline over time as they encouraged more people to join the fishery. They also created opportunities for small-scale processors and for small-scale farmers who were better able to access flooded land.

Source: CFDO and IMM, 2004

ment (CBCRM) programs are effective in engaging local communities but resource users are skeptical about the impact on their livelihoods (Maliao *et al.*, 2009). Evans *et al.* (2011a) also noted that different studies tend to measure different indicators and include biases towards favorable places, or they focus on successful projects or projects that are currently being supported, which is likely to produce more favorable results.

There can often be confusion around impact because of who decides the criteria used to assess it. Researchers or managers views of what should, could or has occurred may be very different from those of the community, and different stakeholder groups in the community may also have quite different perceptions from each other. Participatory approaches to policy reform impact assessment can often reveal interesting aspects of impact (see Box 8).

According to Hanna (1996), there are three main means of assessing the effectiveness of co-management:

- **SUSTAINABILITY:** in the form of stewardship (the maintenance of productivity and ecological characteristics) and resilience (the ability to withstand changes and shocks)
- **EFFICIENCY:** the cost effectiveness of the arrangement (transaction costs or net returns)
- **EQUITY:** this is divided into representation (of users), process clarity (transparency and accountability), homogenous expectations (similarity of user expectations) and distributive effects (equitable distribution of benefit flows).

Wamukota *et al.* (2012) complemented this by indicating that co-management success can be measured through social dimensions, the condition of the resources and aspects of wider ecology. In regard to community-based fisheries management (CBFM), Kuemlangan (2004) noted the importance of balancing the livelihoods of fisheries with improving fish resource conservation or management. Weeratunge *et al.* (2013) pointed out that human wellbeing can be measured in a number of different ways but, in relation to fisheries, this is not a well-developed area of research. They also noted that fishers' perceptions of wellbeing changes over time, which needs to be accommodated in any wellbeing analysis.

Assessing the delivery of impact is often confused by a lack of clarity around the aims of the intervention. Many programs have confused policy objectives that interact, are internally inconsistent (Bellamy *et al.*, 2001), are unrealistic or are incapable of objective measurement. Few seem to recognize trade-offs or a need to prioritize. In part, the ability to measure impact is time dependent, with some impacts taking many years to become apparent. In other situations, the theory of change itself may be changed over time to reflect changing political aims, and the focus of implementation may shift while the impacts being evaluated may remain unchanged (Bellamy *et al.*, 2001).

Co-management impacts seem to have been studied more than most. Sen and Nielsen (1996) noted that in most of the co-management cases they studied, the rationale for introducing co-management was that the fishery was reaching a point of over-

exploitation or was already over-exploited, making it a form of crisis management. Although it was mostly not possible to assess the outcomes in terms of sustainability, equity and efficiency, in most cases representation was increased and process clarity was improved. Guttiérrez *et al.* (2011) noted that the advantages of co-management include an enhanced sense of ownership which encourages responsible fishing, greater sensitivity to local socio-economic and ecological restraints, improved management through use of local knowledge, collective ownership by users in decision-making, increased compliance with regulations through peer pressure, and better monitoring, control and surveillance by fishers.

However, what is rather disappointing is the general lack of strong evidence about the impact of fisheries on people's livelihoods and sense of inclusion. Evans *et al.* (2011a) noted the scarcity of impact assessment data on fisheries co-management in developing countries. Hilborn (2007a, 272) also found that there has been "very little systematic attempt to evaluate the success and failures of individual fisheries." Roe et al (2009, x) found that a "major deficiency of formal CBNRM projects is the absence or paucity of quantitative and/or qualitative data on the social, economic and environmental impacts," and Hilborn (2007) also noted that there are no systematic evaluations of the ecological impact of fisheries.

In reviewing the evidence for the success of fisheries management, Sutinen (2010, 97) concluded that: "Although there are several bright spots for some marine fishery resources (marginal improvements in stock status, growing use of rights-based management, capacity reduction programs, to name a few), the evidence overall leads me to conclude that our marine resource management institutions have failed to conserve resources and improve the economic health of coastal communities."

Although there are few examples of really successful management in developing country coastal fisheries, much still can be learned from the existing operations of fisheries management that may inform a better way of doing things. These critical success factors are outlined in the next section.

6

Critical factors that influence success

This section of the report presents evidence from the literature, cross-referenced with key informants, as to factors that have been key in making fisheries management work.

In spite of the paucity of evidence on the impact of fisheries management systems and approaches, there is some evidence about which factors influence success in particular fisheries in particular locations at a particular time.

This section starts with a brief introduction of some of the efforts undertaken by specialists in the fields of fisheries and natural resources management to encapsulate frameworks of success factors. It then looks at these factors in more detail under three headings: i) factors affecting policy and planning, ii) factors affecting technical implementation and iii) factors affecting community engagement. The critical factors are those which fisheries experts and practitioners perceive to have influenced the extent to which a fisheries management approach has had direct influence over planned or perceived impact. As our concern here is to achieve an understanding of the balance between social and ecological impacts, the critical success factors are reviewed in terms of both social and ecological impacts.

This analysis does not give a concrete solution to management problems but indicates the trends in thinking and practice towards more successful ways of implementing management. As Hilborn (2007, 300) noted, "there is no single prescription for moving currently unsustainable fisheries towards sustainability. The appropriate method will depend greatly on local circumstances." Arthur (2005, 4) concluded in an 11-year study of fisheries management, funded by the UK government's Department for International Development (DFID), "[w]hile a diversity of circumstances and needs suggests there is no single or 'optimum' co-management arrangement for any region, nation or local situation there are some features common to all and common lessons that can be drawn from the study of different arrangements."

In spite of these concerns for the specificity of success, some researchers have developed design principles or generalized criteria. Some are outlined below with the components discussed in more detail in later sections.

6.1 Some frameworks of success factors

Ostrom (2009b) identified the following design principles for the management of common-pool resources management that were sustained over a long period of time and absent from fsystems:

- **USER BOUNDARIES:** clear and locally understood boundaries between legitimate users and nonusers are present
- **RESOURCE BOUNDARIES:** clear boundaries that separate a specific common-pool resource from a larger socio-ecological system are present
- **CONGRUENCE WITH LOCAL CONDITIONS:** appropriation and provision rules are congruent with local social and environmental conditions
- **APPROPRIATION AND PROVISION:** appropriation rules are congruent with provision rules: the distribution of costs is proportional to the distribution of benefits
- **COLLECTIVE-CHOICE ARRANGEMENTS:** most individuals affected by a resource regime are authorized to participate in making and modifying its rules
- **MONITORING USERS:** individuals who are accountable to or are the users monitor the appropriation and provision levels of the users
- **MONITORING THE RESOURCE:** individuals who are accountable to or are the users monitor the condition of the resource
- **GRADUATED SANCTIONS:** sanctions for rule violations start very low but become stronger if a user repeatedly violates a rule
- **CONFLICT-RESOLUTION MECHANISMS:** rapid, low-cost, local arenas exist for resolving conflicts among users or with officials
- **MINIMAL RECOGNITION OF RIGHTS:** the rights of local users to make their own rules are recognized by the government
- **NESTED ENTERPRISES:** when a common-pool resource is closely connected to a larger social-ecological system, governance activities are organized in multiple nested layers.

BOX 9:

Design principes for the Peruvian anchovy fishery

A study of the Peruvian anchovy fisheries assessed the applicability of Ostrom's eight "design principles" of long-lasting common pool resources management regimes. Ostrom (1990) confirmed these could serve as a valuable tool for analysis and understanding of large-scale common pool resource systems:

1. early defined boundaries defining who has rights to withdraw resources and the boundaries of the common resource
2. congruence between appropriation (restricting time, place, technology, etc.) and provision rules (requiring labor, material, and money) and local conditions
3. collective-choice arrangements
4. monitoring of conditions and behavior
5. graduated sanctions depending on the seriousness of an offense
6. conflict-resolution mechanisms
7. minimal recognition by government authorities of rights of appropriators to organize
8. nested enterprises with monitoring, enforcement and governance activities organized in multiple levels for CPRs that are part of larger systems.

Source: Arias Schreiber and Halliday, 2013

Refined versions of these have been tested in the field and demonstrated their value, as shown in Box 9.

Similar sorts of criteria that support positive management experiences have been identified by other researchers. The following highlights the findings of Leal (2010), Berkes *et al.* (2001), Francis and Bryceson (2001) and Bennett (2005b).

Community management of quotas

Leal (2010) suggested that, to be effective, the communities require:

- legally backed quota rights
- sufficient common interest to make negotiations feasible
- clear awareness among fishers that collective management will generate benefits for both fishers and non-fishers
- an acceptable system for disposal of rights should the collective arrangement close
- an effective system for deterring violations with sanctions
- clear signals that such arrangements will not be overturned by higher levels of government.

Fisheries management in San Salvador

Berkes *et al*. (2001) determined that success was due to a number of factors including:

- the resource stakeholders' participation and sense of ownership in project planning and implementation
- clarity of objectives
- supportive leadership
- the partnership between fishers and government
- specification and legitimacy of user rights enforcement
- capability building
- tangible benefits such as redefined resource access, a shift to non-destructive fishing methods, improved enforcement, and observable biological, economic and social changes.

Sustainable use of coastal and marine resources in Tanzania

Francis and Bryceson (2001, 76) identified general lessons learned and key factors, including:

- dialogue and linkage between traditional and scientific knowledge systems
- mechanisms for interaction between scientists, managers and decision-makers
- continued human and technical capacity building of research institutions
- essentiality of addressing land and sea tenure and common property rights
- genuine involvement and empowerment of local communities and civil society including community-based organizations (CBOs), and local non-governmental organizations (NGOs)
- credible and equitable arrangements for benefit-sharing with communities
- open availability of information for overall transparency and accountability
- integration of socio-economic opportunities into conservation programs
- recognition of and respect for local and traditional institutions
- openness in collaboration between traditional and government institutions
- strengthening of relevant institutions providing entry to decision-making
- management agreements between institutions for cross-sectoral coordination

- long-term and broad-based visions in policy thinking
- democratic process of public involvement in policy-making and implementation.

Measures which achieved their objectives

Bennett (2005b) collated a number of drivers from a 1997 Organisation of Economic Cooperation and Development (OECD) study on measures which achieved their fisheries objectives. These were found to be:

- use rights
- co-management
- compliance and enforcement
- biology and luck
- policy frameworks
- pro-active industry
- stakeholder participation
- multi-sectoral approaches.

Bennett noted that few if any of these factors are able to contribute to success on their own but need to be applied in association with others.

As can be seen from these examples, the factors which support positive management experiences are likely to be numerous, and operating over several scales. For example, Wamukota *et al.* (2012) found that "[t]he full list of contextual conditions thought to influence the success of common-pool resource management is large (>30)." But having systematically reviewed 38 papers of 49 co-management projects related to reefs, they concluded that few studies presented results that covered the full range of social-ecological success criteria and that reporting selectivity was likely to have been high.

Success factors appear to operate at different levels and here we have reviewed them at three levels:

- factors affecting policy and planning
- factors affecting technical implementation
- factors affecting community engagement.

However, we have noted that while this helps split the number of factors into operational levels, some operate at multiple levels – and the linkages between these levels are as important as the levels themselves.

6.2 Factors affecting policy and planning

Factors affecting policy and planning are broadly those that act globally, regionally and nationally. This includes relating fisheries management to the complexity of the management situation and conflicting aims, recognizing the importance of context, operating at different scales and levels, ensuring institutional coherence, ensuring ecosystem viability and adapting to external change.

Embracing complexity and integration

Fisheries management is, as mentioned above, a complex process. Efforts to simplify that process tend to result in simplistic solutions. Increasingly, there is a focus on embracing complexity and integrating management across sectors.

Coastal areas are, by their nature, complex. They support a diversity of species, ecosystems and stakeholders in a dynamic environment where the land-water interface generates constant change. The very nature of social and ecological approaches to natural resources management means dealing with the complexity of bringing together factors that relate to the environment, society, the economy, politics and culture. This complexity can often mean that problems have no right or wrong answer (see Box 10). But as Link (2010) noted, the potential for fisheries management to become so complex that it becomes unmanageable should be avoided by getting the balance right.

BOX 10:

Wicked problems of fisheries management

There is increasing study of the "wicked" nature of some of the problems that face fisheries and coastal governance. "Wicked" problems are those that are difficult to define and delineate from bigger problems and tend not to be resolved easily. Essentially they have no right or wrong answer that can be scientifically determined. This can place limits to how rational and effective fisheries and coastal governance can possibly be.

Source: Jentoft and Chuenpagdee, 2009

In the past, fisheries management tended to represent the issues involved in coastal fisheries management in a simplified form. The use of single species models from temperate waters, for example, has been transferred to multi-species fisheries operating in ecologically diverse ecosystems. While this has generated much knowledge of the stocks, it also has many limitations (Link, 2010). Models based on fisheries with fewer larger vessels landing into fewer ports with good infrastructure and monitoring facilities do not always transfer well to fisheries with many small craft landing into dispersed sites with limited monitoring.

A key factor of success is bringing these different elements together in ways that integrate them as a working whole. Acknowledging and dealing with the holistic nature of the coast is an important starting point for understanding how to bring other factors into a management approach. As Link (2010, 3335 of Kindle edition) noted, "without a place, process, or some such mechanism to sort out the social, economic, biological, ecological, and cultural tradeoffs, we will remain mired in the same difficulties we have faced for centuries."

Pomeroy (1994) noted that the delay in developing community-based management in fisheries, compared with other natural resource systems is due, in part, to the complexity of coastal and marine resource systems, the social and cultural structure of fishing communities, and the independent nature of fishers.

Addressing the issue of scale in commons management, Berkes (2006) noted that it may be more useful to think in terms of managing complexity rather than simply trying to "scale up". This involves thinking of management of the commons as the management of complex systems, and recognizing that communities are themselves complex systems embedded within a larger complex system of politics and economics. Ostrom (2009a, 421) identified a number of variables that need to be considered in analyzing socio-ecological systems. Shown in Box 11, these demonstrate how complex it can be to understand and to monitor such systems.

Understanding the processes that lead to improvements in, or deterioration of, natural resources is limited because scientific disciplines use different concepts

and languages to describe and explain complex social-ecological systems (Ostrom, 2009a). The current debate on fisheries and marine biodiversity has polarized to an extent around three key areas: i) economic rationalization, ii) marine conservation and iii) distributional/equity issues. Each of these areas has emerged from specific disciplines, each of which operates within a specific discourse, i.e. a shared way of apprehending the world which constructs meaning and relationships, creates and uses its own language, validates knowledge in its own way, helps to define common sense and legitimate knowledge, and builds assumptions, judgments and contentions that provide the basis for analysis and debate (Dryzek, 2005).

Such discourses tend to separate, confuse and isolate parts of the debate from other parts, which then tend towards reductionism in the solutions they provide and to heightened disagreement between different discourses. Bromley (2009) noted that even within fisheries economics, confused concepts result in incoherent models of fisheries management.

Compartmentalization of the fisheries/biodiversity debate around the three key areas mentioned above has often been characterized by oversimplified solutions to fisheries problems such as the use of individual transferrable quotas, marine protected areas and community-based management (Degnbol *et al.*, 2006). This has been compounded by the evolution of these discourses away from each other (Belsky, 2000). Ostrom (2009a) noted that, without a common framework to organize findings, isolated knowledge does not cumulate.

Armitage *et al.* (2012) found that there are thresholds where existing systems are no longer valid, e.g. where coastal fisheries have reached a level of resource decline that produces profound effects on the system as a whole. This suggests that systems, whatever form they take, should be sufficiently flexible and adaptable to embrace change and respond to it. One approach to this calls for utilizing multi-level arrangements where different levels of management or governance have different roles and responsibilities, and are linked through coordinating institutions (Ostrom, 2009b). The devolution of roles and responsibilities may be the necessary course of action, in part to address capacity issues within government, but such transfers also have the effect of redistributing power, which may be difficult for government to deal with (Mahon *et al.*, 2008).

The multi-species nature of fisheries, especially in high biodiversity areas such as coral reefs, can make management particularly difficult. The potential number of interactions of different species and ecosystems in any given fishery can be extremely high, which manifests itself in many different fisheries (Link, 2010). For instance, the multispecies nature of the fishery along India's Andhra Pradesh coast constrains management measures (Salagrama, 2005). Studies of coastal fisheries and other natural resource systems suggest that success depends upon matching rules to the local resource context and attributes (Ostrom, 2009a).

In research on coastal resource management (CRM) in the Philippines, Fabinyi *et al.* (2010) demonstrated that various aspects of social complexity also have significant implications for the outcomes. By highlighting social complexity, they demonstrated how the planning, implementation and impacts of CRM have different effects for

BOX 11:

Examples of variables in a framework for analysing social-ecological systems

Social, economic and political settingss (S)
S1 Economic development,. S2 Demogaphic trends. S3 Political stability.
S4 Government resource polices. S5 Market incentives. S6 Media organization.

Resource systems (RS)
RS1 Sector (e.g., water, forests, pasture, fish)
RS2 Clarity of system boundaries
RS3 Size of resource system*
RS4 Human-constructed facilities
RS5 Productivity of system*
RS6 Equilibrium properties
RS7 Predictabaility of system dynamics*
RS8 Storage characteristics
RS9 Location

Resource units (RU)
RU1 Resource unit mobility*
RU2 Growth or replacement rate
RU3 Interaction among resource units
RU4 Economic value
RU5 Number of units
RU6 Distincitve markings
RU7 Spatial and temporal distribution

Governance systems
G51 Government organizations
GS2 Nongovernment organizations
GS3 Network structure
GS4 Property-rights systmes
GS5 Operational rules*
GS6 Collective-choice rules*
GS7 Constitutional rules
GS8 Monitoring and sanctioning processes

Users (U)
U1 Number of users*
U2 Socioeconomic attributes of users
U3 History of use
U4 Location
U5 Leadership/entrepreneurship*
U6 Norms/social capital*
U7 Knowledge of SES/mental models*
U8 Importance of resource *
U9 Technology uses

Interactions (1) outcomes (O)

I1 Harvesting levels of diverse users
I2 Information sharing among users
I3 Deliberation processes
I4 Conflicts among users
I5 Investment activites
I6 Lobbying activites
I7 Self-organizing activities
I8 Netowrking activities

01 Social performance measures (e.g., efficiency, equity, accountability, sustainability)
02 Ecological performance measures (e.g., overharvested, resilience, bio-diversity, sustainability)
03 Externalities to other SES

Related ecosystems (ECO)
ECO1 Climate patterms. ECO2 Pollution patterns. ECO3 Flows into and out of focal SES.

*Subset of variables found to be associated with self-organization.

Source: Ostrom, 2009a

different groups of people. The complexity of the socio-cultural systems that make up the way people and ecosystems interact means moving away from simplistic generalizations about the coast and embracing complexity (Mahon et al, 2008; Ostrom, 2009a; Campbell and Townsley, 2013). Understanding and using behavior patterns that emerge from complexity might suggest that management measures focus more on developing participation, building trust, gaining commitment to change, internalizing the political economy, enhancing communication and fostering common interdisciplinary discourses rather than focusing on specific technical measures (Campbell and Townsley, 2013).

There is also a growing realization that complex situations, such as those that characterize coastal fisheries, will often generate forms of feedback, learning processes and non-linear relationships that are not always predictable. These are becoming more difficult to predict due to external factors that affect the fishery – such as climate change, natural hazards, global fuel and food prices – becoming more common and influencing fisheries and coastal livelihoods (Campbell and Townsley, 2013). However, attempts to break down these complex relationships at sectoral and sub-sectoral levels fail to recognize the interconnectedness of the social, economic and ecological systems in which fisheries operate (Campbell and Townsley, 2013). Ferrol-Schulte *et al.* (2013) called for a more holistic approach to understanding coastal livelihoods in order to manage coastal and marine social-ecological systems more effectively.

There is increasing realization that fisheries are, in fact, complex social-ecological systems that are capable of adaptation as management systems alter conditions (McConney and Charles, 2008). Mahon *et al.* (2008, 110) proposed "an approach that emphasizes enabling self organization and adaptive capacity through empowerment, learning, and response systems and promoting positive, equitable, transparent interaction among stakeholders" as a foundation for governing fishery systems. In reviewing a number of papers concerned with this complexity, Armitage *et al.* (2009, 95) determined that "[e]fforts to resolve multi-scale environment-society dilemmas require innovative governance approaches."

Some of these innovative approaches are starting to emerge, but there is still much to be done in this area. In the main, there has been a tendency to implement fisheries management processes in isolation from wider coastal activities and from the planning and management actions in other sectors (Copes and Charles, 2004). In the future, fisheries management will have to take into account a much wider set of social and economic variables and address inter-generational issues (Copes and Charles, 2004). This has started to emerge as a way forward in some areas. In the Philippines, there has been some success in integrating fisheries into a wider process of integrated coastal management. In fact, integrated coastal management (ICM) is now replacing the narrow focus of fisheries management and narrowly based habitat management and moving more towards ecosystem-based management which emphasizes the need for integration and collaboration (White *et al.*, 2006). The potential of ICM to address coastal complexity through breaking down institutional barriers is gaining support and is starting to show positive effects (Christie and White, 2006). But the complexity of such approaches requires that they be developed over time through correspondingly complex systems of consultation and institution building.

Addressing conflicting aims

Fisheries management tries to address social, economic, environmental and political aims, but these often conflict with each other (Cochrane, 2002). Deciding how to trade-off between different aims is not an objective process but is ultimately a political one of negotiation. This section looks at these conflicting aims and discusses the importance of responding to them.

A fishery is a complex system that links individual human endeavor, enterprise, risk, culture, the physical world, technology, the natural world, the political economy, and wider society's beliefs, aspirations and values. Different people's perceptions of reality and their ideals can influence the aims that are chosen for different interventions. For example, wilderness science uses two points on a spectrum when approaching management: i) the pristine wilderness devoid of humans, and ii) humanized landscapes and manipulated ecosystems (Belsky, 2000). Different fisheries ecosystems lie within this spectrum but different aims place different fisheries at different points along it.

Even within a given fishery, the aims of different people engaged in the sector are often confusing. These aims may be numerous, often conflicting or requiring trade-offs, and quite often are being under-achieved. In some situations, the conflicts are clearly defined as noted by Salagama (2005), who identified the need to balance management efforts with providing livelihoods and foreign exchange earnings as one of the constraints to effective management in Andhra Pradesh, India. In other cases, the conflicts are more complex, as noted by Sugiyama *et al.* (2004, 49) who determined "[a] key factor to turn around the current trends (in fisheries in Asia and the Pacific) would be for States to resolve the competing policy imperatives of:

- optimal and sustainable use of fish resources and their supporting ecosystems;
- economic objectives, especially in relation to either small- or large-scale fisheries;
- social objectives, including maximizing employment and improving livelihoods;
- objectives related to equity, including access for only small-scale fisheries; and
- any other objectives (for example trade liberalization, market access etc.) which may have impacts on this sub-sector."

At any one time, the stated aims of fisheries management may be maximization of production, conservation of resources and ecosystems, maximization of economic benefits to the nation, food and nutrition security, foreign exchange generation, employment, poverty reduction, sustainable resource use or maximization of ecosystem service provision. There may also be many unstated aims, such as rent seeking by politicians or for powerful groups that might otherwise threaten political stability, or appeasement of some parts of the electorate, or trade-offs with other non-fisheries aims in other sectors.

Historically the main aim of fisheries was to increase production to satisfy growing demand from an expanding population. Many saw the sea as full of fish, a resource that could never be depleted (Roberts, 2007; Link, 2010). But technology and fishing effort have proved that to be incorrect, and many fisheries are now over-exploited, biodiversity has changed and ecosystems are damaged. The desire to harvest fish must now be balanced by a need to do so sustainably. There is also recognition that fisheries can play a significant role in the livelihoods of people, especially the poor, by

providing food, nutrition, employment and income. As such, the issue of equity in the benefits that flow from fisheries is also important.

In addition to fisheries management having conflicting aims, there also seems to be a significant divide around how those aims might be achieved. Hilborn (2007b) noted that ecologists strongly support marine protected areas (MPAs) as a central part of the solution whereas fisheries specialists support stopping the "race to fish" through a change of incentives to encourage sustainability and stock building. These two approaches need not be seen as two distinct ways of looking at the world. Claudet (2011) noted, for instance, that MPAs can have multiple objectives ranging from sustainable use and management of marine resources to socio-economic development. Likewise, Pomeroy (2003) recognized how co-management approaches can work well with MPAs.

In trying to make sense of the complexities of fisheries management and to break them down into their component parts, Hilborn (2007c) cast light on the motives and intended outcomes of different groups of stakeholders involved in the management process. He concluded that there are broadly four categories of fisheries objectives: biological, economic, social and political, each with specific concerns:

- **BIOLOGICAL OBJECTIVES:** concerned with maximizing production which translates in the traditional maximum sustainable yield (MSY)
- **ECONOMIC OBJECTIVES:** concerned with resource rent maximization through efficiency i.e. maximum economic yield (MEY)
- **SOCIAL OBJECTIVES:** concerned with distributional issues of employment, income, maintenance of communities and food security – or maximum job yield (MJY)
- **POLITICAL OBJECTIVES:** concerned primarily with the avoidance of conflict among the electorate and opposition from resource-users regarding management measures – or what he refers to as "minimum sustainable whinge" (MSW).[4]

This gives some idea of the complexity of objectives and even of the different ways that different groups have of looking at the fishery. It also gives some indication as to why there is so little agreement on targets for the achievement of management objectives – if the different groups are talking at cross-purposes about radically different priorities, they are unlikely to ever achieve a consensus on what is needed. Hilborn (2007c) suggested that the current fisheries crisis can be thought of largely as a conflict between these different objectives, and linked these possible policy objectives to different stakeholder groups in a way that clearly differentiates the groups from each other:

- large-scale fishers may want a greater focus on economic optimization or maximum production (depending on the management regime in place)
- small-scale fishers may prioritize stable, reliable yields
- fisheries managers operate within a highly politicized context
- politicians often react to policy by providing appeasement measures, such as subsidies, to reduce conflict
- government scientists tend to err on the side of caution and avoid deciding where they stand in favor of collecting more data
- environmental NGOs tend to focus on ecosystem and species health and the negative impacts of fishing, concerns which tend to conflict directly with those of production maximization and social inclusiveness.

[4] MSW is a term first used by Pope, J.G. in 1983.

In spite of the diversity of possible aims for fisheries management, Hilborn (2007b) found a seemingly broad agreement among the fisheries management community, the conservation world and even the resource users themselves that the future of fisheries lies with much less fishing, lower exploitation rates, larger fish stocks, reduced by-catch, increased concerns for ecosystems, less destructive fishing methods, more spatial management of fisheries and more areas protected from fishing. In reviews of schools of thought around fisheries management, he identified some areas of agreement, pointing out a broad consensus of the need to move towards lower exploitation rates and to remove subsidies that increase fishing effort. Key elements of the consensus included dedicated access, as well as: "quotas and allocation, fishing cooperatives that internally allocate, territorial fishing rights for communities, groups or individuals, and individual allocation of catch quotas" (Hilborn 2007b, 297).

The debate around the implementation of MPAs, as one form of fisheries management measure, illustrates the increasing recognition of the importance of negotiation in setting management objectives. Christie and White (2007, 1053) noted that "[u]nclear goals and inattention to social dynamics are almost certain to result in conflict that derails MPA implementation." Gaining the support of communities in the use of MPAs and other management measures is vital if fisheries and conservation aims are to be achieved. Integrated coastal management, if planned properly and with a sufficiently holistic perspective can provide a useful framework for bringing aims together. As Christie and White (2006, 191) noted, the ICM process "tries to break down the barriers erected by traditional sectoral management of natural resources as well as the divide that exists among local government, national agencies, community groups, and NGOs."

Diversity in the aims for fisheries management is a fact and needs to be acknowledged and reconciled if we are to move forwards successfully. Berkes *et al.* (2001) discussed in some detail how conflicts between objectives can be resolved but ultimately this requires agreement on a prioritization process.

Recognizing the importance of context

The level and form of complexity of fisheries and their management is not constant but varies between places. The importance of local context and how it affects fisheries management comes out clearly from many references. Recognizing the importance of the local context in fisheries management and adjusting management measures to accommodate that is very important.

The specific context in which fisheries management operates will have considerable influence on what works and what does not. In the wider context of wilderness management, it has been argued that there are no "right solutions" to management problems and that these should be examined in the context of particular places, peoples, issues and ecosystems (Belsky, 2000). Hilborn (2007b) acknowledged that different situations call for different solutions. The local biological, ecological, political economy and socio-economic aspects of a fishery often determine the success of management initiatives.

What works in developed countries will not necessarily work in developing countries. Guttiérrez *et al.* (2011) noted that countries with high and very high human development indices (HDIs) were more successful at fisheries management than those

with low to medium HDIs. Andrade and Rhodes (2012) found that although there is a positive correlation between gross domestic product (GDP) at purchasing power parity (PPP) per capita and compliance with regulations, this may well be due to other factors such as political will, corruption and social inequality. However they also found that population density was negatively correlated with compliance.

Hilborn (2007b, 301) noted that "[i]n countries without strong central management structures, decentralization and locally controlled dedicated access appears to be the best way to make the transition to biological and economic sustainability." In relation to community-based fisheries management (CBFM), Kuemlangan (2004) noted that above all, "the CBFM initiative or programme should be tailored in design and delivery to the individual country circumstances." Bell *et al.* (2006) determined that the success of stock enhancement of scallops in Japan could not be replicated in New Zealand, which may have been due to the existence or not of the other factors mentioned here.

While in many parts of the world there is a move towards greater engagement of communities in resource management, this is not always the case. In Costa Rica, when Alpízar (2006) compared the current level of government involvement in marine protection and fisheries management with that of the community, he concluded that, at that stage of development, the greater role should remain with government. Francis and Bryceson (2001) noted weaknesses in both government and traditional institutions in coastal management in Tanzania that needed support, while Baticados *et al.* (1998) found that even within the Philippines, fisheries cooperatives on the mainland had significant differences in their capacities compared with those on the islands.

This pattern of dependence on specific circumstances also seems to affect specific management measures. On the subject of individual transferrable quotas (ITQs), Robinson (2010, 53) noted "the first best, ITQs, is barely politically feasible anywhere. Even in the best possible circumstances, in rich, well-functioning democracies where the stakes are high, ITQs are highly controversial … If ITQs are not politically feasible in Norway, what chance have they of being adopted in Ghana or Sierra Leone? Very little would be my guess."

Rudd *et al.* (2003, 66) reported that complexity of tropical coastal fisheries "makes economically efficient policy tools such as individual transferable quotas impossible to implement …" This is likely due to a number of factors, such as the quality of the institutions in place in terms of their governance arrangements and management capacity, the adherence to the rule of law, the political economy, the financial and staff resources available, the number of vessels and the number of operating sites.

Operating at multiple scales

Fisheries management cannot be addressed in isolation from other factors that affect the fishery. Fisheries are, by the fluid and interconnected nature of the sea, part of a bigger whole which creates the social and ecological context in which fisheries management must operate. Attempts to externalize these wider influences from the fisheries management equation have tended to lead to rather simplistic and often failed management approaches.

These factors that influence fisheries also operate at multiple levels. In particular, fisheries fit inside a wider set of ecological processes that influence, and are influenced by, the fisheries. There are different scales and levels at which fisheries need to be considered (Jentoft and McCay, 1995; Raakjaer Nielsen and Vedsmand, 1995). In this case, "levels" refers to where decisions should be made and "scale" refers to the fisheries resource system and the management tasks to be undertaken (Sen and Raakjaer Nielsen, 1996). It is clear that when the ecological system is large, some decisions have to be made at the national or international levels, such as those that deal with transboundary issues or are designed to reflect wider national development policies. Likewise, the economic conditions that allow fisheries to function at the local level are also influenced by the wider national and regional economy (see Box 12). Understanding the need to work at these different scales and to identify the appropriate level for particular roles is important to understanding what works in fisheries and how it works. Legislation is generally a national role, trade may be controlled by an international body and the development of specific site regulations may be much more local. In some cases, roles are shared – policy and planning may be jointly developed, and monitoring and evaluation may be participatory.

BOX 12:

Linkages across scales of management

In Cambodia, the community management of fisheries is embedded in a wider process that links fisheries, through the provincial levels, into national development objectives through a Strategic Planning Framework for Fisheries 2010-2019. This Framework allows for decision-making to be devolved to different levels to incorporate local needs and aspirations while also ensuring coherence of objectives at national levels.

Source: Fisheries Administration, 2010

The movements of water, pollution, fish and predators across large areas, between locations and across adjacent or connected ecosystems can affect ecosystem function. Likewise, water circulation patterns, climate change effects and industrial fisheries can all affect small-scale fisheries over large areas and time frames. Where fisheries cover large geographical areas and different fish stocks, there may be need for higher level management functions than in the case of the management of a small area of reef. Arthur (2005) noted the importance of getting management of fisheries at the right scale for the size of the fishery concerned.

At the larger scales, there would appear to be greater room for generalizing the factors that create positive social, ecological and economic benefits. Berkes *et al.* (2000) start to address the generalizability issues in co-management at higher scales. However, the most appropriate scale to manage from an ecological perspective does not necessarily correspond to the most appropriate scale from social or economic perspectives (Roe *et al.*, 2009). This is likely to be particularly true in coastal fisheries where the fluid and interconnected nature of the sea invites a much wider perspective, such as a large marine ecosystem, whereas communities of resource users may be more isolated and different from each other.

The value of managing at multiple levels has become increasingly apparent. Armitage *et al.* (2012) noted that devolution of power to lower levels – closer to the level of resource users – works best when formal policy and regulatory support from the

state are provided. However, such devolution can generate the risk of elite capture of decision-making processes.

Wilson *et al.* (2006) also noted that complex scale issues are now resulting in combinations of institutions working at different scales to form cross-scale networks that can address greater complexity. While the more traditional view of fisheries management has been a more "command and control" approach, these have not tended to create the conservation outcomes that are desired because of the complexity and multi-scale reality of the management issues (Armitage *et al.*, 2012). In response, multi-level governance arrangements involving state and non-state actors are emerging. Multi-levels approaches are often needed to confer economies of scale on knowledge generation, ensure coherence across policy areas, allocate rights fairly, and link national and local priorities. This is particularly so where the effects of management in a fishery will affect adjacent fisheries – either along the coast or further out to sea.

Even in fisheries research, the value of shared functions is being recognized across the research cycle (Campbell and Salagrama, 2001), which has shown traditional ecological knowledge to be very useful, especially when combined with more formal knowledge.

The interconnectedness of the marine environment suggests the need for taking a broader perspective that links fisheries to the wider ecology and human world. This reflects a similar change which is developing in terrestrial systems (Berkström *et al.*, 2012), such as the "tropical seascape" approach in the marine sphere. This approach works with a mosaic of interlinked patches that provides a multitude of ecosystem services and represents a level of management intervention which is receiving increased interest. However, the knowledge of the inter-linkages and connectivity within such systems is limited (Berkström *et al.*, 2012).

In comparing a number of approaches to large areas for marine management (LAMM), Bensted-Smith and Kirkman (2010) addressed marine management at multiple scales from the larger scale of multiple nations down, in some cases, to the local scale with stated aims that covered both marine conservation and sustainable development. These approaches included Large Marine Ecosystems (LMEs), Seascapes, Marine Ecoregions, Regional Seas and Integrated Coastal Zone Management (ICM). Large Marine Ecosystems that cross national boundaries address marine ecosystems at this larger scale – especially in relation to fisheries. The term (LME) is now used to define marine management areas by agencies such as the Global Environment Facility (GEF), the International Union for the Conservation of Nature (IUCN) and the World Bank. The World Wide Fund for Nature (WWF) and The Nature Conservancy (TNC) use the term "Marine Ecoregions" and Conservation International (CI) is working with "Seascapes" (see Box 13) in the Coral Triangle Initiative (Indonesia, Malaysia, Papua New Guinea, Philippines, Solomon Islands, Timor-Leste). The United Nations Environment Programme (UNEP) has developed a "Regional Seas Approach" which includes action plans for protecting the environment and delivering sustainable development. Some form of wider ecosystem approach is an important component of many fisheries management programs, and integrated coastal management is used in a number of countries but particularly widely in the Philippines.

Bensted-Smith and Kirkman, (2010, iv) determined that "Large Marine Ecosystems, Marine Ecoregions and to some extent Seascapes are all ecosystem-based in their

geography and are reasonable starting units, around which to build a programme of marine conservation or restoration and sustainable use." In addition, they suggested that for all of these approaches, context is very important. They (2010, iv) noted that all three approaches "have attained important results, yet we are concerned that the aim of effective governance across sectors and at all levels, from local to regional, is poorly articulated and inadequately addressed, especially in the case of the Large Marine Ecosystems." They also noted that "most Regional Seas Programmes are well established and have an increasingly significant role in coastal and marine resource management and conservation in their respective regions." In relation to ICM they wrote (2010, iv) that "we consider that the other approaches studied here have much to learn from the ICM process, as they strive to overcome some of the barriers to EBM in developing countries, such as: ineffective governance, sometimes undermined by corruption; local stakeholders lacking rights over resources, power in decision-making and the means to develop alternative livelihoods; rapid social and

BOX 13:

The Conservation International (CI) seascape approach

Seascapes are large, multiple-use marine areas, defined scientifically and strategically, in which government authorities, private organizations and other stakeholders cooperate to conserve the diversity and abundance of marine life, with the ultimate goal of promoting human well-being. In each seascape, CI is building coalitions with governments, corporations and civil society organizations to attain nine essential elements.

1. Enabling legal framework. Seascapes generate an enabling framework of laws, conventions, regulations and policies that facilitate marine conservation at local, national and regional scales.
2. Ecosystem-based management including MPAs. Seascapes advance large-scale management of marine ecosystems and species through the use of multidisciplinary scientific information to inform effective planning, implementation, monitoring and evaluation.
3. Adequate institution and capacity. Seascapes build adequate institutional frameworks and capacity, including personnel, infrastructure, and equipment, to make marine governance structures (governmental, commercial and civil) work effectively and efficiently.
4. Private sector engagement. Seascapes promote convergence between conservation and development by linking the viability and profitability of major economic activities with sustainable management of the ecosystem.
5. Social and political support. Seascapes increase the social and political viability of marine conservation as an integral part of sustainable development, and they build broad support at all scales, from stakeholders in local marine managed areas to national leaders.
6. Maintenance and restoration of critical habitats and ecosystems. Seascapes maintain or restore critical habitats and ecosystems so that ecological processes and ecosystem services are sustained.
7. Threatened species recovery. Seascapes reverse declining population trends for threatened marine species.
8. Human well-being benefits. Seascapes improve the social, economic, and cultural well-being of human communities dependent on marine and coastal resources and ecosystems.
9. Sustainable financing and market mechanisms. Seascapes strive to be financially sustainable with funding portfolios that are stable, diverse, and large enough to implement all priority marine conservation activities.

Source: Conservation International http://www.conservation.org/global/marine/initiatives/seascapes/pages/seascapes.aspx

political change preventing sustained commitment to EBM; scarcity of strong civil society organisations to champion and support EBM." Since that review, some of the other approaches, such has the Conservation International Seascape (see Box 13) and The Nature Conservancy approaches have reportedly placed greater emphasis on governance issues and context-specific approaches.

Bensted-Smith and Kirkman (2010, 22) also noted that given the different nature – and, in some aspects, complementary roles – of the five LAMM approaches, "it is not surprising that their application has in many cases overlapped. In some places the outcomes, funding and sustainability achieved may be fruits not of individual programs but of two or more complementary, interacting approaches. An additional question to ask, then, is whether the application of multiple approaches in the same area, or overlapping areas, is synergistic or merely inefficiency caused by institutions adhering to their own methodologies instead of building on what is already in place."

Integrated coastal management is seen by many as an effective, comprehensive and holistic way of bringing different sectors and levels together. The Philippines has probably had the most extensive ICM experience (White *et al.*, 2006). ICM's effectiveness is likely to be, in part, a result of its ability to incorporate other tools at the local level, e.g. MPAs. Christie and White (2006, 184) noted that "[t]o be effective on a wide scale MPAs should be embedded within larger planning frameworks such as integrated coastal management (ICM) or ecosystem-based management (EBM)." These wider frameworks are designed to balance economic development with resource management processes in cross-sectoral ways.

Ecosystem approaches to fisheries also place an emphasis on operating at different scales. Charles and Saunders (2006) noted that from the perspective of EAF, "it is important for fisheries management to take into account the impacts of fishing on the ecosystem, and conversely, the impacts of the ecosystem and of other human uses of that ecosystem, on fisheries." The ecological aspects of fisheries need also be considered in wider development approaches where multiple use economic development is occurring. It is important to understand that context and to adjust fisheries management accordingly.

Clearly, there is a need for fisheries managers to look outside of their normal environment and seek solutions and linkages with other sectors (Mahon *et al.,* 2008). This need for integration of social, economic, environmental and political concerns and issues is starting to take on a new form as integrated ecosystem-based approaches, which have considerable potential to integrate sustainable resource-use management, conservation and development into a single paradigm. The value of addressing this at higher levels of spatial planning is becoming more generally recognized. The Coordinating Body on the Seas of East Asia (COBSEA) (2011) noted that coastal and marine spatial planning (CMSP) "is emerging as a tool of choice around the world, particularly in heavily used marine areas. CMSP offers countries an operational framework to maintain the value of their marine biodiversity while at the same time allowing sustainable use of the economic potential of their oceans. CMSP is an approach that can make key components of ecosystem-based management of coastal and marine areas a reality."

Ensuring institutional coherence

As discussed above, many fisheries are faced with multiple aims that are often conflicting, and few mechanisms exist to facilitate trade-offs and choices. This can potentially lead to a lack of policy coherence which confuses what fisheries management is trying to achieve. Even when there is some clarity of aim, it may not be possible to predict how implementation of policies will pan out. Overfishing can be seen as a rational response to irrational policies (Dengbol, 2009).

Policy processes, legislative frameworks and governance structures often reflect situations that no longer exist. As noted by Bensted-Smith and Kirkman, (2010, 4) "[a]ccess rights, laws and institutional structures in some countries are outdated and do not reflect social and political realities, so that governance structures have inherent conflicts." The historic evolution of the fishery and the forces at play within the political economy influence the way political decisions are made and the way fisheries managers at the national level have interpreted national policy. Much of the past emphasis of fisheries has been on productivity increases and many government departments are still staffed by people with skills that reflect this focus, in agencies structured around productivity using top-down approaches. Salas and Gaertner (2004, 154) recognized this, noting: "… fishers develop and implement strategies and tactics in response to the constraints they encounter and their intended objectives given their particular human, social, cultural and economic contexts. Managers in contrast, have generally made simplistic assumptions about fishers' nature and attitudes when defining management policies."

There is also a need to ensure that institutional structures and processes are enshrined in law to avoid failure in political coherence when political parties or individuals change. Bensted-Smith and Kirkman (2010, 4) noted that frequent changes in political leadership can "make it difficult to secure the sustained policy commitment over decades that EBM requires; individual and institutional champions of EBM can counterbalance this problem but they are few and civil society organisations in many countries are weak." Informal discussions with key informants during the course of the current review also emphasized the importance of this aspect in terms of ensuring coherence between management efforts at the local level and the prevailing policy and legislative framework within which they are nested, and in terms of the need to evolve approaches that take account of changing political priorities over the course of long-term management initiatives.

Ensuring the viability and sustainability of ecosystem function

Marine ecosystems are important not just for the food and income that they generate but also for the many other ecosystem services they provide. These ecosystem services generate benefits for local communities and wider society. A key part of any fisheries management program must be to ensure the healthy condition of the resources and ecosystems being fished. Without this, the harvests are likely to be reduced and/or unsustainable.

As discussed above, greater emphasis is being placed on the larger scales involved in fisheries management and beginning to address some of these larger ecological issues through approaches such as LMEs, Seascapes, Marine Ecoregions, Regional Seas and ICM.

Even with smaller areas of sea, there are wider ecological considerations that need to be included in fisheries management. According to Bennett (2005b), several studies have found that much of the success of the management system put in place is due to the biology of the underlying resource species being managed. Some species and ecosystems respond to fishing pressure better than others. Sharks, for instance, often have to reach a greater age to breed than many small pelagics (e.g. Peruvian anchovy) and are thus more easily affected by overfishing. Coral reefs seem to be very susceptible to sea water temperature increases and, where local fisheries are under pressure from over-exploitation, a decline in habitat can enhance the negative effects of fishing pressure. A University of Washington study of some 230 fish stocks emphasized the impact of environmental conditions on potential fish harvest (see Box 14).

Addressing the wider ecosystem needs will often require combining several approaches to management. The concept of marine protected areas (MPAs), one of the main measures discussed in the literature to ensure the viability and sustainability of ecosystem function, is used widely across fisheries with mixed results. Many consider MPAs a central tool in marine ecosystem-based management of tropical inshore fisheries (Rudd *et al.*, 2003) and there is now substantial evidence to indicate that, within MPAs, species tend to live longer and grow bigger, and that biomass increases, especially among sedentary and benthic species (Roberts *et al.*, 2001; Gell and Roberts, 2002; Rudd *et al.*, 2003). These larger, more abundant fish may be beneficial for tourism. Protected areas can also play an important role in stock enhancement and restocking programs to allow adequate growth and spawning (Bell *et al.*, 2006). Roberts *et al.* (2005) argue that no-take MPAs can also protect against over-generous fishing quotas, which are often set based on poor information about the fisheries stocks available or on a political reluctance to upset fishers. MPAs are part of a larger group of marine management areas which might include no-take zones, buffer zones or limited access zones – all of which have a role to play in fisheries management depending on the local context.

BOX 14:

The drivers of fish abundance

It is often assumed that the potential harvest of fish is dependent upon their abundance, but a recent study suggests that we may have to rethink some assumptions. The University of Washington-led study suggested that harvestable amount was only closely linked to abundance in 18% of 230 fish stocks assessed. For the other 82% of stocks, potential harvest was primarily controlled by irregular shifts in environmental conditions or was random and not controlled by either abundance or shifts in environmental regimes.

Source: University of Washington http://www.washington.edu/news/2013/01/14/potential-harvest-of-most-fish-stocks-largely-unrelated-to-abundance/

Some spill-over effects from MPAs – where protected species migrate into the unprotected area – are also reported. The effect of this will depend on a number of factors such as the time taken to reach a point where density-dependent movement is achieved (Rudd *et al.*, 2003) – which will vary among species, depending upon their behavior and natural ranges (Tupper and Rudd, 2003). This time needs to be taken into account in order to consider the extent to which excluded fishers will be affected by lost fishing opportunities before beneficial spill-over effects are seen.

At the time of their study, Rudd *et al.* (2003) recognized that it was generally unknown if the benefits of greater catches from spillover were sufficient to offset lost catches from the MPA. Pitcher *et al.* (2000) showed that boundary porosity had a strong influence

on the success of marine reserves. One obstacle to MPAs as an effective fisheries management tool is that, while the fish that stay within the MPA are afforded protection, those outside are subjected to greater harvesting pressure unless effort is reduced. While the exploitation of resources inside protected areas on a sustainable basis is reported to improve the living conditions of people who depend upon the protected resources (Andrade and Rhodes, 2012), there can also be negative effects. McConney and Charles (2008) noted that MPAs can lead to conflicts over resources, but the extent to which such issues arise tends to be influenced by design and governance arrangements.

MPAs have a role to play in fisheries management systems, particularly when communities are directly involved in their design and management. Community-based MPAs are designed to meet both small-scale fisheries management and conservation needs. In addition, when run by interested and informed people through collective action, they have proved an effective approach (Christie and White, 2006). In recognition of the role of communities in environmental protection, in 2003, the African Heads of State amended the African Convention on Conservation of Nature and Natural Resources to promote the establishment of community-based protected areas (Tobey and Torell, 2006). MPAs, as part of a wider ICM approach, are having some success in some parts of the world (White *et al.*, 2006). For example, the Philippines has established more than 1,100 MPAs, of which at least 20 percent are reportedly achieving their management targets (Lowry *et al.*, 2009) (See Box 15).

Adaptating to external pressure and changes

Fisheries are always changing and often in ways that cannot be predicted (see Box 14). Climate change is having considerable effects on fisheries, and fuel and food prices are changing rapidly. Even with the best will in the world, plans will need to be adjusted and changed over time. Being able to adapt to these external pressures will be an important function of future fisheries management.

The coast is in a constant state of flux and is subject to major upheavals from time to time. Coastal and marine social-ecological systems are characterized by their high degree of risk and uncertainty (Ferrol-Schulte *et al.*, 2013). Fishers, fish farmers and their communities around the world tend to be vulnerable to natural disasters because of their locations, the characteristics of their livelihood activities, and their overall high levels of exposure to natural hazards, livelihood shocks and climate change impacts. As exposure and vulnerability to these hazards is increasing (FAO, 2012a), the ability to predict, prepare for, cope with and adapt to change will be critical to any fisheries management situation.

BOX 15:

Community-based coastal resource management – success or failure?

There have been a number of assessments of the effectiveness of community-based coastal resource management (CBCRM) programs in the Philippines where MPAs play a major role. Approximately 91% of the over 600 MPAs in the Philippines are managed under the CBCRM framework. In 1997, 19% of the 47 completed CBCRM programs survived after external funding was withdrawn.

In 1999, 10% of the 439 MPAs in existence were well enforced. In 2004, 156 MPAs were evaluated and 44.2% were found to be successful. This suggests that success increases over time.

Worldwide the estimates of successful MPAs vary from 10–30%.

Source: Maliao et al., 2009

Climate change

Climate change is now well recognized as having potential effects on fisheries that are widespread and significant (Cochrane *et al.*, 2009). Climate change is already affecting the distribution and movement of fish stocks. It is also affecting coral reefs through sea temperature rise, and increasing coastal inundation. Extreme weather events, such as tidal surges and storms, are also on the increase. These not only affect the social, economic and cultural aspects of fishers' lives directly, they also affect fishing communities located on coastal margins. Loss of life from such events is more common in developing countries. From 1970 to 2008, more than 95 percent of deaths from natural disasters were in developing countries (IPCC, 2011). The poor are often affected most in these situations, as they inhabit the higher risk environments (Blaikie *et al.*, 1994).

Food and fuel prices

Global food and fuel prices change the costs and benefits of fisheries, as well as the tourism trade, which can be a significant market for many small-scale fishers, such as those in the Caribbean. In addition, global terrorism and economic decline affect markets and especially tourism which, in turn, directly affect fish sales and alternative employment opportunities.

Population and development

Increasing coastal populations and coastal development have a significant effect on coastal habitats and pollution. While coastal tourism brings opportunities to coastal communities, it also increases stress on water and land use. Inland infrastructure, such as dams and factories, is also beginning to affect water quality and flows into coastal areas.

While it is unlikely that all forecasts will be consistently accurate in the fisheries management process, McConney and Charles (2008) noted the importance of learning to live with uncertainty, rather than seeking more sophisticated fisheries models. Box 16 provides an example of how coastal management is evolving to address uncertainty.

Allen and Gunderson (2011) suggested that there are specific circumstances where adaptive management can be effective – especially when the situation is controllable but uncertain (see Box 17). Adaptive co-management can be defined as an approach based on collaboration among agencies, researchers and local stewards where natural resource management is seen as a process of controlled experiments that need to be monitored and improved upon (Moberg and Galaz, 2005).

There is growing support for adaptive management processes that foster resilience and flexibility (Mahon *et al.*, 2008; Allen and Gunderson, 2011; Evans *et al.*, 2011b). Alpízar (2006) noted that co-management and community-based management approaches have the potential to respond to change and dynamic conditions more quickly than central programs because they are closer to where these changes are being experienced. Berkes *et al.* (2000) pointed out that traditional management systems have certain elements in common with adaptive management strategies, such as: i) management rules are locally crafted and socially enforced by users, ii) resource use tends to be flexible and change with circumstances, iii) accumulated knowledge allows ap-

BOX 16:

Spatial Planning in the Coastal Zone of the East Asian Seas Region

INTEGRATING EMERGING ISSUES AND MODERN MANAGEMENT APPROACHES

The Spatial Planning in the Coastal Zone Disaster Prevention and Sustainable Development Project was developed by the Coordinating Body on the Seas of East Asia (COBSEA) Secretariat as a post-tsunami project during 2006. Its overall goals are to reduce and prevent the impacts of natural disasters, climate change and sea level rise, and to promote sustainable development of the coastal areas in COBSEA member countries through the application of spatial planning for integrated coastal zone management (ICZM) and ecosystem-based management (EBM). In achieving the overall goal, the specific objectives are to:

- develop the regional policy, resource and guidance document, Spatial Planning in the Coastal Zone of the East Asian Seas Region: Integrating Emerging Issues and Modern Management Approaches
- strengthen national capacities in sustainable coastal spatial planning through the application of the adaptation of the document into national needs and capacities for the COBSEA countries for spatial planning and disaster risk reduction
- enhance the capacity of countries to integrate the consideration of new concepts such as climate change, ecosystem based management, disaster risk reduction and integrated land-sea planning into their existing national spatial planning procedures and systems.

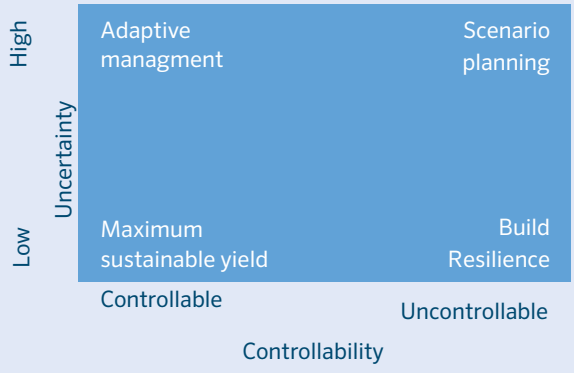
Source: COBSEA, 2011

propriate responses from ecological feedback, iv) a diversity of resources is used for livelihoods thus keeping options open, and v) qualitative approaches are used, rather than working towards quantitative yield targets. They also discussed how traditional ecological knowledge "can be viewed as a 'library of information' on how to cope with dynamic change in complex systems" (Berkes *et al.*, 2000, 1259). They also pointed out that adaptive management and traditional practices emphasize process and accommodate change as part of that process, and that by "responding to and managing feedbacks from ecosystems, instead of blocking them out, adaptive management seeks to avoid ecological thresholds at scales that threaten the existence of social and economic activities, as do some traditional management systems" (Berkes *et al.*, 2000, 1260). In relation specifically to MPAs, Christie and White (2006, 211) said that "[i]t is apparent that a well-managed MPA requires an adaptive management approach."

The external changes not only affect people, they also affect the environment. Increasingly climate change is seen to be affecting abundance and distribution of coastal species. One argument for MPAs in fisheries is that the levels of uncertainty associated with change require a risk buffer that MPAs can provide for the wider marine ecosystem. The

BOX 17:

Management approaches for different situations



Source: Allen and Gunderson 2011, adapted from Peterson *et al.*, 2003

fact that MPAs may have a role to play in building ecological resilience (Rudd *et al.*, 2003) has never been as important as now when, in many parts of the world, climate change is an uncertain process.

When looking at how community-based systems for commons management can be used to scale-up approaches, Berke (2006) noted that "it may be more illuminating to approach the debate by suggesting that commons management in many cases should be understood as the management of complex adaptive systems …", and that such systems are affected by a multitude of outside forces which affect them.

However, adaptive management approaches are not without problems. Allen and Gunderson (2011) identified a number of conditions that can negatively affect the success of adaptive management when:

- stakeholders are not fully engaged in the process
- ecosystems are very complex
- unforeseen events occur – such as natural disasters which are on the increase in many areas where climate change is expected to be significant
- managers are too prescriptive about how they respond to change
- the desire to learn overtakes the desire to act
- learning does not feed back to policy
- hard decisions are avoided
- leadership is absent, dogmatic, non-inclusive or biased in a particular direction
- planning takes the place of action.

There will always be uncertainty in the management of fisheries which are complex social-ecological systems, and this will lead to unpredictability. In addition Ferrol-Schulte *et al.* (2013) noted that, in poverty stricken areas, the necessary funds and know-how to manage resources adaptively is often lacking. A sustainable livelihoods approach can be a useful tool to address the complexities of social-ecological systems in coastal areas and assist adaptive planning.

Adaptive management takes learning as a necessary starting point in the struggle to confront and respond to this uncertainty, according to Armitage *et al.* (2009). They noted that adaptive management is not a governance panacea and will not be suitable in all cases, and that tools are still being developed. They also identified ten key conditions for successful adaptive co-management:

- a well-defined resource system
- small-scale resource-use contexts
- clear and identifiable set of social entities with shared interests
- reasonably clear property rights to resources of concern
- access to an adaptable portfolio of management measures
- commitment to support a long-term institution-building process
- provision training, capacity building and resources for local-, regional- and national-level stakeholders
- key leaders or individuals prepared to champion the process
- openness of participants to share and draw upon a plurality of knowledge systems and sources
- national and regional policy environment explicitly supportive of collaborative management efforts.

However, as Gondo (2008) noted, adaptive co-management systems and tools are still at an early stage of development and should be treated with caution. Gondo also pointed out that a key part of adaptive co-management is the need for continuous experimentation and experience in dealing with the associated problems. This is not new for fisheries managers, who have experimented with management measures over decades.

6.3 Factors affecting technical implementation

While the above factors tend to apply to a larger design scale, there are others that are more concerned with technical issues. Although these classifications are not set in stone, these technical issues can include the allocations of rights, the need to change structures and processes incrementally in order to accommodate the local pace of change, ensuring that the right things are done with the right institution and that decisions occur at the right level, acknowledging the importance of the local political situation and factoring it into management decisions, recognizing the importance of balancing costs and benefits of management, and addressing the importance of local and global markets.

Establishing legal group rights and responsibilities

Across the range of fisheries management approaches and themes discussed above, rights are playing a more and more central role in what is done. There is a growing move towards greater and more sophisticated approaches to rights that combine fisheries and human rights. This is a first step towards connecting fisheries to the wider well-being of coastal communities (Charles, 2011). While fisheries rights can take many forms, there seems to be growing support for community-based rights in small-scale fisheries. Recognition of this linkage between community-based systems and welfare of communities is gaining momentum (e.g. Copes and Charles, 2004) but lacks supporting data, particularly on the multiplier effects across communities.

The need for controls in fisheries and the recognition of the finite and exhaustible nature of fish has encouraged a stronger focus on rights around fishing. This has been closely linked to two key problems associated with common property resources, namely that: i) exclusion or control of access is difficult and ii) each fisher's activity subtracts from the potential gains of other users (Berke, 2006). There is now widespread acceptance among fisheries academics and managers that some form of rights in fisheries is essential to the success of fisheries management.

According to FAO (2012a), such approaches do have potential to rationalize and improve returns in small-scale fisheries and increase resources rents at the national level. However, they need to be implemented in ways that provide for rent distribution methods that include the poor and vulnerable.

Huppert (2005, 201) noted that "(t)he controversies over fishing rights take three forms: disagreements over the meaning and intent of fishing rights, disputes over the distribution of rights and associated economic gain, and concern for disruptions imposed on people who are dependent on the 'old order'." The initial allocation of rights can be particularly difficult and controversial (Pearse, 1992). Anderson and Libecap (2010) suggested that, in the allocation of rights, the allocation along the lines

of first-possession, or "grandfathering" can make both economic sense (they are more knowledgeable about the resource and thus often lower cost) and institutional sense (by suggesting that historic engagement is likely to ensure rights of access). They said that in community-based fisheries where the participants are often poor but well informed about the resources, "grandfathering" is likely to generate local support for management measures.

Overall, the practical experience of using individual transferrable quotas (ITQs), one of the most commonly promoted forms of individual fishing right, is seen as encouraging as a rights-based approach. Yet, in 2008, ITQs were found in less than 2 percent of the world's fisheries (Costello *et al.*, 2008). According to Leal (2010), they had generated considerable benefits in the form of higher income for fishers, improved product quality for consumers, reduced fleet excesses, and largely maintained harvest with TACs. But these benefits have largely been associated with developed countries. ITQs are also beginning to be used in those developing countries where there is a transition to more reliable legal institutions with stronger governance, e.g. in the anchovy fishery of Peru and Chile (Leal, 2010).

While transferable quotas in developed countries have focused mainly on giving quotas to vessels or owners, in developing countries there is increasing interest in rights to quotas being provided to communities or specific community groups or associations For example, in the Philippines, collective action and participation would be increased if fishers cooperatives were given exclusive rights which restrict access and, in turn, provide greater incentives for improved resource management in the long-term (Baticados, 2004). The balance between small-scale and industrial fisheries needs to be examined with a view to the appropriate allocation of property rights (Stobutzki *et al.*, 2006).

In many developing fisheries, legally-backed exclusive fishing rights granted to nearby communities or fishing cooperatives are likely to be a more practical form of rights (Leal, 2010) (see Box 18). Associations of fishers are more and more taking on the role of government in fisheries management, which according to Scott (2010) heralds a new fishers' culture. This is supported to an extent by the fact that studies over the last 30 years have documented the capability of communities to self-organize and self-regulate to resolve problems of the commons (Berke, 2006).

BOX 18:

Local management of lobster stocks

The red lobster (*Panuliris interuptus*) found on the west coast of Baja California, Mexico, is harvested by fishers' cooperatives under concessions established in the 1930s. Nine cooperatives work together in a federation to manage the stock. As an indication of success, in 2004, after extensive scientific review, the Marine Stewardship Council (MSC) certified that the fishery satisfied the MSC's criteria for sustainable fishing.

Source: Leal, 2010

Territorial use rights in fisheries (TURFs), in practice in many parts of the world, have been a means of traditional fisheries access rights and, according to Hilborn (2007a): "the most direct incentive to facilitate compliance is the granting of territorial fishing rights to individuals or communities. This provides a

strong incentive to exclude non-members … .” In much of the Pacific, small-scale fisheries have been based on TURFs from which neighboring communities have been largely excluded.

During expert consultations as part of this review, several respondents referred to the success of introducing TURFS in the Chilean *loco* (abalone) fishery, through which rights to fisheries in different areas are allocated to local cooperatives.

Increasingly fishing rights are being placed in the wider framework of human rights (FAO, 2010) (See Box 19).

Incrementally changing to allow for capacity, reflection and negotiated response

Adopting new approaches and tools for fisheries management – including those that address wider social, economic, ecological and political concerns and are integrated vertically across scale and horizontally across sectors – requires new skills and knowledge, and also new attitudes from those involved, such as managers and community members. In addition, getting the speed of change right is very important to the successful management of change. In many situations, change has been introduced at a pace that managers and community members find difficult to understand and respond to.

The increased focus on the need to integrate fisheries management into wider economic systems is reflected in a move towards more integrated, multi-sector and

BOX 19:

Rights in small-scale fisheries

At its 26th session in March 2009, the FAO Committee on Fisheries (COFI) reviewed the outcome of the Global Conference on Small-Scale Fisheries – Securing sustainable small-scale fisheries: Bringing together responsible fisheries and social development. Held in Bangkok, Thailand, 13-17 October 2008, the Conference was attended by more than 280 participants from 65 countries. It was preceded by a preparatory workshop with more than 100 participants from fishworkers' organizations and CSOs. The Conference re-enforced the claim that small-scale fisheries have yet to fully realize their potential to significantly contribute to sustainable development and the attaining of the UN millennium development goals (MDGs).

In spite of their economic, social and nutritional benefits and societal and cultural values, small-scale fishing communities often face precarious and vulnerable living and working conditions. Various factors contribute to these conditions, including insecure rights to land and fishery resources, inadequate or absent health and educational services and social safety nets, vulnerability to natural disasters and climate change, and exclusion from wider development processes due to weak organizational structures and representation and participation in decision-making.

The 2008 Conference identified several critical ways forward in securing sustainable small-scale fisheries that integrate social, cultural and economic development, address resource access and use-rights issues guided by human rights principles, and recognize the rights of indigenous peoples. The Conference also reaffirmed that human rights are critical to achieving sustainable development.

Source: Willmann, 2010

ecosystem-based management (White *et al.*, 2006). The increased use of integrated coastal management (ICM) as an approach to wider ecological management systems in coastal areas has necessitated adapting institutional and organizational structure to accommodate the different roles and responsibilities. This has meant building skills and qualifications across different ministries and departments to ensure a commonality of purpose, methods and language, a difficult process that should not be underestimated, as shown by ICM experience in the Philippines (see Box 20).

During discussions for this review, experts highlighted the challenge of finding the means of communicating ideas about complex management issues that are accessible to those who are unfamiliar with the terminology and concepts. Several respondents referred to experiences with foreign experts in ecosystem-based management approaches who had attempted to explain extremely complex ideas to local or national counterparts using language that was largely inaccessible to them, rather than breaking the concepts down into more "digestible" elements and building understanding incrementally.

Christie and White (2006) recommended the incremental development and the adoption of ICM and other comprehensive frameworks such as EBM, building on past practice to match human and fiscal capacities. Although calls have been made for larger scale interventions to maximize ecological function, they were sometimes done without sufficiently careful analysis. For example, the Large Marine Ecosystem (LME) approach moved ahead with little empirically grounded understanding of what it entailed (Christie and White, 2006).

BOX 20:

Lessons from ICM in the Philippines

A review of experiences in coastal management in the Philippines provided the following lessons.

- ICM provides the framework for local government to implement sustainable coastal development.
- Participation at all levels and allowing interagency cooperation and cross-sectoral integration is a prerequisite for ICM.
- An integrated planning process is essential.
- Comprehensive information systems that evolve with planning processes are needed.
- Institutionalizing ICM into local government is important for integrating into regular development plans.
- Baseline information is necessary for ICM planning.
- Community-based management requires on-going support and mentoring from government, civil society and the private sector.
- Sustainability of ICM cannot be determined without time and field testing.

Source: modified from White *et al.*, 2006

Incentives are often needed for local government to move in the direction of change in support of ICM. For example, when the Philippines adopted a coastal resources management (CRM) certification process which was often provided with external financial support, it encouraged national-level agencies to start redefining their roles as providing technical assistance to local government rather than taking the lead on such initiatives (White *et al.*, 2006). There is also recognition in the Philippines that networks of MPAs in a wider ICM process require development of network governance (Lowry *et al.*, 2009). In some areas of the world, MPA and other management networks have been established to support joint learning and lesson sharing. The Philippines has social and information networks that assist in improved management of MPAs. Christie and White (2006)

identified five effective processes derived from networking efforts that led to good practice and scaling-up of governance: i) consensus building on common issues, ii) information sharing and identification of core groups, iii) institutionalizing mechanisms for administration, iv) sustainable financing and v) adaptive management. For instance, at the international level, the Local Marine Management Area Network (LMMA) is an example of a learning network, in place across Southeast Asia and the Pacific where members exchange information and experiences.

Institutional fit and subsidiarity

Ensuring the institutional "fit" of a set of management/governance issues is increasingly recognized as important (Armitage *et al.*, 2012). This might include the suitability of different institutional arrangements to address specific problems. Some researchers, such as Folke *et al.* (1998) have determined that resource boundaries rarely fit institutional boundaries. Similarly, Berkes (2006) noted "integrated systems of human-in-nature are more likely to work if there is a fit between the level and boundary of the ecosystem and the institution designed to manage it." For example, tuna in the Pacific migrate between nations, in and out of EEZs and through inshore fishing areas. Even though many communities have successfully addressed many of the issues associated with common property fisheries, they are still subject to many external pressures that require solutions that respond to scale (Berkes, 2006).

In many parts of the world, traditional customary marine tenure (CMT) was the norm and, in some places, particularly in the Pacific, CMT still plays an important role. However, as fisheries capacity has developed and concerns over the resource have increased, the management process in many places has become more centralized and developed. Some see this move from community-based fisheries management systems to centrally controlled government systems as leading to replacement of common-property regimes with open-access (Pomeroy, 1994). However, in many cases, traditional community-based institutions, in their original form, are no longer appropriate for the management of more mechanized fisheries which extend beyond traditional grounds, involve many more people and feed into more easily accessible and larger markets.

Kuemlangan (2004), who looked at the institutional fit between community-based fisheries management and the legal systems in a number of countries in the Pacific, found that recognition of customary marine tenure may provide an opportunity for adopting more community-based systems. This raised the important question of the legal requirements needed to establish co-management in countries with less history of such approaches. In Cambodia, a process of consultation around the by-law on fisheries co-management took four years. Although customary marine tenure has worked in the past, Kuemlangan (2004) also noted that those past structures and processes are not necessarily ideal for the future. Rather, it is better to see customary marine tenure as a dynamic process that can inform and influence future processes.

In noting the importance of the legal and jurisdictional context in which MPAs operate to long-term management, Christie and White (2006) also identified the following principles for effective legal and jurisdictional norms related to MPA experience.

Nested institutional and legal (national to local) systems, if balanced and supportive of local initiatives, support MPA implementation. MPA management requires both upward (from local to national agency) and downward (from national to local agency) coordination and accountability.

- Embedding MPA management within larger management systems designed to address larger sectoral and development processes will help address external impacts on MPAs.
- Transparency, fairness and broad understanding of the law and enforcement support compliance and reduce conflict.
- Clear identification of the role and responsibilities for formal and informal MPA management bodies is necessary.
- The jurisdictional mandate should fit the institutional capacity of a management body. If necessary, there should be ongoing attention to the development of institutional capacity.

A consistent national mandate for MPA implementation with adequate resources for implementation can provide a supportive environment (Christie and White, 2006, 197).

This theme, regarding the way in which the legal and institutional context meshes with management efforts on the ground, emerged repeatedly during expert interviews. It often took the form of constraints encountered by local-level fisheries management initiatives in situations where existing legislation on fisheries and management contradicted rules and regulations being evolved at the local level. Often, the fact that legislative functions are entirely held at the national level meant that local administrations could not be as responsive as they wished in approving and sanctioning new forms of management being generated at the ground level. The issue of subsidiarity and the devolution of decision-making responsibility to the lowest appropriate level in order to support adaptive management in the field therefore seemed to be particularly important.

Institutional fit also has cost implications (Abdullah *et al.*, 1998). Christie and White (2006) noted that MPA planning and monitoring can be expensive, and centralized government MPA agencies must compete with other more pressing budget needs such as health, economic development and education. But they also pointed out that centralized control of management is necessary and effective in some situations, as in the case of MPAs in Brunei.

In some cases, it may be appropriate to consider the private sector as the agency for engaging in management as, for example, was shown in Chumbe Island, Tanzania (Cristie and White, 2006). In such situations, it is important to balance the incentives of society's goals with those of the private sector. Across a number of environmental concerns, there is a growing emergence of hybrid forms of governance that combine state, markets and civil society (Armitage *et al.*, 2012).

Costa Rica has split its resource management function between two government organizations, one concerned with conservation and the other with resource use. This agency interaction is not uncommon, as fisheries departments do not always agree with the policies of environment agencies (Alpízar, 2006).

Also, in dealing with the effect of climate change on fisheries, the more traditional institutional arrangements within government no longer fit the problems to be addressed. Instead, this calls for incentives to be in place that will encourage different agencies and ministries to collaborate and share information and experience, e.g. in cross-sectoral functions such as climate change response, disaster risk reduction and ICM.

Other external considerations, such as fuel and food prices, fisheries-tourism interactions, coastal development and livelihood diversification might require changes in the types of institutional arrangements needed to implement change. Likewise, the move from a production focus in many fisheries to a poverty reduction or food security focus may require skills and experience that fisheries departments do not have and may necessitate evolving new partnerships with other agencies such as NGOs. Having the right institutional arrangements at the community level and within government is also crucial. In some situations, localization of governance might be seen as decentralization of function to district-level fisheries offices rather than to community organizations (Rudd *et al.*, 2003).

Less traditional forms of rights, such as ITQs, faced implementation issues in developing countries, in part because of the lack of appropriate legal, institutional and governance arrangements required to achieve an appropriate institutional fit. Bennett (2005b) noted that property rights have to be equitable in their allocation but also, the wider stakeholder group, i.e. society, must see them as fair.

Another often overlooked aspect of institutional fit is the way that external funding can distort fisheries management processes. Project support can provide a hothouse effect which ensures a greater chance of a fisheries management initiative succeeding. However, reporting on the success of such projects during implementation may generate a more favorable assessment than would be the case several years after the project has finished. Likewise, donor willingness to compartmentalize the policy process and fund some aspects of fisheries management but not others can distort those policies, resulting in long-term adverse effects. Aid effectiveness processes have been established to address some of these distortions.[5] The situation has shown considerable progress in the fisheries sector in Cambodia, which now has much greater policy coherence and has reduced the transaction costs of policy, planning and policy implementation (see Box 21).

The engagement of any external implementer or funder, e.g. NGO, consultancy or intergovernmental agency, in the process of fisheries management can distort the factors that support sustainability of positive change. The ecoregional approach adopted by The Nature Conservancy and World-Wide Forum for Nature, works with national and local partners and with NGOs that are committed to the kind of long-term (15–20 year) intervention needed. However, the long-term engagement of an external NGO can impede the emergence of sustainable governance (Bensted-Smith and Kirkman, 2010). Such powerful organizations can influence policy implementation in much the same way as that described for donors above, and aid effectiveness procedures need apply equally to them.

[5] For example see OECD: www.oecd.org/dac/effectiveness

BOX 21:

A sector wide approach in Cambodia

The fisheries sector in Cambodia is planned around a 10-year Strategic Planning Framework (SPF) that links to national development policy. The SPF was developed through a participatory planning process that links all subsectors together and links those to provincial plans.

A "basket funding" mechanism is in place, which allows donors to fund the sector according to the SPF, rather than their own donor-generated projects. It also has a common monitoring and evaluation system, which uses participatory approaches to gain fishers' perspectives on policy implementation and feeds these back into policy.

Cross-sectoral and donor harmonization issues are addressed through a technical working group process and a strategy for harmonization and alignment encourages donor procedures to harmonize with each other and then align to those of government. There also has been a progressive process of decentralization of function and resources on the basis of subsidiarity.

The government-developed Cambodian Code of Conduct for Responsible Fisheries (CamCode) provides a framework for government, development partners, civil society and private sector to work to a common set of principles and guidance.

Source: FiA, internal documents

Incorporating politics and political choices

Fisheries management is, in part at least, about the distribution of rights to access resources and the distribution of the benefits from those rights. These are largely political decisions and can be subject to both the choices of political parties and the personal choices of politicians. These two choices manifest themselves either as overt policies or covert forces behind the scenes. Political decisions can be some of the most important influences on fisheries, and the political economy needs to be included fully in the management process for it to stand a chance of being successful.

The political forces that influence fisheries management effectiveness have been touched on a number of times in this synthesis. In management more generally, the political aspect of environmental protection has been downplayed (Belsky, 2000) or even externalized in the resource management equation. Economic rationalization approaches to fisheries management tend to focus on the state capture of resource rents for the wider application to national economic development – a political decision which prioritizes economic impacts over other impacts. Welfare approaches tend to focus more on the distributive aspects of resource rents to fuel local development and secure livelihoods. Politics, power and corruption often influence how wealth is redistributed in both cases, e.g. through the political economy of national governments and through patronage at a local level.

A renewed focus on rent capture by the state is sometimes seen as a means of "introducing some logic into the policy process" (Cunningham *et al.*, 2009). This might suggest a level of rational thinking in economics that does not exist in politics. However, policy is driven by politics, and political processes may have their own logic which may not prioritize purely economic incentives. Wider political issues may concern re-election, feeding the population now, short-term foreign exchange generation, trading fisheries sustainability for politically more important gains, or enhancing personal wealth and/or patronage through non-transparent means. These may well represent logical uses

of fisheries resources if they achieve wider development aims. Externalizing the political economy in discussions of policy is likely to lead to unforeseen outcomes.

Robinson (2010) found that most fisheries reform has occurred in well-functioning democracies where competition is for public goods rather than private goods, e.g. to achieve larger departmental budgets rather than personal financial gains. The extent to which the rule of law and other legal and governance institutions function effectively will play a major role in the form of fisheries management and who will benefit from it. If, for instance, government officials allow foreign fishing vessels or unlicensed domestic fishers to operate, then sustainability can be easily undermined (Hilborn, 2007b). There are many documented cases in the Philippines where CBCRM initiatives have collapsed because of local politics (Maliao *et al.*, 2009). Roe *et al.* (2009), after reviewing a number of community-based natural resource management initiatives across Africa, noted that conflicts between local groups and powerful elites remain widespread and are often intensifying. According to Rudd *et al.* (2003), a breakdown in MPA management on Sumilon Island in the Philippines was caused in part by local politicians engaging in opportunism.

Vested interests can also be an incentive for greater or lesser involvement of the state – if conflict over resources plays out beyond local levels, then greater involvement by government may be needed (Wilson *et al.*, 2006). In some situations, the government may be provided with inadequate resources to implement management of fisheries on their own, and it may need the involvement of the community to assist (Wilson *et al.*, 2006). In fisheries management, the generation of knowledge itself is not an apolitical process. By its very nature, what scientists say has a political element because some of the evidence goes on to inform policy and some does not (Belsky, 2000).

In discussing the political economy approach to fisheries, Robinson (2010, 54) noted that the political economy approach "leads to a very different way of thinking about policy than the one current in international institutions. It suggests that too much attention is being paid to the first-best solution to this problem and not enough to finding politically feasible ways of mitigating the tragedy of the commons."

The key challenge here, and one widely recognized by respondents during the expert interviews, is that these issues relating to politics and power relations in society are too often regarded as "externalities" which cannot be influenced or addressed by interventions focused on fisheries management. However, the critical role that these factors play in influencing fisheries management outcomes is equally recognized. This is in part attributable to the nature of projects working on fisheries management, which do not necessarily have the skills, mandate, resources or time required to engage at the political level. However, it is also due to a general paucity of appropriate tools for analyzing and addressing the political economy surrounding fisheries management and understanding how it can be influenced, or adapted to, during the course of interventions.

Sustainably and equitably addressing costs and benefits

According to recent analyses of fisheries management, fisheries in some parts of the world cost more than they generate. To generate benefits for society or for fishers, the fisheries management and development process needs to generate surpluses. This, in turn, means understanding the costs and benefits of the management process.

At present, most of the world's fisheries are heavily subsidized (World Bank-FAO, 2009). In 1992, FAO estimated the global fiscal deficit of fisheries at US$50 billion [FAO, 1993]. Thus, the reference to wealth capture involved in some fisheries management approaches must seem very attractive to politicians who are faced with small budgets, low returns from the sector and ever increasing demands on financial resources. According to Cunningham *et al.* (2009), under free- and open-access conditions, fisheries exploitation levels will reach equilibrium only when all resource rent has been dissipated. While the removal of the free and open access could be seen as the solution to this problem, such arrangements also incur costs.

For tropical inshore fisheries, transaction costs may make up a large proportion of the total fisheries management cost, but there are limited data to assess this (Rudd *et al.*, 2003). Abdullah *et al.* (1998, 108) separate transaction costs into: 1) information costs, 2) collective decision-making costs, 3) collective operational coast, 4) distributional costs, 5) resource maintenance costs and 6) monitoring, enforcement and compliance costs. They suggest that the cost difference between centrally run management and co-management systems is that cost 1 and 2 are low under a centralized systems whereas 3, 4, 5 and 6 are high, while in a co-management system the cost structure is reversed. Copes and Charles (2004) recognized that socio-economic data are limited for different management systems, but also noted that community-based systems can be less expensive to manage than more individually focused approaches such as ITQs, because of the self-regulation aspects of community based systems. Co-management represents a shift in the financial burden from the central government to the community, which the community may not be able or willing to support, especially where the benefits of better management may not arrive for many years. MPAs, as part of a program of fisheries management, do appear to have some cost advantages. Cullis-Suzuki and Pauly (2010) roughly estimated the global costs of MPAs to be only 3 percent of fishing subsidies. But this needs to be balanced by considering the number of MPAs that are actually operating effectively.

The work done under the DFID-funded Fisheries Management Science Programme (FMSP) showed that, while participation in fisheries management by fishers is beneficial, it also comes at a cost. Arthur (2005, 13) noted that, in order for the benefits of co-management to outweigh these costs, "it is vital from the outset that efforts are to develop trust and mutual respect, including respect for different knowledge types. This requires a commitment, throughout the management process, to transparency, accountability and empowerment as well as to explanation, developing skills, and increasing organisational flexibility." Analyses of marine management areas across Belize, Costa Rica, Ecuador, Panama, Colombia and Brazil found considerable variability in costs among locations but all sites had significant expenditure on enforcement (Samonte *et al.*, 2010).

If fishers are not committed to the rules, there is a particular danger that enforcement costs can exceed the benefits to society that the fishery is capable of generating. There may be strong arguments for increased economic rent capture to cover at least some of the costs to society of fisheries management, but given the institutional weaknesses in many developing countries, this seems unlikely to be very effective (Robinson, 2010). Many see co-management as the implementation of the principle of

subsidiarity, and that management is better done, at least in part, at lower levels. This perhaps suggests that there is a case for greater resource rent going to local authorities to assist with that management process and to facilitate the wider development role of fisheries locally.

Taxation of fisheries might be one way to do this but, in reality, these taxes are rarely applied in developing countries. In part, this is because governments do not have the information to set such taxes at appropriate levels, or do not have the political power to do so, or both (Anderson and Libecap, 2010). This is not to say that more rational economic measures in fisheries would not be beneficial. For instance, fishers generally do not pay for the right to fish or for the ecological costs of stock depletion (Sutinen, 2010) and, in some situations, revenue generation from the fishery, especially if locally collected, might be beneficial for wider development.

In most developed country fisheries, a trend towards the concentration of investment and fishing effort into fewer, larger vessels has helped the management process. However, a side effect has been the decline of employment opportunities. In the UK between 1938 and 2008, employment in capture fisheries fell from 48,000 people to 12,761, a loss of 73 percent of the workforce (Campbell and Cattermoul, 2009), a trend also seen in Norway, which lost 90 percent of its capture fisheries employment in a similar period (Béné *et al.*, 2010). While this may be acceptable in developed countries, where greater employment opportunities exist, it is less so in developing countries. Furthermore, the transaction costs of governments collecting this rent, enforcing property rights and delivering replacement development services to rural communities while avoiding political interference are likely to be high, especially where the rule of law is poorly adhered to. Legal rules, organizations and processes are central to the success of any effort to reform fisheries management (Thompson, 2010) and their existence and rigorous application in many developing countries is limited. Anderson and Libecap (2010) also noted that rents created by rights-based approaches and transferred to government will be competed for in a potentially rent-dissipating political process.

The extent to which fisheries are seen to generate economic benefits is in part dependent on how costs and benefits are measured. As Béné (2011) noted, "reducing the value of fisheries to their rent … misrepresents the real contribution that these small-scale fisheries play for the livelihoods and food security of millions of people in Africa." In the case of small-scale fisheries in developing countries, what is perceived as the dissipation of rents through a failure to accurately capture and measure them can actually represent, at least in part, the distribution of benefits from small-scale fisheries within local communities through employment and trade. This contribution is often not recorded in GDP figures, and so the economic role of small-scale fisheries is often ignored (Hall and Andrew, 2011). In this sense, community-based fisheries can play a significant role as a social policy instrument (Campbell *et al.*, 2006). In many countries, coastal fishing communities represent growth hubs where income from fisheries fuels a large local economy, but these multiplier effects are often poorly understood (Allison, 2011) and are all too often externalized from fisheries economic calculations. Small-scale coastal fisheries have generated, and continue to generate, employment for large numbers of people (Béné, 2011) on a full-time, part-time, seasonal and safety net basis which often forms a very significant part of their

livelihood strategies linked into other sectors (Whittingham *et al.*, 2003, Béné, 2011). For many people, having a particular sectoral focus for food, income and employment puts too much risk in one area, while a diversified portfolio of livelihood activities is safer and may keep them out of poverty (Allison and Ellis, 2001).

However attractive the capture of resource rent by the state may seem, it is difficult to find many examples where fisheries resource rent from small-scale fisheries in developing counties has been captured by the government and subsequently applied to local community development with the same multiplier effect as the fishery itself. This role of generating rural employment and providing a safety net, which fisheries often play in developing countries, is very important politically, especially when the government does not have the funds to fill the gap that other approaches to fisheries management might create.

Alban *et al.* (2011) provided some useful insights into addressing cost benefit analysis of MPAs but recognized the problems involved in doing so effectively, for example the difficulty of measuring non-market values such as marine biodiversity and the lack of data on the effects of MPAs on wider fisheries. In addition, transaction costs are likely to be high when using MPAs for tropical inshore fisheries (Rudd *et al.*, 2003). After reviewing a number of protected areas and associated approaches to management, DeFries *et al.* (2007) determined that identifying "small loss-big gain" opportunities – where big gains for management are achieved at low cost to human use – presents a key management challenge.

While the costs and benefits of different management systems will vary greatly, there are doubtless ways in which these costs can be rationalized through the application of good practice. One facet of costs and benefits noted in both the literature and interviews is that positive change in fisheries management requires adequate financial support for a long period of time to be effective. Ultimately this should be self-sustaining. Even in conservation-related management measures where fishers are excluded, there may be problems in financing the operations. Andrade and Rhodes (2012) noted that the successful establishment and maintenance of protected areas requires political and financial commitment in the long-term. Conservation International, in its Seascapes approach, recognizes the importance of sustainable financing and market mechanisms (Bensted-Smith and Kirkman, 2010).

The expert discussions, held as part of the review, highlighted the need for new and innovative sources of financing for fisheries and marine ecosystem management. The timeframes involved in establishing effective management processes and mechanisms are generally long and tend to stretch beyond the normal period of donor funding and project cycles, generally exceeding the mandates of politicians and administrators whose support and engagement is so important in bringing about change. Clearly, over these long timeframes, the priorities of donors, supporting agencies and politicians will often change, and the destination of available funding will often shift as these priorities evolve. For example, donors or government may prioritize setting up MPAs as a key management intervention for 2–3 years in response to wider political agendas, but this may subsequently be replaced by a desire to focus on climate change issues or community resilience for the next funding cycle.

This can make it extremely challenging to ensure the flow of resources required to support a long-term intervention to develop fisheries management. Those involved in implementing and supporting such processes on the ground often speak of the need for managers to be "entrepreneurial" in knitting together different sources of short-term funding in order to create a coherent program on the ground, and in molding the way in which they present their work in order to respond to changing priorities.

Alternative and innovative mechanisms for ensuring a more consistent and long-term flow of resources into the sector are therefore attracting increasing interest in fisheries management, just as they are already playing an increasingly important role in supporting marine conservation efforts in general. A variety of models for generating the resources to support transition to more sustainable management approaches have been proposed.

- The Financial Institution for the Recovery of Marine Ecosystems (FIRME), currently being developed as part of the WWF Smart Fishing Initiative, proposes establishing a fund that can provide resources for the upfront costs of developing and implementing management schemes on a loan basis, secured against the value of future fish stocks based on credible sustainable fisheries management plans. Initial potential financing for this fund has been identified to come from the redirection of subsidies currently directed at the fisheries sector (which are themselves partly responsible for existing management issues). Funding would also come from socially responsible investment from private finance, with a potentially important role for more traditional grant funds from governments and philanthropic institutions to leverage more sustainable investment sources and support higher risk initiatives (WWF, 2012).

- The development of markets for seafood products produced with ecologically and socially responsible methods has attracted much attention in recent years, particularly in developed countries. This provides, at least potentially, a means of generating revenue for producers and agencies through premium pricing that can be used to cover the additional costs of management and to cushion the social and economic impacts of changes in management. The costs associated with labeling schemes, which are considerable, particularly for small-scale producers, have generally been covered to date by grant funds from supporting organizations (MRAG, 2010).
- Trust funds for marine conservation have become popular over the last two decades as a means of providing longer-term financing that is not dependent on funding for specific projects or programs. These trust funds can take several forms, including endowments, which provide a permanent capital fund which generates investment from interest and investment earnings; sinking funds, which may also invest the capital provided and therefore have a limited life span; or revolving funds, where the capital provided is maintained through user fees, fines or earmarked taxes, such as the Belize Protected Areas Trust Fund which is maintained by a $4.00 fee for park visitors. Trust funds often tend to operate as sources of small grants and can provide effective long-term flows of resources into either fisheries management or marine conservation more generally, although they can suffer from relatively high administrative costs and are dependent on the performance of their investments (Spergel and Moye, 2004).

- Debt-for-nature swaps have also attracted attention, particularly from bilateral donors who agree to cancel part of a country's debt in return for guarantees on investment in nature conservation. The Philippines 2002 Debt-for-Nature swap with the United States government provided funds for small grants for conservation over a 10-year period, some of which was spent on marine conservation activities (Spergel and Moye, 2004).

- Earmarked taxes, fees and levies have been widely used in fisheries to ensure a sustainable flow of funding into fisheries management. Issues have been raised on occasions regarding the specific "earmarking" of funds from these sources, as opposed to their inclusion in the overall national budget. However, countries such as New Zealand, which has a Fisheries Services Levy and also charges a Conservation Services Levy on specific fisheries that have high levels of by-catch or ecosystem impacts, and Namibia, which has a Fish Catch Levy, have effective systems in place that ensure a flow of funds to fisheries research and fisheries management. Worldwide, these levies are found in many different forms, ranging from taxes on tourists, hotel guests and airport users, protected area entrance fees, excise taxes, lottery revenues and pollution fines (Spergel and Moye, 2004).

- Payments for ecosystem services (PES) also provide a potential source of financing for fisheries and marine ecosystem management. Although better developed for terrestrial ecosystems, where initial valuation and monitoring is easier, a market for the protection of marine ecosystem services is developing, particularly for coastal habitats and coral reefs. The valuation of the ecosystem services involved in marine habitats is particularly challenging, and the effectiveness of these mechanisms is particularly dependent on good governance and strong capacity to ensure compliance. The most widespread applications have been in more developed nations where the rule of law is strong and monitoring mechanisms are better developed (Forest Trends *et al.,* 2008).

To date, the application of such mechanisms to fisheries is less developed, although fisheries has also benefitted from existing tools and their application. However, the majority of these tools have tended to be applied in more developed countries as they almost all depend on the availability of data (for example on the values of ecosystems), high levels of monitoring (for example to ensure compliance in the protection of ecosystem services) and the availability of the resources and capacities required to set them up and ensure their proper functioning.

Getting market measures right

Market measures to support the sustainable harvesting of fish are becoming more popular in developed countries as a means to enhance the management process. Thus far, they have had limited effects in developing countries, but there is increasing pressure for these measures.

Markets have had profound effects on fisheries in many countries in recent years. Fish is now a significant source of foreign exchange for many countries, which has raised its profile among politicians. There is also a growing realization among consumers

BOX 22:

Certification helps community fishery in Vietnam

Ben Tre province in Vietnam worked with government officials to implement management measures in its clam fishery through allocating fishing rights to local cooperatives. This improved management of the clams and attracted the attention of WWF which provided partial funding toward paying for the full Marine Stewardship Council (MSC) assessment of the fishery. In 2009, the fishery received full certification that it was sustainable and well-managed. In total, the MSC certification cost $120,000.

Source: MRAG, 2010

that fisheries are having profound effects on the environment. Sustainable fisheries labels are becoming an increasingly important marketing device, especially in developed country supermarkets. The extent to which this has influenced small-scale fisheries in developing countries is limited, but the number of cases is growing (see Box 22).

An analysis of the Marine Stewardship Council (MSC), undertaken by Gulbrandsen (2009), found that the MSC has contributed to more open management processes in certified fisheries but that environmental benefits from the scheme may take longer to be seen. In a report on fish certification and eco-labeling, the OECD and FAO (2009) highlighted that sustainability is difficult to market. It is becoming clear that despite consumers' stated interests in the environmental impacts of their purchasing decisions, their actual buying behavior, especially in relation to food, is more likely to be determined by other factors. The current global financial crisis has seen consumer confidence fall and their behavior increasingly influenced by price. The industry therefore cannot, at the moment, rely on consumers being prepared to pay a price premium for sustainable fish and seafood.

Part of the debate at the 2009 OECD and FAO Round Table on Eco-labeling and Certification in the Fisheries Sector focused on the role that eco-labeling has played in management and fishers' behavior. According to the meeting report, at that time, there was little concrete evidence of the impact of eco-labeling and certification on improvements in fisheries management and sustainability. It speculated that eco-labeling had achieved more as a marketing tool than as a conservation one, although the report did go on to say that increasing evidence indicated that eco-labeling and certification might lead to better management through the purchasing behavior of the fish retail industry rather than through the direct demands of the public.

While market demand can influence the way fisheries are managed, there is a need to ensure that the poorer fishing communities are not excluded from these benefits through the cost of certification. It is also necessary to ensure that the increased revenues that certification may bring do not act as an incentive for increased movement into the fishery.

The need for a better understanding of how market mechanisms such as eco-labeling and certification work across international market chains was highlighted during expert interviews. The experts noted that the expected premiums to producers from such schemes did not always seem to materialize or were insufficient to cover the considerable costs involved in compliance with such mechanisms. UK retailers' concern over the use of trawler by-catch in fish feed for prawns in Thailand was cited as a specific

example of a situation in which realistic alternatives for feed producers were not always readily available and, when they were, would be likely to incur costs that they were not confident would be recouped through existing certification arrangements.

6.4 Factors affecting community engagement

A number of factors relate specifically to the community and the individual fishers themselves. These relate in part to the extent to which fisheries depend upon the coastal fisheries resources for their livelihoods, and what alternatives they have to engage in. Bringing about change in behavior requires understanding where fishers are coming from – what drives them – and from that understanding, building their commitment to change. This requires participation in all levels of decision-making, not just for fishers but for all relevant groups in the community. This participation includes making use of local knowledge systems and people's ability to analyze and advise on change processes.

Understanding dependency

The extent to which communities or households depend upon fisheries as a key part of their livelihood strategies will be a significant driver of impact within any fisheries management system. Livelihood dependency on fisheries can take many forms and is often a complex mixture of these.

Coastal ecosystems and their associated fisheries resources provide a wide array of ecosystem services (Millennium Ecosystem Assessment, 2005), and poor coastal people have quite specific and diverse patterns of dependency on these services (Campbell and Townsley, 2013). Whittingham *et al.* (2003) describe the forms that dependency can take. Some people, households and communities are highly dependent on fisheries resources for all or most of their needs. These needs may take the form of food, income, employment, a resource for reciprocal relations and to demonstrate power, cultural values, protection from the sea (e.g. coral reefs for coastal protection), building materials (e.g. reefs and mangroves), and areas for recreation and social engagement. Some people may depend upon the marine resources at times when land-based activities are less productive. Other people may depend upon the fishery at certain vital times of the seasonal calendar and, while they only spend a small proportion of their time involved in fisheries, this may be key to their survival. Yet other people may use fisheries as a safety net to fall back on when times are very hard. This is most prevalent where government social protection programs are not very strong (Bennett, 2005b). Cinner *et al.* (2010) have shown that poorer households have a greater reliance on fishing for primary subsistence or for income.

It is assumed, to an extent, that if other opportunities exist, fishers will leave the fishery and take up those opportunities. This was found to be the case in Cambodia where many of the fishers did not have a long cultural history of fishing (IMM *et al.*, 2003) but not the case in Kenya where fishers have a longer tradition of fishing (Cinner *et al.*, 2010).

More indirect forms of dependency also occur when people depend upon fish for processing and trade, and this can be a very significant part of household income. In

many communities, the income generated through fish sales and wages in the fishery provides a diverse array of local industries that survive because of the fishery (IMM *et al.*, 2005). The management system adopted for fisheries and marine ecosystems must be very aware of the dependency of different stakeholders and how management arrangements will affect each group.

Balancing exclusion, livelihoods alternatives and the local economy

All too often, fisheries management is seen as separate from the economic activities that surround it. But the local economy is one of the main drivers of over-exploitation of resources – if fisheries is seen as a business that is more beneficial than other local activities, more people will try to enter the fishery. This is particularly important for the poor who often have limited means to invest in equipment or land and lack the skills to enter other industries. Thus, if people are to be successfully excluded from the fishery, they need to have access to alternative options for their labor and capital that provide as good, or better, returns than fishing. This is often seen as an area of development that stands outside of fisheries management but, in reality, it is crucial to it.

As coastal populations increase and where fisheries' entry barriers are porous, more people will join the fishery on a full-time, part-time, seasonal or safety-net basis. A key part of fisheries management must ultimately be the decision to allow some people to fish and others to be excluded. If this is to be done equitably, then the different ways in which fishers depend on and use the coastal environment and its ecosystem services will need to be accommodated in the management system. In describing the underpinning rational for the need for closer links of fisheries in the wider economy, Charles and Herrera (1994, 1315) noted "…fisheries of developing regions typically face a trio of key problems: over-exploited stocks, an over-extended fleet and a lack of alternative employment outside of the fishery. In addressing these, the late economist Ian Smith (1981) expressed well a fundamental but oft-neglected reality: to be just, feasible and effective, policies cannot be restricted to resolving one of two of these problems alone." Charles and Herrera (1994) also discussed the points that Smith made regarding the consequences of not taking all three elements into account, namely: i) inhumane impacts on the fishers, ii) political infeasibility due to community reaction, or iii) failure due to fishers' non-compliance.

Ultimately some people will need to seek alternatives, or at least reduce their dependency through a more diversified livelihood portfolio, for some or all of the year. This requires an understanding of how fisheries and the wider economy interact. Graham *et al.* (2006) noted that "[m]uch has been written about economic development in countries, in regions, and in communities, but little about the connection between community-based fisheries management and economic development." This is a significant limitation, given how dependent those in the fisheries are on the wider local and national economy. This economy generates markets for capital and labour that affect investment in fisheries. Community-based fisheries management can be greatly influenced by the economic viability of the surrounding community.

Limited diversity of livelihood opportunities are both a factor driving people into fisheries and a barrier to their leaving. As a consequence, in coastal communities where there are few alternatives, more people will join the fishery or will need to

migrate away from their communities. Kuperan and Jahan (2010), for instance, identified a lack of alternatives as a major obstacle to fisheries management in coastal Bangladesh, where population pressure and non-compliance to fisheries regulations is accelerating over-fishing, noting that "the resource can be better managed and the compliance level can be improved if the fisherfolk have other means of generating income to manage their losses for the regulatory measures" (Kuperan and Jahan, 2010, 112).

In many coastal fisheries where fishing is seen as the occupation of last resort, this will be very difficult to achieve. As Tobey and Torell (2006, 853) noted, regarding the poor "[w]ithout other income generating options in the near future, the loss of nearshore marine fisheries could lead to a downward spiral of food security, income and vulnerability of rural coastal households."

Providing opportunities for the poor to move out of fisheries permanently, or at least reduce their level of dependency, is also fraught with difficulties, given their multiple deprivations: low income opportunities, weak market power, poor access to land-based resources, weak political access and low inclusion in public services such as health and education. Even under rights-based fisheries, Swan and Gréboval (2005) noted that regulating access and dealing with displaced fishermen are particularly important problems that must be overcome. This emphasized the need to view fisheries within the wider local and national economies.

However, for many people involved in fisheries, the household will already support a portfolio of livelihood activities reflecting, e.g. levels of wealth, skill, seasonal opportunities and available alternative or additional livelihood options (Allison and Ellis, 2001; IMM *et al.*, 2005; Walmsley et al., 2006; Cinner *et al.*, 2010). These will often be linked into the wider aspects of the local economy, and fisheries management should, ideally, be seen as part of the wider process of community development (Jentoft, 2000). Understanding fisheries from a livelihoods perspective can be a useful way of understanding dependency and the linkages to the wider community (Ferrol-Schulte *et al.*, 2013). Livelihoods approaches encourage a focus on the contribution of fisheries to wider local economic development, with the opportunities in the wider economy providing livelihood alternatives for fishers which might lower the pressure on stocks and improve the livelihoods of those involved. Closer integration of the fisheries economy with the wider local economic development should also assist in shifting the safety net/buffering role that fisheries provide for rural labor (Béné, 2003).

Co-management processes in the Philippines have started to move beyond fisheries management issues and started to address wider development, eco-tourism, alternatives to fishing and livelihood enhancement (Wilson *et al.*, 2006). This has also been recognized by ICM programs, which cover a much wider part of the economy and need to include a diversity of livelihood opportunities (White *et al.*, 2006). In Tanzania, there are also efforts to promote livelihood diversity (see Box 23), and in South Asia, efforts to develop a systematic approach to sustainable livelihood enhancement and diversification (SLED) have proved successful (Cattermoul *et al.*, 2008).

BOX 23:

Livelihood diversification

In Tanzania, MPAs have used the generation of diversified livelihood options as a way of reducing pressure on resources. Some 19% of male-headed and 16% of female-headed households surveyed have been involved in these activities.

Diversified income-generating activities included: agriculture, improved fishing techniques and marketing, apiculture, tree nurseries, rabbit fish cage culture, oyster farming, seaweed farming, and handicrafts such as weaving, .

Source: Tobey and Torell, 2006

From studies in Costa Rica on the diversification of livelihood opportunities for fisheries households, Charles and Herrera (1994) determined that the role of livelihood opportunities for fisher households may be enhanced by taking a more integrated approach to management which addresses value addition within the sector and by addressing both micro-level (community) and macro-level (industry) changes to alternative livelihood options.

The sequencing of the introduction of livelihood alternatives is very important (Cattermoul *et al.*, 2008). If restrictions on entry to the fisheries are introduced as part of a fisheries management process before adequate and acceptable alternatives are developed, then fishers are likely to invest in means to circumvent management measures. It is important to develop livelihood opportunities early in the management process. Ideally, these should not be the sorts of opportunities that are only services that rely solely on the income generated by fisheries. This is likely to create a localized "resource curse" situation. The "resource curse" reflects the poor potential of natural resource dependence to generate the economy-wide innovation needed to sustain growth (Collier, 2007; Barbier, 2007). This happens because a large amount of human, physical and financial capital often gets directed at the development of those resources at the expense of the rest of the economy (local or national). The spillover effects of natural resource exploitation tend to be less than those of manufacturing and service sectors, which reduces the diversification effect in the wider economy. This may be particularly pronounced in smaller economies where development resources are few anyway. Small-scale fisheries have the potential to be a "growth pole" in many coastal communities but, all too often, they tend to generate economic activity that perpetuates over-exploitation and dependency on the fishery. In reality, small-scale fisheries are a valuable resource that can lead to economic diversification if used properly.

While livelihood diversification is not always a successful approach to shifting pressure from fisheries resources (Tobey and Torell, 2006), there are examples where a participatory approach which facilitates the selection of livelihood opportunities by the communities themselves, rather than imposed from outside, can work (Cattermoul *et al.*, 2008). Micro-finance is very important to stimulate or facilitate livelihood alternatives (Tobey and Torell, 2006), as are wider mechanisms of support such as technical training, market information and development of entrepreneurship skills (Salagrama and Koriya, 2008).

Building capacity

Fishers and their wider communities have an important role to play in fisheries management, but first they need the skills to understand the management process and the knowledge required of their roles and responsibilities. Good leadership can play an

important part in this but can also distort the outcomes. Building community capacity to participate, engage, share and cooperate can be equally as important.

Good leadership of communities and groups seems to be an important ingredient of sound management as does good community cohesion. With an analysis of 130 co-managed fisheries across 44 countries, Guttiérrez *et al.* (2011) identified strong leadership as the most important attribute contributing to success, followed by individual or community quotas, social cohesion and protected areas.

However, White *et al.* (2006) noted the importance of building durable institutions that will be self-sustaining after leadership change. Processes such as ICM are seen as valuable governance mechanisms that can help this and can enhance the local government leadership role.

In his discussion of co-management on the Mekong River in Laos, Baird (1999) mentioned that when solidarity increases through co-management, there may also be other spin-offs such as community development.

A counter to good leadership can be dominant elites who look after themselves and their immediate supporters and colleagues. Patronage systems can be seen as powerful allies in management where a village chief or local elite is able to ensure compliance to management by a particular group. Participation in co-management does not always mean community empowerment and, even when the community is more empowered, it does not necessarily mean that such empowerment is even. Local elites may have a vested interest in moving the co-management process in certain directions or in presenting personal choices as those of the wider community. Such patronage is likely to exclude some key stakeholder groups, especially the poorest and most marginalized. This can be particularly damaging when managers or scientists assume a certain degree of homogeneity within communities and that the leader represents different groups fairly. This is particularly so where the effects and impacts of MPAs are being measured, and the exclusion of fishers is likely to have very different effects on different groups of people. Women excluded from gleaning local reefs on foot, for instance, are likely to suffer much more from a local exclusion zone that men with boats who are able to travel further afield. Women may lose not only local access rights but the ability to fish anywhere and the opportunity for social engagement with other women in the community where gleaning is a collaborative activity.

But paradoxically, local elites are essential to providing the leadership and legitimacy of co-management structures and processes (Wilson *et al.*, 2006). NGOs can have a role in reducing the adverse effects of these elites through building rights committees and other transparency mechanisms.[6] Civil society more generally has a particular role to play in fisheries management where communities are poorly organized (Jentoft, 2000). The power of such organization can be seen in Box 24.

[6] The Hunger Safety Net Programme (HSNP) outlines rights committees in pastoralist communities in Kenya http://www.hsnp.or.ke/index.php?option=com_content&view=article&id=142%3Arights&catid=34%3Aarticles&Itemid=1

BOX 24:

Post-cyclone cooperation

On India's Orissa coast, many migrant fishers had coalesced into communities but lacked cohesion and organization. After the Orissa cyclone in 2000, the NGOs providing support insisted that the community organize itself and form groups through which support could be provided. Although it had little previous experience of working in groups, the community discovered the benefits of mutual support and cooperation very quickly. Residents reported that this alone had transformed the way they function as a community and influenced all aspects of their lives.

Source: IMM, 2001

Rudd *et al.* (2003) noted that social capital in communities is very important for influencing decision-makers, for building solidarity within communities and for forming bridges among communities. This is important for developing learning networks and sharing ideas. According to Armitage *et al.* (2009), successful adaptive management calls for clear and identifiable sets of social entities with shared interests.

The extent of the community's ability to organize itself to work within a co-management arrangement is a significant issue affecting the potential impact of such arrangements. Abdullah *et al.* (1998) found that it can take 3–5 years to develop effective institutions.

Wilson *et al.* (2006) found that many co-management initiatives give the role of building capacity to NGOs operating in the areas. They provided examples in Philippines, Cambodia, Laos, Thailand and Bangladesh where capacity was strengthened by NGOs.

During expert discussions, participants also highlighted leadership issues as being important at levels above the community, as initiatives for fisheries management or conservation of marine areas have often tended to be highly dependent on specific individuals with the commitment and charisma to encourage wider support for such initiatives, whether in local government, the NGO sector or at higher policy-making levels. They saw this dependence on specific leaders as representing vulnerability, because such individual "champions" are subject to generational change or regular transfer to other locations or fields of work, especially given the long timeframes often involved in fisheries management development.

Work in Indonesia within the Coral Triangle Initiative is looking at how more systemic incentives can be created – within schools, higher education and government departments – to encourage people to commit to and engage in marine management issues. The goal is to generate a wider group of leaders of change across generations and institutions who can provide more sustainable leadership for change processes in the long-term.

Engaging with fishers' motives and preferences

A key part of working in partnership with fishers in the management process is understanding their motives and preferences. Without this, management assumptions can be well off mark.

In addition to understanding dependency of different groups, it is important to understand what drives fishers to do what they do and how they will react to change.

Hilborn (1985, cited in Salas and Gaertner, 2004) suggested that the collapse of many fisheries is due to misunderstanding fishers' behavior rather than a lack of knowledge of fisheries resources. Understanding what motivates fishers is an important part of deciding how to manage a fishery according to Hilborn (2007a), who also noted (2007a, 286) that "… fishermen respond to regulation in ways that often surprised managers, and managers must understand the motivation and incentives for fishermen to understand how they respond."

The context in which fishers convert policy measures into actions is subject to a number of influencing factors that can change the course of those actions. These include what their priorities are, their cultural norms and expectations, their perceptions of risk, their relationship with managers and politicians, conflict and cohesion with communities, and beliefs around the sustainability of the resource. In addition, these may differ from those of managers. Salas and Gaertner (2004, 154) recognized this when they said: "…fishers develop and implement strategies and tactics in response to the constraints they encounter and their intended objectives given their particular human, social, cultural and economic contexts. Managers in contrast, have generally made simplistic assumptions about fishers' nature and attitudes when defining management policies." This can be very important in a management context. As Hilborn (2007a, 290) noted: "[f]isheries management works much better when there is good cooperation between managers, scientists and the fishing fleets …" This cooperation depends on people understanding where each is coming from.

Understanding and responding to the motives of fishers is not straightforward. In an attempt to counter the potential effects of a change in community attitudes about MPAs, the Philippine government introduced the National Integrated Protected Areas Systems (NIPAS) to replace community-based management with national government direction. It did so because it feared the community might choose to turn its back on conservation objectives and exploit the MPA for economic benefit. This has reportedly generated much resentment within the communities and reduced effectiveness of the MPA (Hind *et al.*, 2010).

In many fishing communities, there is a tendency for boys and girls to follow in their parents' footsteps and join the sector. In some more traditional communities, fishing may be seen as a right or an obligation as a career. This can influence people's inclination to leave the fishery or not join the sector. This is not true in all situations, especially where fishers are part-time or seasonal operators. Where viable alternatives offer better benefits, those people will generally take them up. However, many fisheries people have few other skills and knowledge, which may make leaving much more difficult for them.

Fishers are apt to view resources in terms of their time preferences or the way they discount future benefits in current prices. People who have high discount rates favor current gains much more than the same gain in the future. Time preference influences the behavior of fishers, as well as those people making policy and those implementing it. For politicians the time horizons are generally short – 2 to 6 years (Sutinen, 2010) – because of the time between elections. The time preference for donor agencies can be even shorter, leading to substantial distortions of policy as their funding priori-

ties fluctuate in a given sector or policy area. Longer-term considerations are often less important to them than short-term gains. This can become a significant problem because when major institutional reform is needed for fisheries management change, it may take many years. After reviewing the legal requirements for community-based fisheries management in the Pacific, Kuemlangan (2004, 32) noted that "[a]ny external programme for assistance (for CBFM) should be for a longer term duration than normal technical assistance or development projects." This is not only required to address community-level institution building but also to build government understanding of the benefits of CBFM and to facilitate the necessary policy and legislative changes.

Fishers also often focus on the short-term. In open access fisheries, where fishers have no secure claim over future outcomes from the fishery, they are encouraged to reap the benefits quickly before others do. There are also uncertainties about future fisheries policy, markets and fish stocks. Poor people also sometimes have shorter time horizons because they discount benefits at higher rates suggesting a lesser commitment to environmental management (Holden *et al.*, 1998). In Tanzania, Tobey and Torell (2006) found that poverty may be a limiting factor to conservation efforts, in that poverty often forces people to engage in destructive practices.

If the time preferences of managers and fishers are very different, then giving fishers or local communities the rights to harvest fish resources may not always generate the expected results. For example, rights do not necessarily confer a commitment to sustainability. As Bromley (2009, 282) noted, "if the 'time preference' of a private owner is such that income now trumps income in the future, then private owners will be quite intent on liquidating (destroying) a renewable natural resource in order to spend the proceeds or invest them elsewhere." Investing current catches in your child's education may seem like a good investment even if it destroys future stocks.

It is also worth noting that the motivations and preferences of fishers are dynamic and constantly changing in response to their surrounding social and economic environment. Experience in India indicated how a combination of people's perceptions of the increasing competition for fisheries resources, exposure to outside ideas (in this case during the post-tsunami relief efforts after 2004), improved communications and access to education had led, over the course of a generation, to a significant change in the attitudes of many fishers in South India regarding the future of fisheries and their desire for their children to enter the fishery in the future (Townsley *et al.*, 2011).

Understanding these different motives is important for ensuring that fisheries management systems accommodate them and work with them.

Addressing commitment, compliance, conflict and enforcement

The enforcement of regulations represents a large part of the cost of any management process. This can be very high where fishers must be forced to comply with regulations rather than where they have a commitment to those regulations. Moving from compliance to commitment can be an important step in increasing management's effectiveness and reducing its cost.

Rights imply an entitlement which is generally supported in law. With those rights are responsibilities which often require the sustainable use of the resources. Enforcement involves both protecting those rights and ensuring that rights holders adhere to their responsibilities. In traditional fisheries, the enforcement of rights and responsibilities were often controlled by traditional authorities. The importance of these institutions should not be underestimated. As Jentoft (2000) noted, if the community disintegrates socially or morally, it becomes a threat to fish stocks. In many developing countries that have introduced more formal and centralized licensing systems, the enforcement of regulations has become more difficult with many vessels operating from many small landing sites. In many small-scale developing fisheries, the government lacks the funds to implement effective enforcement (Arthur, 2005).

Non-compliance to fisheries regulations undermines the effectiveness of management measures and is a major problem in most fisheries. In their review of compliance in the coastal fisheries in Bangladesh, Kuperan and Jahan (2010) recommended examining the level and causes of non-compliance and exploring policies for encouraging or securing compliance because, at that moment, the chances of detection and conviction in fisheries rule breaking in coastal Bangladesh were reported to be virtually nil. One solution to the compliance issue, suggested by Kuperan and Jahan (2010), called for moving towards co-management in fisheries where the additional transparency of the approach would support greater compliance.

Unless there is commitment to the operation of management measures, there are likely to be difficulties in getting compliance. For example, Christie and White (2007) found that MPAs were one of the preferred coral reef fisheries management measures – covering (at the time) 18.7 percent of the world's reef. Yet less than 0.01 percent of coral reefs were within no-take zones, with no poaching and at low risk. This suggested considerable lack of adherence to the rules. Rules not only need the legal framework to enforce them and the political will to implement enforcement but also legitimacy in the eyes of the fishers. Furthermore, legitimacy should also be in the eyes of wider society, but these forms of legitimacy can sometimes conflict (Jentoft, 2000).

The use of graduated sanctions is seen as important in resource management systems (Ostrom, 2009b), particularly in relation to rights, as well as very important to the success of fisheries management. However, all too often, this is missing, especially in countries where the rule of law is not well established. According to Christie and White (2006), lack of clear tenure rules can undermine MPAs, and fair and effective law enforcement, knowledge of the law, and consistency between national and local laws and institutional goals are important to MPA effectiveness. In-migration and conflicts outside of the community often require the government to intervene to resolve disputes (Wilson *et al.*, 2006). Where communities are more homogeneous, co-management seems to work better. Francis and Bryceson (2001, 94) noted that "[c]onflicts of interest can be resolved or avoided by fair processes respecting coastal communities' systems of land/sea tenure and common property rights."

Andrade and Rhodes (2012) implemented a meta-analysis of 55 published studies to understand the key factors that lead to community compliance with protected area

(PA) regulations. These included:

- establishing cooperative relationship among all stakeholders
- building relationships on voluntary compliance rather than draconian enforcement
- promoting enforcement through participatory decision-making
- setting rules that are clear and easy to understand
- setting internal and external boundaries that are well defined and recognized by resource used and officials
- ensuring well trained, equipped and motivated personnel
- determining penalties and applying and enforcing them consistently.

Fisheries management works best if there is good cooperation among the fishers, managers and scientists (Hilborn, 2007a), which enables the beginning of a shift from mere compliance with regulation to a sense of commitment to making the fishery work. As Bennett (2005b) noted, when fishers believe a stock needs supporting, they will agree to limit effort. A key part of the move towards effective management must be a move from fishers' coerced compliance to management regulation towards one where fishers are committed to the success of the management measures. Otherwise, there will be need to spend large amounts of funds and effort to ensure compliance, which is unlikely to be achieved in developing countries that have financial constraints. Understanding what incentivizes fishers is central to that process (Hilborn, 2007a).

Ensuring participation and inclusion

A part of generating compliance and commitment is building support for the management process, which requires involving fishers and their communities in the decision-making process. This means bringing in a much wider group than just the fishers because, in most communities, the whole local economy is closely linked to fishing and decisions are likely to have far reaching effects. The quality of that participation is also very important. Extractive participation – meaning the community is mined for its knowledge and consent – is likely to be less effective than where participation is more collegial (Campbell and Salagrama, 2001).

Participation of fishers in management decisions and processes that affect their lives and livelihoods is important for several reasons. It generates buy-in and support for the process, it empowers communities, it incorporates local knowledge and experience, and it can reduce costs. Recognizing that communities are not made up of people who all have the same needs and wants is key to effective participation (Bennett, undated).

Andrade and Rhodes (2012) found that compliance is driven primarily by local involvement in the protected areas' decision-making processes. This is because those decisions are likely to impact upon the livelihoods of people in adjacent communities. Many protected areas around the world have been developed using exclusionary top-down methods and, as such, failed to consider other important issues such as social, cultural and political concerns. Opponents of no-take MPAs consider that such measures have failed largely because they have been imposed on fishermen, and they argue for the assignation of property rights to fish stocks and co-management

through the greater involvement of fishermen in decision-making processes (Jones, 2007). The effects of exclusion of fishers from MPAs will have effects and impacts that are determined in part by the size of the enclosed area relative to the non-enclosed. MPAs that force the same number of fishers to catch from a smaller area are in danger of increasing over-exploitation in the areas outside the MPA at a much faster rate.

Respect for participation and inclusion is seen across the literature. Allison (2011, 11) found that "[o]nly meaningful engagement with and deliberation amongst stakeholders can yield goals that will be seen as legitimate." Similarly, Hall and Mainprize (2004) said that while it may not be possible to get complete agreement on the aims and potential outcomes of fisheries management, it is important that the views of all be heard. Aswani and Weiant (2004) noted that when local communities are excluded from protected area management systems, and their needs and aspirations are ignored, it becomes very difficult to enforce conservation policies. Andrade and Rhodes (2012) also noted that while the cost of patrolling big protected areas can be reduced by involvement of local people in patrolling and management, such stewardship will only take place if local communities feel included in the decision-making process. While biodiversity conservation may be achieved in the short-term, marginalizing participation in decision-making, not engaging in capacity building, not enhancing governance processes or enforcing regulations fairly is likely to lead to biodiversity loss in the long-term. In addition there seems to be a growing recognition that stakeholder participation needs to be sought throughout the monitoring and adaptive management process, not just in initial planning, given the limited knowledge of how ecosystems function (Arkema *et al.*, 2006).

In relation to community-based natural resources management (CBNRM) in general, Roe *et al.* (2009) pointed out that, to be successful, it must prioritize local interests, agency and capacity. Bell *et al.* (2006) noted that in China, if the state took over stock enhancement programs, they tended to fail because it was difficult to see who should pay for the benefits, while those operated by local fishermen worked much better.

The role of women in decision-making around fisheries management should not be forgotten (Bennett, 2005a). While women may play a smaller role than men in fish harvesting in most countries, their role in fish processing and trade is vital. Fisheries management measures can influence how much fish is landed, what sort of fish is landed, where it is landed, when it is landed and the condition in which it is landed. A recent study of women fish traders in Cambodia found that changes in the market for fish had changed significantly over an eight-year period, demonstrating the dynamic nature of the fish trade process (Asian Fisheries Society, 2013). Such changes can be driven by the fishery itself or by outside forces, but they can radically change the interface between fisheries management and fisheries trade.

All of these characteristics affect fish processors and traders, but can be dealt with quite differently by men and women, the poor and the wealthy, those who are able to travel and those who are restricted to the village for religious or family reasons (see Box 25).

Alpízar (2006) noted that the quality of participation is very important. This begs the question: who will be involved, how are they selected and what role will they take?

The degrees of participation of small-scale fishers in fisheries research were reviewed by Campbell and Salagrama (2001) who noted the important and valuable role that fishers can play in research but also the limitation of such practice. Charles *et al.* (2009, 178) noted that participatory research and community-based management "have considerable, yet often unrealized, potential in coastal fisheries of the world. They are, to a great extent, two sides of the same coin. In thinking about participatory research, we envision the building of a co-learning environment that is empowering for all participants…" DFID's Fisheries Management Science Programme identified the role that fishers can play in stock assessment work and how feedback from that process improved management decision-making (Howard and Arthur, 2005).

BOX 25:

Factors influencing fish processors in India

Increased capitalization of the India coastal fisheries has had a generally positive effect on the fishers although future catches are more vulnerable to overexploitation. However, increased landings into fewer ports has adversely affected many of the small-scale processors and traders. Centralization of landings has affected access to landed fish processing practices (especially the increased use of ice) and fish market opportunities. These have had knock-on effects on fishers' household incomes.

Source: IMM and ICM, 2003

Jentoft (2000) recognized the relationship between community and fisheries management as fundamental. Fishers are often born in and live in communities, and are enmeshed in the social and cultural structures and processes. If the management systems exclude the community, there is a danger that the fishers will act in their own interests only and ignore those of wider society. This role of the community will be important both in the design and implementation of fisheries management plans. However, Van Tuyen *et al.* (2010) noted that the livelihoods of coastal people in Vietnam are often in a state of flux (as they are in most places) adding to the complexity of planning and management in fisheries. They suggested that there is "growing recognition among authorities of the value of engaging local fishers and fish farmers in participatory process to resolve complex livelihood challenges, and the development of local management bodies (newly formed Fishing Associations) as a basis for emerging co-management of aquatic resources" (Van Tuyen *et al.*, 2010, 327).

However, as Belsky (2000) noted, we should be careful not to replace a more top-down theory of conservation with another where we assume that rural communities are "ecological noble communities" or make them central to every conservation effort. This is reiterated by Alpízar (2006) who pointed out that communities are heterogeneous and multidimensional, so conflicts, divisions and inequalities are likely to exist, and decisions are not always going to be environmentally benign. Belsky (2000) also found that not all communities have the necessary skills, governance and social structures to enable management to occur, that a focus on community management takes the focus off the role of multi-nationals, international treaties and institutions, and that those in control of conservation policy often do not have a strong understanding of how communities work. In relation to reef decline, Whittingham *et al.* (2003, 52) noted that "… participation is not a panacea to ensure that interventions succeed in preventing reef decline and assuring sustainable reef benefits for poor stakeholders." Other key elements include: i) when participation occurs in the management process,

ii) how it is sustained, iii) the equitability of the participation process, iv) the extent to which the poorer and other marginalized groups are included and v) how systems of patronage are included.

People also need to be included in understanding the need for change. In relation to ICM in the Philippines, White *et al.* (2006, 299) noted that "[p]roviding effective feedback on biological and socioeconomic information and quantitative indicators on fisheries and habitats as a result of effective management contributes to the understanding of why ICM is needed."

An important element of inclusion often omitted from fisheries management discussions is that of poverty. Where do the poor fit into fisheries management systems? Walmsley *et al.* (2006) expressed that fisheries is often poorly addressed in national poverty reduction strategies. In addition, because of their often marginalized positions, the poor are often excluded from fisheries management systems.

Linking different knowledge management systems

A key element of participation and building commitment is recognizing the value of local ecological knowledge and the experience-based knowledge of local fishers. All too often, fishers are regarded as ignorant and their traditional knowledge as inferior to that generated by more formal knowledge systems, which has often proved incorrect. There is a growing awareness of the value of these informal knowledge systems in fisheries management.

Knowledge management can be thought of as being composed of three components: i) generating knowledge, ii) sharing knowledge and iii) using knowledge. Even though knowledge is often considered that which is generated through formal science, fisher societies have both traditional knowledge that is transferred between generations with its roots in history, and experience-based knowledge which comes from working in the sector. Many fishers have profoundly detailed knowledge of their environment, the species of fish they target, changes in the waters they fish and its navigation, the seasons which influence their fishing and the techniques which preserve fish (see, for instance, von Brandt, 1972; Johannes, 1981; and Worsley, 1997 cited in Campbell and Salagrama, 2001).

Customary marine tenure systems are often underpinned by the existence, value and application of traditional ecological knowledge to management (see: Christy, 1982; Ruddle and Johannes, 1985; Scudder and Connelly, 1985; Cordell, 1989; and Johannes, 1981 cited in Campbell and Salagrama, 2001).

Berkes *et al.* (2000) discussed the importance of traditional ecological knowledge and acknowledged the similarity between such knowledge-based systems and adaptive management. Francis and Bryceson (2001, 94) researching the situation in the coast of Tanzania noted that "[b]oth traditional and scientific knowledge systems of coastal ecology and ecosystem management exist, but there are many gaps and there is a need for much improved dialogue and mutual respect between these knowledge systems."

In all aspects of knowledge management, a more collaborative approach is emerging as a key mechanism for shared understanding and decision-making in governance and policy processes more generally. The greater use of indigenous knowledge in fisheries management is a case in point. In fisheries research, participatory approaches to knowledge generation through all stages of the research cycle are becoming more prevalent (Campbell and Salagrama, 2001). Wilson *et al.* (2006) expressed that experience-based knowledge of fishers can be very useful for fisheries management. In the UK, the government's recent (2010–2013) process for the identification of marine conservation areas involved a very significant consultation and engagement with a wide array of stakeholders including fishers, sports divers, boat operators and conservation specialists. This was supported by marine scientists and policy makers. The extent and relevance of indigenous knowledge to fisheries is clearly demonstrated in Johannes' (1981) work among island communities in the Pacific.

The expert discussions generally found consensus that local knowledge and experience offer a crucial contribution to the knowledge base required for effective fisheries management. However there was less clarity regarding how this could be married with scientific knowledge. Some respondents, for example, were skeptical regarding the reliability of purely community-based mechanisms for monitoring and evaluating the impacts of management, particularly on the ecosystem and its functioning. Inputs by trained scientists were seen as indispensable in some fields. Others felt strongly that a large proportion of key information-gathering roles could be taken on by resource users themselves, and that this could represent an important cost-saving mechanism while also contributing to building local commitment and engagement in the whole process.

However, even when new knowledge is shared, it often is not used to inform policy and policy implementation. The work done through the Global Environment Facility (GEF) on its Large Marine Ecosystem projects, for instance, has generated a large amount of information about the biophysical, socio-economic, fisheries and governance aspects of marine management. However GEF is reported to have been less enthusiastic about funding improved practice, new management actions and protection of priority sites, according to Bensted-Smith and Kirkman (2010), who also noted that "[o]verall, the LME approach is a powerful generator of information and financial resources and promotes transboundary cooperation but we suggest that, in a developing country context, GEF and LME proponents should redirect emphasis and resources from natural sciences to effective, sustainable governance" (2010, iii).

Mutual respect for, and trust in, different knowledge systems can take several decades to develop (Armitage *et al.*, 2012). Without trust, the incentive to commit to management regimes based upon shared knowledge can be lost (Campbell and Cattermoul, 2009). The incorporation of local knowledge into policy-making processes is becoming more common in fisheries management, as is sharing more formal sources of knowledge within communities in ways that can be understood and used.

7

Discussion, conclusions and ways forward

7.1 Discussion

A large body of literature, both peer reviewed and institutional reports, covers the area of small-scale fisheries management. This synthesis reviews a small proportion of those to provide an understanding of the existing knowledge field. The emphasis of the study has been on "reviewing reviews" of experiences in the field, as much of the literature stands one step removed from the field itself. As a consequence, the synthesis represents the findings and opinions of thought leaders in the field who have assessed the evidence, cross referenced by discussion with some 20 key informants across the field.

There was widespread agreement that the fisheries sector is very important to global food and nutrition, to livelihoods, to foreign exchange earnings, to local community development and as a safety net for the poor. It was also agreed that fisheries are in a fairly poor state with most over-capitalized and many over-exploited. But there was also a sense of optimism that this could be turned around and that there were already signs of hope that this was being achieved.

A number of major themes in fisheries management that hold center stage in the discussions tend to focus on the degree of emphasis placed on different aims. Yield maximization, conservation, economic maximization and social policy are all entry points into fisheries management that color the focus of the management efforts. Increasingly, however, there is recognition of the need to balance these different themes and to look at fisheries management much more holistically.

This holistic approach brings recognition of the complex nature of fisheries management that is changing in the face of globalized markets and climate change. It is that complexity which needs to be embraced through much more integrated approaches to management that work across different scales and levels. This requires horizontal integration into the wider economy at local, national and global levels, and vertical

integration to link the local fisheries situation to wider concerns of migratory stocks, cross-boundary effects, water pollution, IUU fishing and global markets.

There is also recognition that there is no "silver bullet", no universal answer for all the problems of fisheries. Each situation is ecologically, socially, economically, culturally and politically different. Local context is very important, particularly as more holistic approaches are adopted. The aims and objectives of different stakeholders and the local context will differ, making the definition of revitalized fisheries different in different locations. However, there does appear to be considerable support for the idea that a number of factors influence success in a number of locations around the globe. There is also a growing consensus of the need to use a combination of these factors to set a general trend of improvement in motion.

An important element in this consensus is that the process by which fisheries management is developed and implemented is more important than the specific measures through which it is implemented. In part, this is dictated by the fact that the timeframes involved in bringing about change in the way fisheries and marine ecosystems are managed are long, which means that the process by which stakeholders, institutions and decision-making mechanisms are engaged over time needs careful attention. Collaborative approaches seem to play an important role in such processes, but the exact roles played by government, the community, community representatives, NGOs and the private sector will tend to vary according to context and the stage of development of the process itself. The way the management process develops will also depend very much on the broader context of governance, subsidiarity, institutional capacity and fit, rights to resources, the legal framework, inclusiveness and scale, and it will be influenced strongly by the prevailing political economy in different locations.

Ensuring the long-term viability of the resource and the wider ecosystem was generally accepted as a key element, but one which needs to be balanced by other concerns around the ability of stakeholders, particularly the poor, to respond to change and around how benefits from protected ecosystem services might be distributed. It was also clear that adaptation to change is likely to play a larger part in fisheries management in the future – climate change is introducing uncertainty that needs to be incorporated into the planning process. There was considerable support for the use of more adaptive approaches to respond to change and to build greater resilience in communities. Given both the level of change in the management process and the change in the fishery itself, it was felt that fisheries management needs to be introduced incrementally, as this approach allows adaptation in policy, policy implementation and community structures and processes. However, creating the capacity at all levels – within policy mechanisms, communities and agencies – to work in an adaptive fashion is itself a challenge for which they require support and assistance.

This suggests that introducing and establishing major shifts in the management process will not occur quickly in most situations. A long-term commitment by funders to this change process will be necessary, requiring more sustainable funding mechanisms to be identified and put in place without further adding to the subsidies to the sector. Improved market chains have a role to play in improving the benefit flows to fishers, but will require sequencing.

There was also widespread recognition that greater inclusion of fishers and their communities in the decision-making process is key. This builds on recognition of the importance of rights and responsibilities at all levels, and goes beyond the inclusion of fisher's representatives in the form of local elites. It recognizes that fishers are a disparate group of people who depend upon fisheries in quite different ways. It also recognizes that other members of coastal communities are affected by how fisheries management is conducted. Women in their roles as fish processors and traders are greatly influenced by management decisions. Children are affected by future employment opportunities. The wider society is affected by the benefits that flow from fisheries into the local economy.

Ultimately, fisheries management decisions will involve some people being included in the right to fish and some being excluded. Those excluded may be current fishers or future generations who may wish to join the fishery. Those who are excluded will need alternative livelihood options, otherwise they are likely to become impoverished or will try to circumvent entry regulations. Fisheries are generally closely linked to the local economy in which they operate, and ensuring that they become a vital part of local economic development is essential. Getting the balance right between exclusion, alternative livelihoods and linkages with the local economy will be very important to the sustainable and equitable development of small-scale fisheries. Embedding fisheries management into the wider context of the local economy is essential if the livelihoods of the poor are to be enhanced.

It will also be important to get the sequencing of decisions around controls over entry, market chain development and livelihood alternatives right. Introducing improvements in market chains before the rights to fish are established will encourage movement into the fishery. Restricting entry to the fishery before alternative investment and labor opportunities are established can push the poor into a state of desperation.

There was considerable concern about getting the motives of fishers in line with those of managers and recognizing the importance of different time frames for management decisions. Given differences between people, there would likely be conflicts and violations of regulation that would need good enforcement, sound leadership, community cohesion and a greater sense of commitment to the management process. This again requires support for capacity building at the community level and building a sense of trust among the different players. A shared recognition of the value of formal and informal knowledge systems would provide a basis for starting to build that trust.

7.2 Conclusions

It is clear from this work that there is no simple universal cure for the problems that face small-scale coastal fisheries. These fisheries are complex, confused and difficult to deal with, as well as locally specific. However, this does not mean that fisheries cannot achieve a much more balanced equitable and sustainable trajectory into the future. The 20 factors identified in this synthesis could help achieve this – when combined into a process for change. There are doubtless others that would emerge from a more comprehensive study.

There is much that needs to be done to celebrate the areas of success that have been achieved so far but also to recognize that widespread success will take a considerable number of years, substantial financial support and a commitment to building capacity at all levels.

Lessons can be learned from outside of small-scale coastal fisheries, such as those that have emerged from inland fisheries, such as Bangladesh and Cambodia where co-management systems are well developed. There also have been lessons from other resource management systems such as forestry, livestock and game which have parallels with fisheries. An approach to fisheries management which seeks examples and solutions beyond fisheries is likely to generate more useful approaches.

Efforts to distill these different factors into principles for management began with the *Code of Conduct for Responsible Fisheries*. The specific needs of small-scale fisheries that go beyond the Code have been progressively recognized and FAO is currently producing a draft *International Guidelines for Securing Sustainable Small-Scale Fisheries* to address many of the emerging issues associated with fisheries management. These Guidelines are intended to enhance the contribution of small-scale fisheries to poverty alleviation, food security and economic growth.

An important development in fisheries management is the greater interest in operating at higher scales as well as the community levels. Regional recognition of, and support for, good practice creates normative pressure for others to adopt. Learning networks around fisheries and marine ecosystem management are important in supporting the exchange of positive experience. While the *Code of Conduct for Responsible Fisheries* has not been universally applied, it has become a standard against which practice is measured. The proposed Guidelines have the potential to go much further but will need time, commitment and financial support to achieve this potential.

7.3 Ways forward

There is much that can be done to bring the successful experiences of different fisheries together into a more coherent and consistent process – a process supported by tools and mechanisms and learning materials that will facilitate a more incremental but more coordinated approach to management change. This would need to be done on an iterative basis where experience and learning is shared through networks and exchanges, particularly in the face of climate change where so much remains unknown.

The evolving FAO *International Guidelines for Securing Sustainable Small-Scale Fisheries* provides a framework for moving more equitable and sustainable fisheries forward. This is still being developed and needs to be piloted to enable the different tools and mechanisms for implementation to be developed.

In addition, as this report has shown, there are knowledge gaps in the process that should be given consideration for future work, investment or development in the sector, such as: how to combine these success factors into an effective process; to what extent will they complement or conflict with one another; how can the appro-

priateness of different elements in the fisheries management process for different locations be assessed and understood; what form would adaptive planning take to address fisheries management in a rapidly changing marine environment; how can we generate revenues from small-scale coastal fisheries that will fund local management initiatives, create alternative investment and livelihood opportunities, and stimulate the wider local economy; how do we get the sequencing of interventions right for different stakeholder groups; and how do we ensure long-term funding for the process?

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Annexes

ANNEX 1:

A: Electronic database search log

DATE OF SEARCH	SEARCH DATABASE	SEARCH TERMS	SEARCH FIELD	NO. OF RESULTS
02/07/13	Web of Knowledge –Web of Science	Fish* *manage*	Topic	29,916
02/07/13	Web of Knowledge – Web of Science	Fish* *manage* coast*	Topic	5,189
02/07/13	Web of Knowledge – Web of Science	Fish* community-based	Topic	550
02/07/13	Web of Knowledge – Web of Science	Fish* adaptive NEAR/3 manage*	Topic	447
02/07/13	Web of Knowledge – Web of Science	Ecosystem *manage*	Topic	32,823
02/07/13	Web of Knowledge – Web of Science	Ecosystem *manage* coast*	Topic	4,267
02/07/13	Web of Knowledge – Web of Science	Ecosystem community-based	Topic	438
02/07/13	Web of Knowledge – Web of Science	Ecosystem adaptive NEAR/3 manage*	Topic	1,041
02/07/13	Web of Knowledge – Web of Science	Natural resource *manage*	Topic	15,408
02/07/13	Web of Knowledge – Web of Science	Natural resource *manage* coast*	Topic	1,288
02/07/13	Web of Knowledge – Web of Science	Natural resource community-based	Topic	622
02/07/13	Web of Knowledge – Web of Science	Natural resource adaptive NEAR/3 manage*	Topic	460
03/07/13	Scirus	Fish* *manage*	Complete document	Query too general
03/07/13	Scirus	Fish* *manage* coast*	Complete document	Query too general
03/07/13	Scirus	Fish* *manage*	Title	18,445
03/07/13	Scirus	Fish* *manage* coast*	Title	514
03/07/13	Scirus	Fish* community-based	Complete document	2,095,331
03/07/13	Scirus	Fish* community-based	Title	342
03/07/13	Scirus	Ecosystem *manage*	Complete document	Query too general
03/07/13	Scirus	Ecosystem *manage* coast*	Complete document	Query too general
03/07/13	Scirus	Ecosystem *manage*	Title	9,323
03/07/13	Scirus	Ecosystem *manage* coast*	Title	72
03/07/13	Scirus	Ecosystem community-based	Completed document	772, 268

DATE OF SEARCH	SEARCH DATABASE	SEARCH TERMS	SEARCH FIELD	NO. OF RESULTS
10203/07/13	Scirus	Ecosystem community-based	Title	102
03/07/13	Scirus	Natural resource *manage*	Complete document	4,725,634
03/07/13	Scirus	Natural resource *manage*	Title	8,874
03/07/13	Scirus	Natural resource *manage* coast*	Complete document	937, 141
03/07/13	Scirus	Natural resource *manage* coast*	Title	105
03/07/13	Scirus	Natural resource community-based	Complete document	1,858,356
03/07/13	Scirus	Natural resource community-based	Title	360
04/07/13	Directory of Open Access Journals	Fish* *manage*	All Fields	No matches
04/07/13	Directory of Open Access Journals	Fish* *manage*	Title	No matches
04/07/13	Directory of Open Access Journals	Fisheries management	All Fields	32+
04/07/13	Directory of Open Access Journals	Fish* community-based	All Fields	4+
04/07/13	Directory of Open Access Journals	Ecosystem *manage*	All Fields	No matches
04/07/13	Directory of Open Access Journals	Ecosystem *manage*	Title	No matches
04/07/13	Directory of Open Access Journals	Ecosystem management	All Fields	3+
04/07/13	Directory of Open Access Journals	Ecosystem community-based	All Fields	3+
04/04/13	Directory of Open Access Journals	Natural resource *manage*	All Fields	No matches
04/07/13	Directory of Open Access Journals	Natural resource *manage*	Title	No matches
04/07/13	Directory of Open Access Journals	Natural resource management	All Fields	1+
04/07/13	Directory of Open Access Journals	Natural resource community-based	All Fields	5+
04/07/13	Applied Social Sciences Index and Abstracts	Fish* *manage*	All Fields	10+
08/07/13	Applied Social Sciences Index and Abstracts	Fish* community-based	All Fields	2+
08/07/13	Applied Social Sciences Index and Abstracts	Ecosystem *manage*	All Fields	0
08/07/13	Applied Social Sciences Index and Abstracts	Ecosystem community-based	All Fields	0
08/07/13	Applied Social Sciences Index and Abstracts	Natural resource *manage*	All Fields	1+
08/07/13	Applied Social Sciences Index and Abstracts	Natural resource community-based	All Fields	0
10/07/13	Aquatic Sciences and Fisheries Abstracts	Fish* *manage*	All Fields	94, 247
10/07/13	Aquatic Sciences and Fisheries Abstracts	Fish* *manage* coast*	All Fields	21, 127

DATE OF SEARCH	SEARCH DATABASE	SEARCH TERMS	SEARCH FIELD	NO. OF RESULTS
10/07/13	Aquatic Sciences and Fisheries Abstracts	Fish* *manage* coast*	Abstract	7, 248
10/07/13	Aquatic Sciences and Fisheries Abstracts	Fish* *manage* coast*	Document Title	316
10/07/13	Aquatic Sciences and Fisheries Abstracts	Fish* community-based	All Fields	923
10/07/13	Aquatic Sciences and Fisheries Abstracts	Ecosystem *manage*	All Fields	49, 666
10/07/13	Aquatic Sciences and Fisheries Abstracts	Ecosystem *manage* coast*	All Fields	13, 184
10/07/13	Aquatic Sciences and Fisheries Abstracts	Ecosystem *manage* coast*	Abstract	3,811
10/07/13	Aquatic Sciences and Fisheries Abstracts	Ecosystem *manage* coast*	Document Title	111
10/07/13	Aquatic Sciences and Fisheries Abstracts	Ecosystem community-based	All Fields	516
10/07/13	Aquatic Sciences and Fisheries Abstracts	Ecosystem community-based coast*	All Fields	155
10/07/13	Aquatic Sciences and Fisheries Abstracts	Natural resource *manage*	All Fields	38,446
10/07/13	Aquatic Sciences and Fisheries Abstracts	Natural resource *manage* coast*	All Fields	9,953
10/07/13	Aquatic Sciences and Fisheries Abstracts	Natural resource *manage* coast*	Abstract	1,438
10/07/13	Aquatic Sciences and Fisheries Abstracts	Natural resource *manage* coast*	Document Title	9

+ results screened for language and relevance criteria

B: Institutional grey literature search log

DATE OF SEARCH	INSTITUTION WEBSITE:	SEARCH AREA	NO. OF RESULTS
14.07.2013	http://www.coopesolidar.org/	Sent by author	2
14.07.2013	http://www.wcs.org/	Sent by co-author	2
15.07.2013	http://fish.washington.edu/	Sent by co-authors	7
15.07.2013	http://www.fao.org/fishery/topic/13261/en	FAO Fish Ecosystem	7
15.07.2013	http://www.fao.org/fishery/mpas//en	FAO Fish Ecosystem Marine protected areas	1
15.07.2013	http://www.fao.org/fishery/topic/2880/en	FAO Fisheries Ecosystems	1
15.07.2013	http://www.fao.org/fishery/topic/3542/en	FAO Fisheries Ecosystems Coastal & marine ecosystems	1

DATE OF SEARCH	INSTITUTION WEBSITE:	SEARCH AREA	NO. OF RESULTS
15.07.2013	http://www.fao.org/fishery/topic/3320/en	FAO Fisheries Ecosystems Coastal & marine ecosystems Types of ecosystems	1
15.07.2013	ftp://ftp.fao.org/fi/DOCUMENT/eaf/eafguidelines_278364.pdf	Sent by co-author	1
18.07.2013	http://toobigtoignore.net/	Books	2
18.07.2013	http://toobigtoignore.net/	Articles	1
19.07.2013	http://www.conservation.org/global/marine/Pages/partnerlanding.aspx	Marine	-
19.07.2013	http://www.conservation.org/global/marine/initiatives/fisheries/Pages/sustainable_fisheries.aspx	Sustainable fisheries	-
19.07.2013	http://www.conservation.org/global/marine/initiatives/seascapes/pages/seascapes.aspx	Seascapes	2
19.07.2013	http://www.science2action.org/	Research and innovation	8
19.07.2013	http://www.science2action.org/files/sciencereports/	Science reports	4
19.07.2013	http://www.conservation.org/global/marine/publications/	Marine, Resources and publications	2
19.07.2013	http://equatorinitiative.org/		-
19.07.2013	http://sfg.msi.ucsb.edu/current-projects/sustainable-ocean-solutions	Sustainable Oceans Solutions	-
19.07.2013	http://sfg.msi.ucsb.edu/current-projects/unassessed_fisheries	Un-assessed fisheries	1
19.07.2013	http://www.ifad.org/	Sent by author	1
19.07.2013	http://sfg.msi.ucsb.edu/	Sent by co-author	1
23.07.2013	http://www.mrcmekong.org/	Sent by author	1
23.07.2013	http://www.mrcmekong.org/publications/topic/fisheries?start=20	Publications Fisheries	1
23.07.2013	http://www.rflp.org/co_management	Co-management	7
25.07.2013	http://www.protectplanetocean.org/	Tools and resources	1
27.07.2013	https://openknowledge.worldbank.org/browse?order=ASC&rpp=20&sort_by=-1&etal=-1&offset=200&type=topic	Fisheries and aquaculture	1
27.07.2013	http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTARD/0, contentMDK:23070469~pagePK:148956~piPK:216618~theSitePK:336682,00.html	World Bank Profish	20
29.07.2013	http://www.iucn.org/about/union/commissions/sustainable_use_and_livelihoods_specialist_group/	Lessons learned	2
30.07.2013	http://www.afma.gov.au/resource-centre/research/reports/	Research reports	5
30.07.2013	http://www.afma.gov.au/search/?query=ecosystem+based+management	Ecosystem-based management guidelines	2
30.07.2013	http://www.afma.gov.au/	Sent by author	1
30.07.2013	http://www.cdu.edu.au/	Sent by author	4
01.08.2013	http://www.lmmanetwork.org/resourcecenter	Resource center	3
14/08/13	http://www.idrc.ca/EN/Resources/Publications/Pages/default.aspx	Publications - Co-management	2
14/08/13		Publications - Fisheries management	0
14/08/13		Publications – Fish	1

DATE OF SEARCH	INSTITUTION WEBSITE:	SEARCH AREA	NO. OF RESULTS
14/08/13	http://www.idrc.ca/EN/Resources/Publications/Pages/IDRCBooksList.aspx	IDRC Books – Co-management	0
14/08/13		IDRC Books – Fisheries management	0
14/08/13		IDRC Books - Fish	2
14/08/13	http://www.smu.ca/webfiles/Dr.TonyCharles.pdf	Co-management; community-based; ecosystem approach to fisheries; fishery management and governance; international fisheries; rights based management; small-scale fisheries; successful fisheries	26
14/08/13	http://www.southampton.ac.uk/oes/research/publications.page?	Publications	0
14/08/13	http://www.enaca.org/modules/library/tag.php?label_type=1	Better management practices	0
14/08/13		Livelihoods, gender and social issues	1
14/08/13	http://www.afdb.org/en/documents/environment/12/	Environment	0
14/08/13	http://www.adb.org/publications/search/448?keyword=fish	Agriculture and natural resource – Fish	2
15/08/13	http://www.worldfishcenter.org/worldfish-publications	Fisheries management – open access	23
15/08/13	http://r4d.dfid.gov.uk/Search/SearchResults.aspx?search=advancedsearch&SearchType=3&Projects=false&Documents=true&DocumentsOnly=true&Anyword=fisheries+management&AnywordCondition=AND&AnyWordPhrase1=1&AnyWordChooseField1=-1&Keywords=2188&PageNo=7	Fisheries management	7
15/08/13	http://www.apfic.org/modules/wfdownloads/	Co-management	2
15/08/13	http://www.apfic.org/modules/wfdownloads/viewcat.php?cid=59	Fishery and aquaculture policy	1
15/08/13	http://www.apfic.org/modules/wfdownloads/viewcat.php?cid=57	Ecosystem approach to fisheries	3
15/08/13	http://www.apfic.org/modules/wfdownloads/viewcat.php?cid=67	Promoting co-managemenet	2
15/08/13	http://www.apfic.org/modules/wfdownloads/viewcat.php?cid=76	Gender in fisheries and aquaculture	1
15/08/13	http://www.apfic.org/modules/wfdownloads/singlefile.php?cid=68&lid=274	Participatory development approaches	1
16/08/13	http://caricom-fisheries.com/PublicationsandDocuments/CRFMResearchPaperCollection/tabid/86/Default.aspx	CRFM Research Paper Collection	2
16/08/13	http://caricom-fisheries.com/PublicationsandDocuments/CRFMTechnicalandAdvisoryDocuments/tabid/87/Default.aspx	CRFM Technical and Advisory Documents	4
20/08/13	http://www.macfound.org/press/publications/conservation-sustainable-development-white-papers/	Conservation and Sustainable development white papers	1
20/08/13	http://www.castlefoundation.org/grants-marine.htm	Nearshore Marine Resource Conservation	0
20/08/13	http://www.waltonfamilyfoundation.org/environment/marine-conservation	Marine Conservation	0
20/08/13	http://www.oakfnd.org/library	Environment	0
20/08/13	http://www.packard.org/what-were-learning/program-area/children-families-and-communities/	Conservation and Science; Children, Families and Communities	0

ANNEX 2

Informal knowledge search checklist

NAME(S)	ORGANIZATION(S)	POSITION(S)	LOCATION	DATE

The checklist below lays out some broad questions about your knowledge and experience of eco-system based community management approaches (left hand column) while the middle column contains some additional more specific issues that you may want to consider while writing your responses in the right hand column. Please feel free to treat these questions as freely as you wish and by all means make suggestions regarding their relevance. In your responses to some of the questions, you might want to make a distinction between your personal opinions and experience, and those of the organization that you work for.

GENERAL QUESTIONS	PROMPTS	KEY KNOWLEDGE AREAS/OUTPUTS
What do you feel are the key characteristics or defining features of an ecosystem-based community management (ECM) approach?		
What experience have you had of these approaches?	What ECM initiatives have you been involved with / are you familiar with?	
	Describe the key features of the approaches used?	
What do you regard as the strengths and weaknesses of ECM approaches (based on your experience) and what factors contribute to them?	How would you define a successful ECM approach?	
	What are/were the strengths of the approaches you have experienced or used?	
	What were the weaknesses?	
What specific factors contribute/d to their success or positive impacts / failure?	Ecological / resource characteristics?	
	Social setting?	
	Governance arrangements?	
	Characteristics of the organisations involved?	
	Wider institutional context?	
	Scale?	
	Markets?	
	Wider economy?	
	Timing?	
	Cost-effectiveness?	
Can you suggest key initiatives, individuals or organisations who work on ECM who we should be in contact with as part of this review?	What other individuals or organisations are you aware of working on ECM and/or community-based management?	
What documents would you regard as the most useful for understanding ECM approaches?	Papers. Reports. Books. Guidelines and manuals. Articles.	