Fisheries co-management

A synthesis of the lessons learned from the DFID Fisheries Management Science Programme

MRAG

ACKNOWLEDGEMENTS

The Fisheries Management Science Programme (FMSP) has generated a wealth of information on various aspects of the management of fisheries resources in developing countries. This synthesis document provides an opportunity to synthesise, in an accessible manner, the experiences gained from a number of projects implemented in Africa, Asia and the Pacific that can inform the development, implementation and evaluation of co-management policies and plans.

In the first place, funding by the UK Department for international Development (DfID) through the FMSP should be acknowledged for enabling this synthesis to be produced. In developing this synthesis particular thanks go to Ashley Halls, Caroline Garaway, Suzannah Walmsley and Charlotte Howard who have provided useful design ideas, comments and corrections during its development.

While this synthesis provides an opportunity to bring together the lessons and experiences from eleven years of FMSP research, these lessons and experiences are the result of close collaboration between a large number of researchers and organisations over the years. The researchers who have undertaken the research on which the synthesis draws are also acknowledged, in particular those associated with projects R7042, R8285 and R8462, R7335, R8292, R7947, R8397 and R8464, it is hoped that this synthesis document will lead the reader to explore their work further. The interest and effort of policy makers, managers, fishers and others dependent on the resource systems who have been involved in all the FMSP projects and who have shared their knowledge, experiences and perspectives over the years is also gratefully acknowledged.

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Cover photo. Kiribati fishers in Tarawa lagoon. Photo taken by R. Arthur

WHAT IS THE AIM OF THIS SYNTHESIS?

For the last eleven years, the UK Department for International Development (DfID) have been funding research projects to support the sustainable management of fisheries resources (both inland and marine) in developing countries through the Fisheries Management Science Programme (FMSP). A number of these projects that have been commissioned in this time have examined fisheries co-management. While these projects have, for the most part, been implemented separately, the FMSP has provided an opportunity to synthesise and draw together some of the information generated by these projects. We feel that there is value in distilling some of the important lessons and describing some of the useful tools and examples and making these available through a single, accessible resource.

Photo: Benefitting from co-management: Increased harvests of fish from flooded rice fields in West Bengal (Photo: P.K. Pandit).

The wealth of information generated means that it is impossible to cover everything in detail but it is hoped that this synthesis will at least provide an overview of the co-management process together with some useful information relating to implementing co-management in a developing country context and links to the more detailed resources available, in particular on information systems for co-managed fisheries, participatory fish stock assessment (ParFish) and adaptive learning that have, in particular, been drawn upon for this synthesis.

Moves towards co-managed fisheries

In many developing countries centralised management of small-scale fisheries has not been able to ensure the sustainable management of fisheries resources on which so many depend. Often this is because information to support management decision making is either not available or, being provided in a top-down manner that may be detached from resource users and their needs, fails to account for local complexities and the uncertainties they create. At the same time, centralised management agencies also often lack the resources to enforce management decisions made centrally or to support more local arrangements.

Because of this, or because of economically driven reforms and constraints, increasing attention has been given to the possibilities afforded by co-management. While co-management has been interpreted differently by different groups (see next page), there is agreement that the exact nature of the co-management arrangement will depend upon the particular human, technological, economic and biological circumstances and the particular opportunities and constraints associated with the fishery. In a co-managed fishery different stakeholder groups will need to agree and assume different (and perhaps new) management roles and responsibilities.

Apart from the scale at which the arrangement operates, and perhaps the issue of the development of appropriate and effective decision making arrangements (see page 12), it is clear that co-management will make demands on all stakeholders involved. It will also require an increased emphasis on communication and flexible management decision making. These requirements mean that the process of developing and maintaining co-management arrangements will need support and facilitation if it is to meet the needs of those dependent upon the resources as well as wider national objectives.

While 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. Indeed, given the wider opportunities for learning that diversity can provide, the variety of arrangements that can arise should perhaps be welcomed.

Co-management advocates recognise that while local users may have little financial capital they often have, at the very least, considerable knowledge about the fishery and local needs that can be utilised. In collaborative management arrangements this knowledge can be complemented by the assets brought by government and external agents, including their access to technical and scientific knowledge and potential to facilitate communication between stakeholder groups. This synthesis will consider a number of issues around this.

Who is this synthesis aimed at?

This synthesis is aimed at anyone interested in fisheries management in a developing country context. In particular we feel that it will be of particular relevance to those individuals and organisations that are already involved, or who intend to be involved, in developing co-management arrangements and/or the co-management planning processes.

What do we mean by co-management?

As mentioned on page 4, a diverse range of co-management arrangements are possible. As shown in the diagram below these can range from the instructive, where decisions are made by government and government informs fishers and other stakeholders (including external agents such as NGOs, academic and research organisations, and other fisheries and coastal resource stakeholders such as boat owners, fish traders, money lenders, tourism establishments etc) of the decisions that they have made. At the other extreme, decision making authority is delegated to fishers who then inform the government of the decisions made. As such co-management is seen to represent the sharing of management responsibility and/or authority between fishers and government. This definition has been used by a number of FMSP projects (see page 6) including *information systems, ParFish* and *floodplains management*, projects which have developed tools that are also useful in centralised management.

However, it has been found that the delegation of responsibility for management without corresponding delegation of authority, described as 'instrumental co-management', often produces outcomes not much better than for centralised management. This is because the stakeholders still lack the incentive to manage in a sustainable manner. For this reason there has been an increasing use of a narrower definition of co-management where co-management involves decentralizing decision making, providing an opportunity for partnership arrangements in which government, fishers and other stakeholders share both the responsibility and authority for decision making and implementing agreed management plans. This centres around the co-operative type of co-management in the diagram below. This narrower definition has been used by FMSP projects including the *synthesis of stock assessment methods* and *adaptive learning*, the latter which has developed and tested tools specifically for collaborative decision making and learning. In this synthesis, while the broad definition is accepted, the view is taken that it is the narrower definition, and the more collaborative management arrangements, that is more desirable.

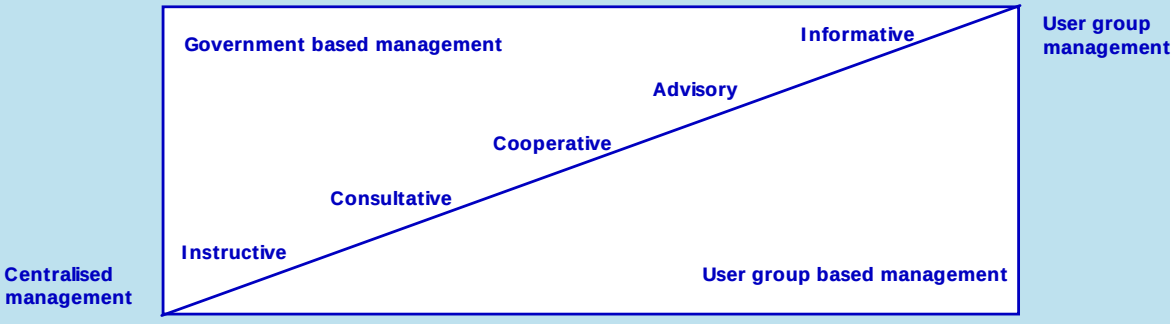


Diagram: Typology of co-management arrangements. Adapted from Sen and Neilsen (1996)

SYNTHESIS STRUCTURE

Over the past eleven years the Fisheries Management Science Programme has commissioned over 50 projects. These projects have been designed to address constraints to the development and sustainable use of both capture and enhancement fisheries in developing countries. The projects have produced a wealth of new knowledge and a number of innovative tools and methods and made these widely available.

While many of the technical tools produced, e.g. stock assessment tools, will have a role in supporting management decision making, several have generated knowledge, tools and methods that are directly relevant to the establishment of, and on-going support to, co-managed fisheries.

This latter set of projects form the basis for much of the material within this synthesis. Details on a number of the key projects, some of which have themselves built on earlier projects, are provided in the table below. Further details on all FMSP projects, together with project reports, are available on the FMSP website at **www.fmsp.org.uk**.

Projects	Project purpose	Outputs
Customary Marine Tenure (R6436)	To examine the performance of Customary Marine Tenure regimes and identify how co-management can contribute.	Guidelines towards effective co-management of coral reef fisheries in the Pacific region.
Interdiciplinary Multivariate Analysis for adaptive co-management (R7834)	To develop empirical models of co-management performance based on interdisciplinary indicators and robust statistical methods.	Guidelines for field application of regression and Bayesian Networks analysis.
Application and promotion of ParFish (R7947, R8397 and R8464)	To develop, field-test and promote a toolkit (ParFish) to provide rapid stock assessment using fisher knowl-edge in data poor fisheries.	Toolkit including guidelines, software and user manual to support implementation of ParFish methodology.
Co-management data collection and sharing mechanisms (R7042, R8285 and R8462)	Develop, test and promote appropriate and cost-effective generic data collection methodologies and information sharing mechanisms.	Guides and guidelines for designing Data Collection and Sharing Systems for co-managed fisheries
Enabling better management of conflict (R7334 and R8294)	To develop and promote better conflict management approaches, including assessment and resolution tools and consensus building methods	Framework (FishCom), guide to conflict resolution and policy brief.
Synthesis of FMSP assessment tools (R8468)	To develop manuals to assist managers to select and use the most appropriate FMSP stock assessment tools for their circumstances.	Framework guides and guidelines to the selection and use of FMSP stock assessment tools.
River fishery harvest reserve design and co-management (R7043)	To identify ecological, social and institutional criteria for the selection and use of harvest reserves in tropical river fisheries, and to develop guidelines for their management	Guidelines for establishing co-management systems for river fisheries and selecting and managing harvest reserves.
Adaptive learning approaches for co-management (R7335 and R8292)	To develop, test and promote interdisciplinary approaches, tools and guidelines to support learning approaches in co-management.	Guidelines for implementing adaptive co-management.
Understanding livelihoods dependent on fisheries (R8118, R8196, R8249 and R8331)	To provide information on the importance of fisheries in complex livelihoods of the poor and constraints to development.	Policy briefs.
Sluice gate control in floodplain fisheries (R8210 and R8486)	To improve the decision-making capacity of poor farmers/fishers in using sluice gates to manage the water in modified floodplains for the mutual benefits of both rice and fish crops.	Guidelines for sluice gate operation and policy briefs.

How to use this synthesis

It is recognised that every co-management situation will be different, is likely to be complex, and that the situation will also be dynamic in the biological, technical and social aspects of the resource system. It is also the case that some sort of management will probably already be happening. This synthesis, therefore, is not presented to you as a guide to 'doing' co-management or as a definitive set of recommendations. Rather it is a collection of experiences and lessons learned for you to consider, together with tools and criteria relevant to various stages of the management process, that have resulted from the FMSP projects. Informative and illustrative examples from the experiences of FMSP projects will be highlighted.

In developing this synthesis the focus has been on providing information and links to further resources. As you read the sections you should keep in mind the nature of the particular system you are working in and the resources and capacity available to you.

The layout of the synthesis is based around the process of co-management as depicted in the diagram on page 9. This is used to structure the sections rather than to describe a process with a start and finish as it is expected that many of the parts of the process will overlap or occur simultaneously. You should therefore dip in and out of the sections as needed. We hope that you will find the guide useful and that you will feel free to adapt the tools and methods presented for your own needs.

PART 1 — The co-management process

This section describes the process of co-management, including the development and implementation of co-management policy and local management plans. It also highlights the generation and use of information within the process.

PART 2 — Co-management policy

Part 2 covers the development and implementation of national policies that can provide a legal framework and enabling environment for the development of local co-management plans, highlighting some of the tools that can be used at the local level to identify stakeholders and engage them in management planning..

PART 3 — Developing co-management plans

Developing co-management plans can be a difficult process and this section highlights some of the tools that have been developed to identify objectives, information needs, roles and responsibilities during this process.

PART 4 — Implementing co-management plans

During implementation information will be generated that can be used to assess the performance of management plans and policies. This section concentrates on methods for information sharing so that it can be utilised by different stakeholder groups.

PART 5 — Evaluating co-management

Evaluation is a key part of the co-management process and this section highlights some of the areas that will need to be addressed in evaluating co-management.

PART 6 — Additional resources

The final section provides details of the resources on which this synthesis has been based and where these can be accessed.

THE CO-MANAGEMENT PROCESS

As we have suggested in the last section, the failure of centralised management that is detached from fishers and those dependent on fisheries resources means that there should be more involvement of these groups in the management process and in decision-making.

It will only be in this way that we can ensure that management reflects their needs rather than what we assume their needs to be. However, bringing these stakeholders into the management process makes a number of demands and requires that we look again at the management process.

More on identifying which stakeholders should be involved, and how, can be found on pages 12 and 13.

Management as informed decision-making

One way to look at management, and the one that will be used in this synthesis, is to think of it as a process of informed decision-making together with the effective implementation of actions to support these decisions. Taking this view focuses us on to two aspects of the process that have been subjects of FMSP research. Firstly the information (its relevance and use of) and secondly the decision-making arrangements (their transparency, accountability and effectiveness).

The role of information

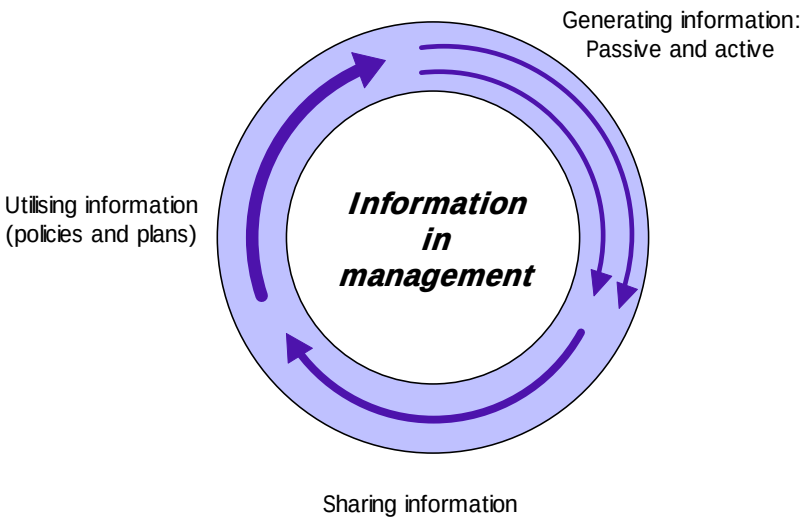
Four uses of information within the co-management process have been identified by the *information systems* projects. These are:

1. Information for developing and evaluating national policy
2. Information required to develop local management plans
3. Information to implement and enforce management plans
4. Information to evaluate and revise local management plans

In each case, to improve management it is important that the three stages of information use shown in the diagram below are conducted effectively in order to provide relevant information in an appropriate and timely fashion to each of the stakeholder groups involved. The FMSP research has provided a number of useful resources on generating and sharing information and for evaluating the process of information use. Details on a number of these are provided in Part 6.

The co-management process

The process and how data is generated, transformed into information and then utilised is shown in the diagram on the right. This diagram will provide the structure for the rest of the



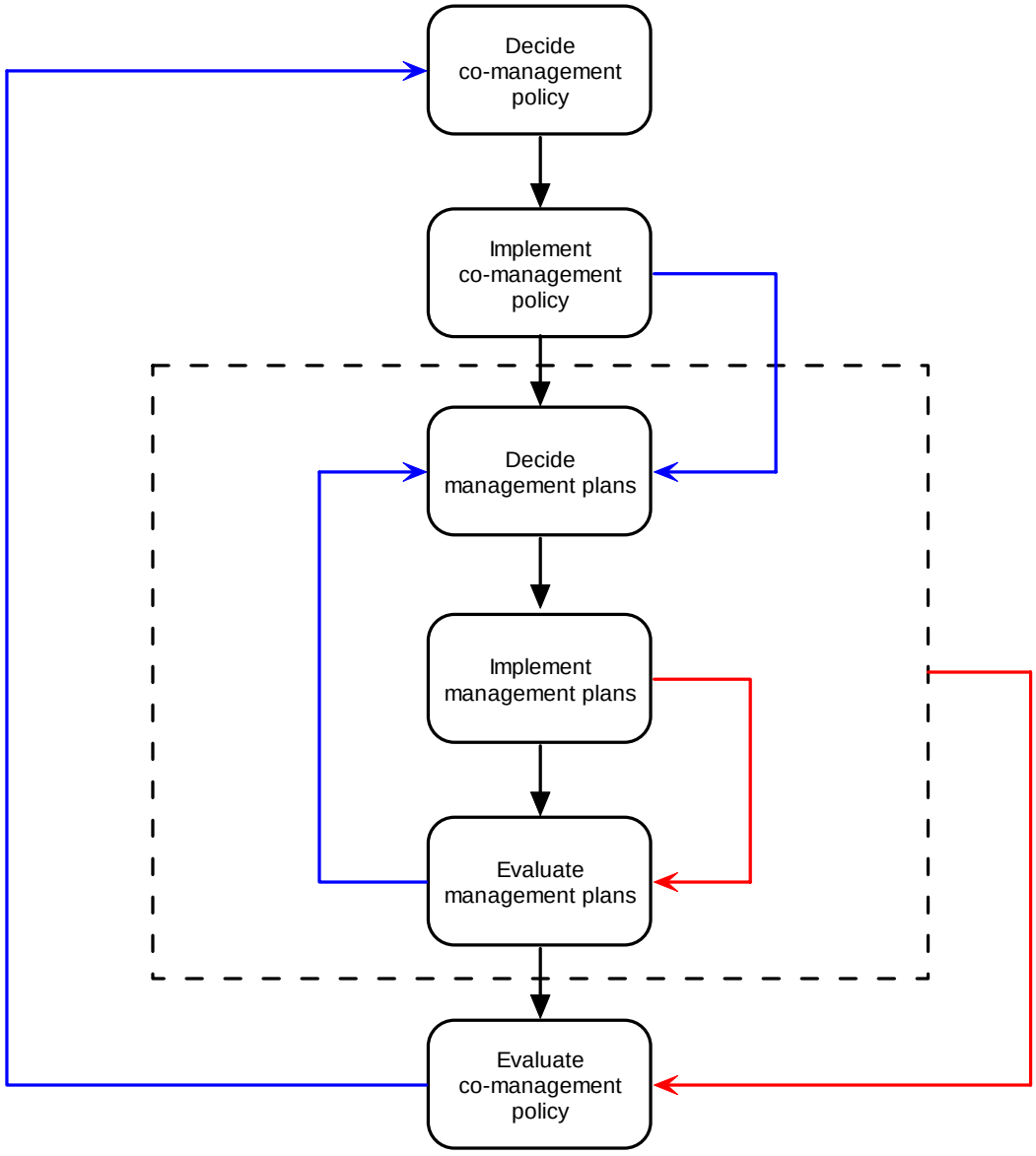


Diagram: The co-management process, indicating the role of data (red) and information (blue) at different stages of the process. The dashed box represents a single co-management unit. Adapted from Halls et al. (2005)

guide. In terms of the process, the FMSP co-management projects have focussed mainly on developing tools and strategies to support the management planning part of the process rather than policy. However some lessons can (and will) be drawn from the experiences.

As can be seen, data (in red) and information (in blue) feature strongly in the process with the implementation of co-management plans providing data that can then be used to inform both future management planning as well as policy formulation.

As mentioned, the decision making arrangements are the other crucial area of the process and, as can be seen from the diagram above, there are two key decision-making arenas. The first is in the decisions about co-management policy. These decisions then act to create, or not, an enabling environment in which co-management plans may be developed. The second key decision-making arena is management planning.

Management planning will occur within each co-management unit (of which there may be many), and will be influenced not only by conditions within the unit but also by the decisions made at the policy level.

DEVELOPING AND IMPLEMENTING POLICY

As mentioned on page 8, the FMSP projects have not researched co-management policy formulation and implementation. However research at the operational level has highlighted a number of lessons relating to policy. Essentially this can be summarised as formal legislation should be used or created that supports co-management. The aim should be to legitimise the management planning and provide an enabling framework within which detailed and locally appropriate rule making can occur with full backing of the law. Local arrangements and locally decided rules may also then need support for monitoring and enforcement from government agencies.

Photo: Conflict over control of water resources for fishing and agriculture at Pabna, Bangladesh. Multiple resource use issues can be a major consideration in policy formulation (Photo: A. Halls).

Policies at the national level are generally aimed at ensuring sustainability, food security, equity in benefit sharing and providing direction for good governance. These policies may be explicit co-management policies or devolution of management decision-making may be a component of natural resources management policies. Because of the need for such policies, their implementation and ensuring the consistency of local plans with policy, government will always have a vital role in co-management regardless of the extent that it becomes involved in local management planning.

Either way, policies will often reflect national legislation, the broad development and poverty reduction goals of governments as well as obligations resulting from international or regional management and development agreements, or ratifications of conventions, codes of conduct or voluntary instruments - many of which have management, monitoring and reporting obligations associated with them. In order to put these policies into practice the key activities that need to be undertaken at the national level are:

- The development or modification of legislation that enables and supports decentralised co-management including facilitating access to the resources and strengthening inclusive decision making fora at all levels;
- Provision of training, communication, conflict resolution and extension services to support management;
- Specification of broad national sectoral objectives;
- Ensure compatibility of management plans with national plans and international agreements.

Policies, legislation and their ability to achieve the aims needs to be under constant review. Not only are policy decisions often made without perfect information but also societal changes, together with changes in the biological and technical aspects of the fishery, may create a need for revision of legislation and supportive arrangements.

Governance and co-management

Devolution of fisheries management to local co-management units is not easy. It makes demands on governments to develop and implement policies that will result in devolution as well support to the co-management units. This can be challenging and requires changes in the way that agencies have operated at all administrative levels.

In the first instance many governments and their agencies at the different administrative levels may need to be convinced of the benefits of co-management before making changes to existing legislation or promoting it as policy and practice. This in itself may be no trivial matter.

Where devolution occurs, it is likely that government departments and agencies will find themselves taking on new roles and responsibilities. The most important one is working with local managers or their representatives to formulate local management plans. As part of this process the department or agency will have to ensure that management objectives are consistent with policy objectives, and that the decisions made comply or are consistent with existing national legislation.

Departments and agencies may also find themselves having a role in monitoring and evaluating the performance of the co-management policy itself, and making refinements and adjustments where necessary. The key attributes that are needed for these changes are an ability to communicate with different stakeholder groups and a commitment to transparency, accountability and self-evaluation. Attributes that can be a challenge to develop.

This leads on to an important role of the state: improving management decision-making by providing both information related to the fishery and to national objectives and in developing the decision-making arrangements by increasing the capacity of those involved to make, implement and to evaluate management decisions. This can include, for example, increasing technical, social financial and decision-making skills by providing training both informal and formal. This could possibly include inputs from non-governmental agencies with particular skills in facilitating organisational change.

Devolving decision-making to the appropriate level means there may be decisions relating to fisheries occurring at a number of administrative levels, involving a variety of sectors and a wide range of stakeholders. Ensuring that these decisions do not lead to conflicts and that there is no duplication of effort requires coordination. However this coordination also provides opportunities. For example, the monitoring of a number of management plans can allow management activities within individual plans to be coordinated, potentially minimising conflicts and providing opportunities to learn from comparing across management units.

Issues of scale

With fisheries it is important that the decision making associated with developing the management plan occurs at a scale that matches the scale of the resource. There is little point making detailed management plans at a village level if the fishery is accessed by fishers from elsewhere who cannot be excluded or made subject to the agreed regulations. Similarly there may be a need for coordination of individual management units, for example within a catchment area. However, management at larger scales and higher administrative levels means, if the decision-making forum is to be manageable, that not every individual can be present. Where this is the case then there is a need to ensure that a) all the important stakeholder groups are represented and b) that the representation is legitimate and communicates the views of those being represented.

Photo: Small waterbody in Lao PDR managed at the village level. A straightforward issue of scale (Photo: R. Arthur and C. Garaway).

The level at which it is appropriate to make management decisions are made will therefore depend upon a number of aspects including the scale of the resource and the skills, capacity and resources that the managers need to successfully manage the fishery and the administrative level at which these exist.

Once the administrative level(s) have been established there is a need to identify who should be involved in management and to develop and support multi-stakeholder management structures through effective governance. The following pages will focus on describing lessons and tools from FMSP projects that can assist the development of and support for these co-management structures that can be established at a more local level.

Engaging stakeholder groups

When moving towards a more inclusive decision making process it is important to establish which stakeholder groups should be involved in the process and what roles and responsibilities each could assume. Even if there is on-going management decision-making it is worth pausing and looking at who is involved and represented in the decision-making process and how. As a means to systematically identifying the key stakeholders in a system FMSP projects made use of stakeholder analysis methodologies.

Stakeholder analysis

There are a number of ways you can collect information for a stakeholder analysis. Some examples used in the FMSP projects have included:

Details on a stakeholder analysis are provided in the adaptive learning and information systems guidelines and in the ParFish toolkit. See references in Part 6.

- Identification by staff of key agencies, and other knowledgeable individuals;
- Identification through written records and population data;
- Stakeholder self-selection:
  Encourage stakeholders to come forward through announcements in meetings, newspapers, local radio or other local means of spreading information;
- Identification and verification by other stakeholders. Early discussions with those stakeholders who are identified first can reveal their views on the other key stakeholders who matter to them.

Conducting a stakeholder analysis will identify a range of stakeholder groups from different backgrounds and sectors who are considered as being important to involve in the decision making process. It may be the case that these groups may not have much, or indeed any, experience of working together.

Developing an asset-based process

At the outset (see box on page 5) it was stated that co-management provides an opportunity for different stakeholder groups to collaborate in the management of the fishery. One of the principles of the *adaptive learning* approach is that the management process should build on strengths and existing knowledge rather than identifying and focussing on weaknesses. This is very important with co-management where so many different perspectives are available and there is so much knowledge of different types that can be made use of. In fact the principle of asset-based management is one that we shall return to within this synthesis.

Photo: Small-scale fisher in Seychelles. Such people often have a wealth of time and place knowledge about the fishery. (Photo: R. Wakeford).

The table on the right provides a summary of the relative strengths and weaknesses of the different stakeholder groups that were involved in the co-management of small waterbody, community managed fisheries in southern Lao PDR in the *adaptive learning* project. As can be seen, each stakeholder group had a range of skills and knowledge that, when brought together, could complement one another. While it is unlikely that the mix of strengths will be the same in every case, such an analysis can provide an early indication of the potential roles that different stakeholder groups might be able to play.

Strengths	Local communities	Government	External researchers
Capacity to make management regulations	☑☑☑	☑☑	
Capacity to monitor & enforce regulations	☑☑		
Knowledge of local resources and needs	☑☑☑	☑☑	☑
Scientific knowledge	☑	☑☑	☑☑☑
Traditional research skills		☑	☑☑☑
Access to experiences of others	☑	☑☑	☑☑☑
Financial resources	☑	☑	☑☑
Capacity to bring different stakeholders together to share experience		☑☑	

Diagram: The relative strengths in skills and knowledge of key stakeholders in southern Lao PDR during adaptive learning.

Who should be involved and how

Identifying the strengths and weaknesses of the different stakeholder allows us to begin to establish what each group can contribute to the management process and what sort of roles that they might best assume. It also provides a starting point for identifying what communications linkages might need to be developed and what sort of communications methods and media might be needed to facilitate effective communications within and between stakeholder groups. This is especially important where groups may be from different social or discourse communities and hence may not used be to communicating

While more will be said about communicating with stakeholder groups on pages 14 and 15, there will need to be an initial approach to stakeholder groups, either directly or through their representatives, to mobilise the interests of the stakeholder groups and secure their involvement in the management process. It can also provide a starting point for negotiating and agreeing the type of arrangement that will be developed and how this will be resourced. Experience from the FMSP projects suggests that it is important that this is clear from the outset.

That stakeholders will wish to be involved is something that is often taken for granted. Just because we come with good intentions does not mean that people will want to work with us, or with each other. This is true not just of fishers but also researchers, policy-makers and extension workers, many of whom are busy with other activities and who will need to see that participation will benefit them.

All of the FMSP projects have shown that time spent participating in co-management comes at a cost. In order that the benefits from co-management 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 . A number of the tools developed in the *adaptive learning*, *ParFish* and *floodplains management* projects can assist with this.

Developing stakeholder communication networks

Across the FMSP research projects the importance of identifying and developing information flows has come up repeatedly. For example, in the *adaptive learning* approach, 'learning' is seen not only as generating new information, but also about sharing this information along with other relevant existing information. Likewise, the *ParFish* project found that feeding back information to fishers on the results of analysis was important in developing ownership of the results and consensus on the state of the stock and management options. However it is necessary to find the best means and channels for communicating this information for it to reach the right stakeholders. The adaptive learning and information systems guidelines both identify the lack of access to information as a potential constraint to more effective management.

One way to determine the most effective communications flows is to examine existing communications networks and use this to identify new opportunities or build on existing connections. Such analysis often reveals that communications networks are highly complex and rather than being simple lines from the resource user up to government departments are more likely to be a series of inter-linked webs that may include both formal and informal lines of communication. For example a review of communications networks among the stakeholders involved in the management of the Huay Luang Reservoir in Thailand during the *information systems* project found a series of linkages between villages, the water-body management organisation (TAO), provincial and district government which could be used to define an effective communications network (see diagram below).

The review enabled stakeholders to determine who was in the best place to collect monitoring data, who could analyse this data and what networks were in place or could be enhanced for passing the information on to those who would be interested in it. Although many of the networks were already in place, the review enabled stakeholder to realise the benefit of the TAO acting as an information hub and the importance of data and information flows between the resource users collecting the data and the Fisheries office analysing the data.

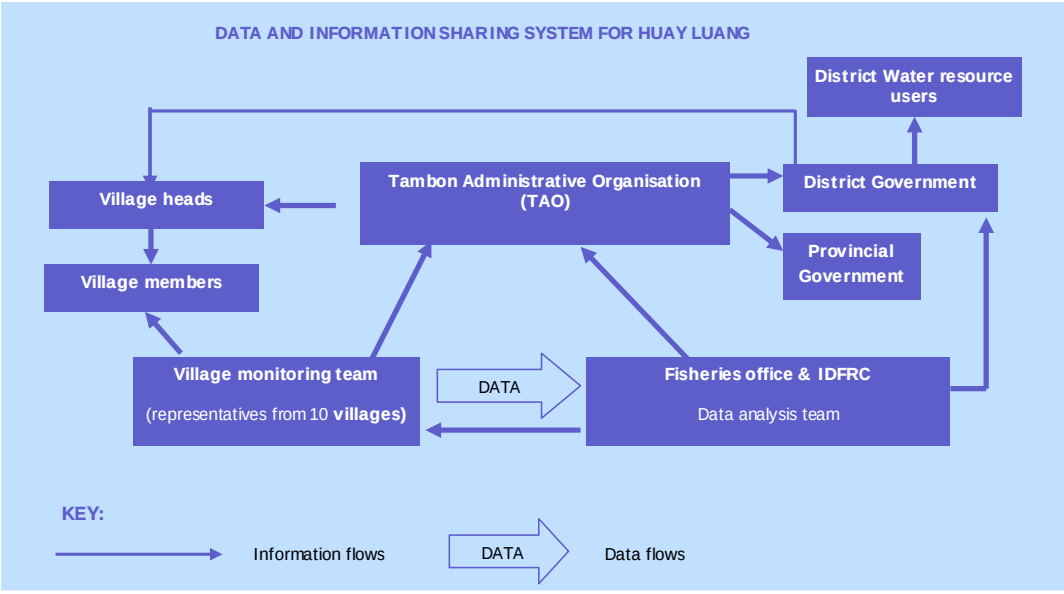


Diagram: Communication networks developed for co-management of the Huay Luang reservoir and fishery during the information systems project (From Halls et al. 2005)

Building on existing structures

The *adaptive learning* approach showed that it was possible to build on existing, rather top-down information sharing structures to fundamentally change information flows and allow more interchange between groups.

A review of the information flows among stakeholders within a fishery in southern Lao PDR revealed a hierarchical system, with the majority of information flowing downwards. There was some information flowing back up the hierarchy but this was minimal. There was no sideways communication (i.e. within the different stakeholder groups) and there were no mechanisms for any of the other stakeholders to communicate with external researchers (see diagram below).

In the example below, in the existing situation (before), many opportunities for information flow were being missed. Villagers and village committees are both users and managers of the fishery and have considerable local knowledge. However learning, in order to improve resource management, is slow as villages manage separate water bodies in isolation and have little opportunity to share knowledge and experience among one another. Likewise district and provincial staff receive minimal information on the real needs and priorities of villages and have little contact with other districts to learn from successful management or research methods used by others. This system is by no means atypical of other communication networks in the region, particularly those connected with government extension services and similar hierarchical situations were also identified for a number of fisheries during the *information systems* project.

As shown in the diagram below, a more desirable and achievable communications network could be identified that would enhance information sharing. This system moved away from the hierarchical structure and allowed information flows within stakeholder groups e.g. between village committees and between districts, as well as improving the two-way flow between the different levels. This communication network formed the basis for increasing the flow of information that allowed villages to improve the management of their waterbodies in line with their objectives and enabled the government staff to better understand the opportunities and constraints faced by villages. The results were increased benefits from the fisheries and government staff who were better able to support villagers in management decision-making.

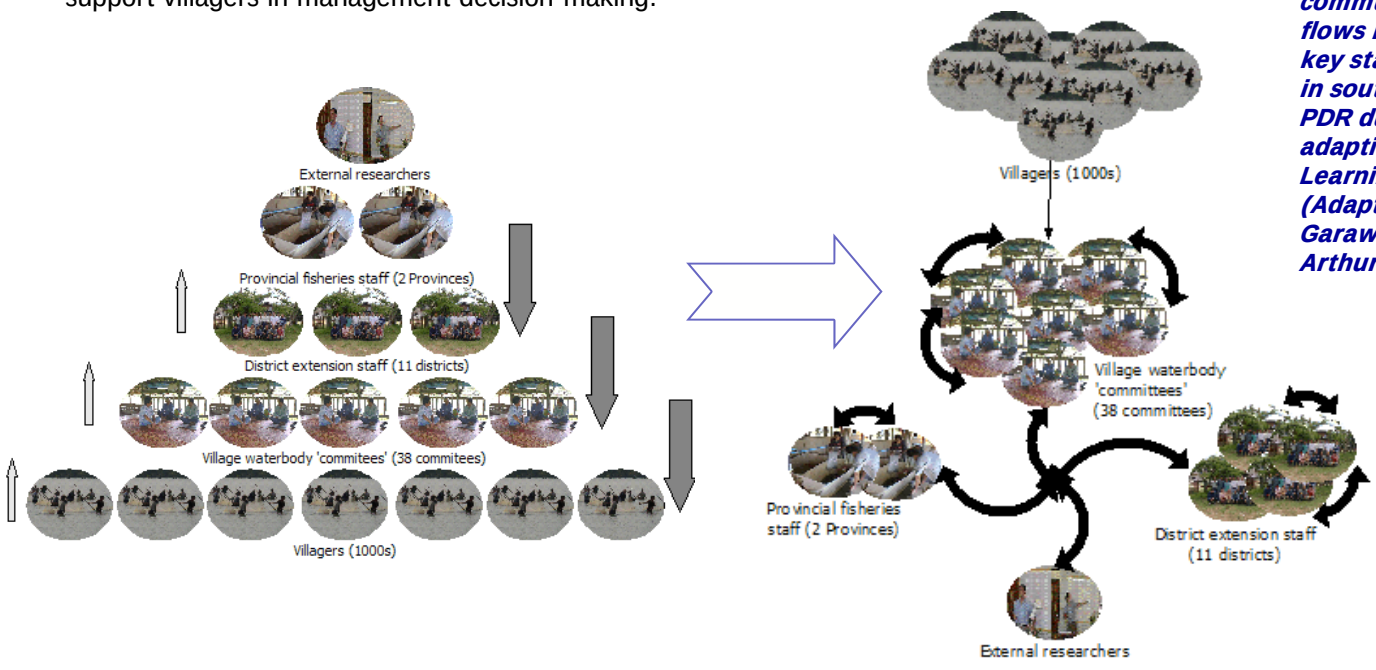


Diagram: Changes made to communication flows between key stakeholders in southern Lao PDR during the adaptive Learning project (Adapted from Garaway and Arthur 2004).

SUMMARY (PARTS 1 and 2)

While the FMSP has mainly supported projects that have dealt with co-management at an operational level, i.e. support for management planning, implementation and evaluation, there has only been limited consideration of the environment within which this planning takes place. Even so, FMSP projects have identified a number of important points related to the co-management process and to the development and implementation of policies and actions that can support more devolved local management planning. These have been discussed in the preceding pages and are summarised here.

Co-management

- While there are different interpretations of co-management, the process requires that a range of stakeholder groups, but in particular government agencies and resource users (who may not usually work together), need to be identified and work together to manage the fishery.
- Within any co-management structure both information and decision-making arrangements are vital for developing and agreeing locally appropriate management actions.
- There are many benefits that can be realised from the co-management process, whatever form it takes to begin with, if it is asset-based and builds on existing strengths.
- The FMSP has supported a number of projects, most recently the *adaptive learning, information systems* and *ParFish* projects, that have developed tools and strategies that can support co-management planning, implementation and valuation, particularly in terms of information and decision-making arrangements.

Developing supportive policies

- A key role of government at all levels in supporting co-management is to provide an enabling environment within which it can take place at the local level. For this reason, whatever the extent that it is involved in the local management planning process, there will always be a vital role for the government.
- Ensuring good governance and support for effective co-management requires:
  a) enabling and supportive legislation;
  b) the provision and/or facilitation of training, communications, conflict resolution and extension services;
  c) clearly stated and supported co-management and sectoral objectives;
  d) action to ensure that individual management plans are compatible with national, regional and international agreements.
- Devolution of management authority and responsibility is not easy and requires agencies and individuals to work in new and often challenging ways.
- While authority and responsibility for local management planning may be devolved, there is a crucial role for the government in coordinating local management planning and providing opportunities for lesson learning across management units.

The management planning scale

- The scale at which local management plans are developed and implemented will depend on a number of aspects and should match the bio-physical scale of the fishery. The necessary skills, capacity and resources need to be made available at the appropriate administrative level(s) for this to happen.
- Who should be involved should be established at an early stage and these groups, or their representatives, engaged.
- Engaging stakeholder groups can start with a stakeholder analysis. This will also provide an early indication of the relative strengths of the different groups and their potential roles in the management process.

- An asset-based management process should value the different perspective and knowledge types that the various stakeholder groups will possess. It should also seek to strengthen and empower all the stakeholder groups. This requires a commitment to transparency and accountability as well as to encouraging the active participation of stakeholders or stakeholder representatives and to developing skills.

Information sharing

- Information sharing is a vital consideration. A lack of access to information in appropriate formats can be a major constraint to management.
- Different stakeholder groups have different perspectives and may have different knowledge types. These all need to be valued and methods need to be developed that allow these to be included.
- Efforts should be made to move towards non-hierarchical structures for communicating. These should ensure that the sharing network enables ***all*** stakeholder groups to share their knowledge and experiences with each other.

Photo: Developing the computer skills of government extension staff in southern Lao PDR (Photo: R. Arthur and C. Garaway).

Creating conditions for success

Successful co-management arrangements, that is arrangements that are most likely to achieve consensus and successfully implement management plans that can contribute to meeting multiple objectives will depend on supportive policies and structures. The following conditions relating to policies devolution and governance structures that can improve the chance of successful outcomes were identified in the floodplains management guidelines from the literature:

- Boundaries of the management unit should be clear, of a manageable size, in terms of both the physical boundaries of the fishery and the structure and membership of the management committee.

- There must be external recognition of the right of the management unit to manage (e.g. legislation providing tenure or devolving responsibility).

- Management should be supported by a nested arrangement of organisations that support management and that share responsibility.

- Communication between the community and external agencies requires a joint body to be established that includes representatives from both stakeholder groups and that can monitor progress, resolve conflict and enforce management decisions.

- Rules relating to the fishery must reflect local conditions.

- Rules are best made by, or with the cooperation of, the individuals who will be affected by them.

- There should be a system of graduated penalties in place to deal with people who break the rules that are supported by formal mechanisms such as the law courts.

MANAGEMENT PLANNING

Understanding resource systems

To ensure that it is possible to develop a management decision-making process that results in decisions and actions that best reflect the needs and objectives of all involved it is important that all stakeholders have a shared understanding of the resource system. Only in this way is the process transparent and can you ensure that your interpretation of needs and priorities is the same as that of the user community.

The term 'institution' as used here does not mean the same as 'organisation'. Instead it refers to the rules and regulations in place governing users access and use of the resource as well as their participation in decision-making.

Based on an Institutional Analysis and Design (IAD) framework, as shown in the diagram, these pages outline the types of information that are needed to develop a common understanding of the natural resource system. For a more detailed explanation of this framework, see Oakerson (1992).

This process is really about collating existing information in a systematic manner to ensure that all aspects of the resource systems and its management can be understood. Even where there has been management in process this can be a useful diagnostic exercise and can highlight opportunities for sharing existing knowledge or where new information might be generated to improve management. It can also help to identify additional key actors in the management arena that may not have been identified in the stakeholder analysis for one reason or another. The framework was found to be very useful during the *adaptive learning, ParFish* and *customary marine tenure (CMT)* projects.

The IAD framework

IAD frameworks can help identify a wide range of management constraints and previously unconsidered potential causal links between management policy, resource use and management outcomes. The basic concept of the framework is that the outcomes of resource use are not only determined only by the physical and technological aspects of the resource but also by people's interactions with it. These are in turn affected, but not totally determined, by the nature of rules and regulations set up to govern resource use and how people view these in the light of the nature of the resource.

The resource system is described in terms of four main aspects. On the left hand side are those that influence actions of resource users or the resource itself. In the middle of the diagram are the patterns of interaction

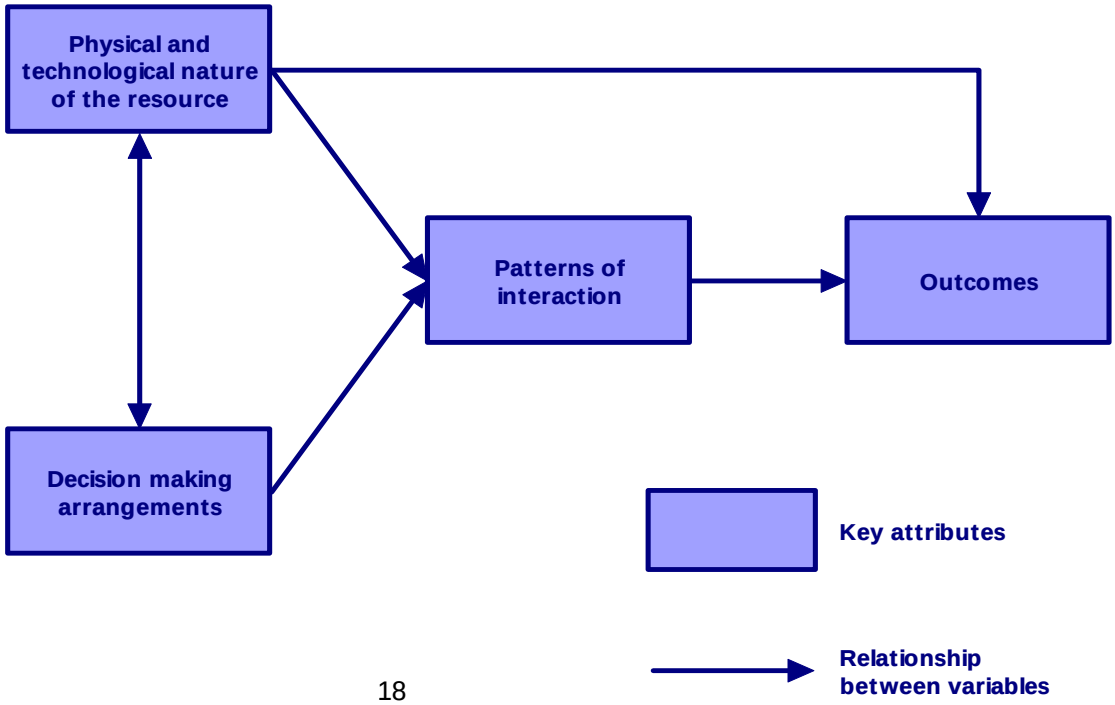


Diagram: Framework for analysing the commons (Source: Oakerson (1992) p.53).

Photo: Using participatory methodologies to develop understanding of resource use, Moyna village, West Bengal (Source: R. Arthur).

representing the sum of all individual actions made by all resource users. On the right hand side are the outcomes of these interactions.

Relationships between the aspects are shown as arrows. Some physical/technical attributes of the resource, such as natural productivity, will affect resource outcomes separately from the actions of resource users (top arrow) whilst others, for example size of resource and therefore ease with which regulations can be enforced, may do so indirectly through the effect they have on actions of resource users.

Because the relationship between people, the resource, and the decision-making arrangements all combine to cause the particular outcomes that we see, all should be studied to develop an understanding of why outcomes are as they are.

The data collection and information sharing guidelines (see reference in Part 6) can provide you with ideas about the types of information to collect on each aspect.

Working through the framework

A useful way to approach the framework in practice is to work back through it (from right to left), asking as we go, what is happening, who is involved, why is this happening and how does it occur?

The first step is to examine the outcomes of management, whether these outcomes are considered satisfactory and by whom, and how outcomes are constrained by the physical, biological or technical nature of the resource. The next step is to examine what resource users are doing, including whether they are following regulations or not, and from this develop an understanding of why this is the case by looking at the rules, the resource and how together they influence the actions of users.

Working through the framework in this way, key issues regarding management can be identified such as the user community needs, priorities and objectives.

Creating a shared understanding

Having collected the information, it is important that this is then shared with all stakeholder groups so that they can understand it (often a challenge where complex statistical assessment procedures have been used) and discussed to provide a foundation for joint decision-making.

The potential of ParFish

ParFish, a tool for participatory fish stock assessment can contribute to understanding the biological and technical nature of the resource where there is little or no data available on which to base a fish stock assessment by incorporating existing fisher knowledge in the assessment. In addition it provides methodologies for rapidly determining users objectives and the constraints to management.

Also included in the ParFish toolkit are suggested methods for sharing information about the state of the resource and of the effect of fishing on fish stocks with fisher groups. As such these tools are useful in establishing a common understanding that can then be used as a basis for management decision making.

Some useful references on the use of the IAD framework and ParFish are included in the guidelines and methodologies listed in Part 6.

Agreeing the management priorities

Using the definition of co-management where co-management represents shared decision-making then developing the management plan for the fishery becomes very much a collaborative process that takes place at the appropriate local level involving all stakeholder groups or their representatives.

Co-management is a dynamic process and within the FMSP projects it has been found that agreeing management priorities and **establishing the management plan is likely to be an iterative process**. However the projects have shown that it is much easier to discuss the issues and reach consensus if the starting point should is a shared understanding of the resource system. This allows all participating groups to establish their objectives and constraints and so identify management priorities.

Adaptive approaches and how they may be implemented are described in more detail in the adaptive learning guidelines—see Section 6 for references.

The management priorities of individual stakeholder groups will depend on their resources and attitude towards risk. The FMSP project experiences suggest that it can be expected that altogether there will be multiple objectives, different priorities and different learning and information requirements among stakeholder groups. Over the next few pages experiences with reconciling these differences and combining these priorities into management strategies and agreed management plans are presented.

Photo: Discussing local management priorities with fishers in Songkram River basin, Thailand (Source: K. Deeburee).

Where it has been identified that there are constraints to management that could be reduced by generating new information about the fishery then taking an adaptive approach to Management, where management actions are designed **from the outset** to yield Information, may be acceptable. This might especially be the case in fisheries particularly where discrete but similar local management units can be identified and there is potential for comparisons across management units. More information on the practicalities of taking such an approach, and the challenges, are described in the *adaptive learning* guidelines (see references in Part 6).

Collaboration is crucial

Whether an adaptive approach is taken or not, this a part of the process where a commitment to transparency and facilitating communication has been found to be vital. Providing appropriate fora for discussion and negotiation with affected stakeholders is a crucial part of the planning process. There can often be some distrust between stakeholder groups and it is important that issues can be discussed and any potential conflicts resolved. In this context a wide view of conflicts should be taken to include anything that is likely to impinge on stakeholder interests or livelihoods.

Ideally this process of selection should be conducted in collaboration with all stakeholder groups. Experiences from *adaptive learning* indicated that this can help to ensure transparency and consensus on the final management plan. The extent to which the different stakeholders are able to act as equal partners from the outset will depend on factors such as the capacity of the stakeholder groups, or their representatives to make decisions, a reluctance to share power and conflict. Thus it may be necessary to start small, with limited objectives and look to establish an on-going dialogue and to be able to show over the longer term the benefits of collaboration. In the *adaptive learning* project in West Bengal there was initially a lack of trust between stakeholder groups but by identifying limited management activities that could provide benefits to participants and supporting the implementation of

these activities trust was built and interest in being involved in similar co-management processes was stimulated in other nearby fisher groups.

Experiences from FMSP projects have suggested that managing and resolving conflicts is more difficult where stakeholder groups are more distinct and/or geographically distant. They also indicate that state support (implicit or explicit) is vital for the success of conflict management mechanisms. Effective communications is vital and the communications needs of the various stakeholder groups should be considered to ensure that they are able to participate fully in the process and make their voices heard. Some thoughts on communicating from the *ParFish* experiences are provided on page 31.

The FMSP has commissioned projects addressing conflict resolution in fisheries and more details can be found in the references listed in Part 6.

Sharing responsibilities

There are a wide variety of roles and responsibilities are possible and that may be determined depending upon the nature of the fishery and the co-management arrangements (for examples see the *information systems* guidelines). While the roles and responsibilities will be finalised in the management plan (see pages 26 and 27), it is important that at the outset it is clear that co-management will be about sharing responsibilities and that this may be done both hierarchically as well as spatially. It is also vital that the sharing of responsibilities should not be driven solely by a desire to decrease costs but that it should be informed by the relative strengths of the different stakeholder groups.

Local conditions for success

The following is a summary of local conditions that can improve the likelihood of success in co-management planning, drawn largely from the floodplains guidelines:

- It is helpful if there is an existing institution with management responsibility, even if this does not specifically cover fisheries. This can provide a structure for the introduction of any new management interventions.

- Individuals are likely to participate if they can see clearly that the benefits from participating exceed the costs of their involvement. This is particularly important where management experiments are being considered as these may involve additional costs and risks for participants.

Supporting local management plans: district staff assist with monitoring catches at a village fishing day in Lao PDR (Photo: R. Arthur and C. Garaway).

- Both the state of the fishery and activities of fishers, including rule breaking, need to be monitored. Monitoring should be carried out by the fishers themselves or people accountable to them.

- There should be fast and low cost means to resolve conflicts that rely on both formal (e.g. law courts) and informal (e.g. village committee) methods.

- There should be a core group within the fisher community that takes responsibility for the management process. Individuals may need incentives to commit time, money and effort to fisheries management.

Over the next few pages we shall look at how the ***information requirements*** based on the agreed management priorities can be identified and, in turn, form the basis for developing a ***data collection system*** that can be implemented by all stakeholders.

Identifying information requirements

Collaboratively determining the management priorities provides a starting point for identifying current information needs, which will relate to the four categories introduced on page 8. The framework provided here is meant to capture how the system is affected by management decisions and how, in turn, these changes affect future decisions that are made.

The framework has been useful for identifying the aspects of the fishery on what information is needed for management plan and policy planning and evaluation. While the cost effectiveness of co-management should always be a consideration, the framework provides a structure to ensure that there are not other aspects that are overlooked. This can then provide a basis for the design of the data collection system. As with the model on page 18, starting on the right hand side with the outcomes.

Stock assessment methods and their data requirements have been considered in an FMSP synthesis of stock assessment methods—see Part 6 for references.

The outcomes include the biophysical and technical attributes of the resource system as well as the attributes of the community. Both of these may be modified through management actions. This provides a range of information types that could be collected that can provide insights into the effectiveness of the management plan. There will also be priorities related to monitoring policies and reporting requirements that will need to be considered.

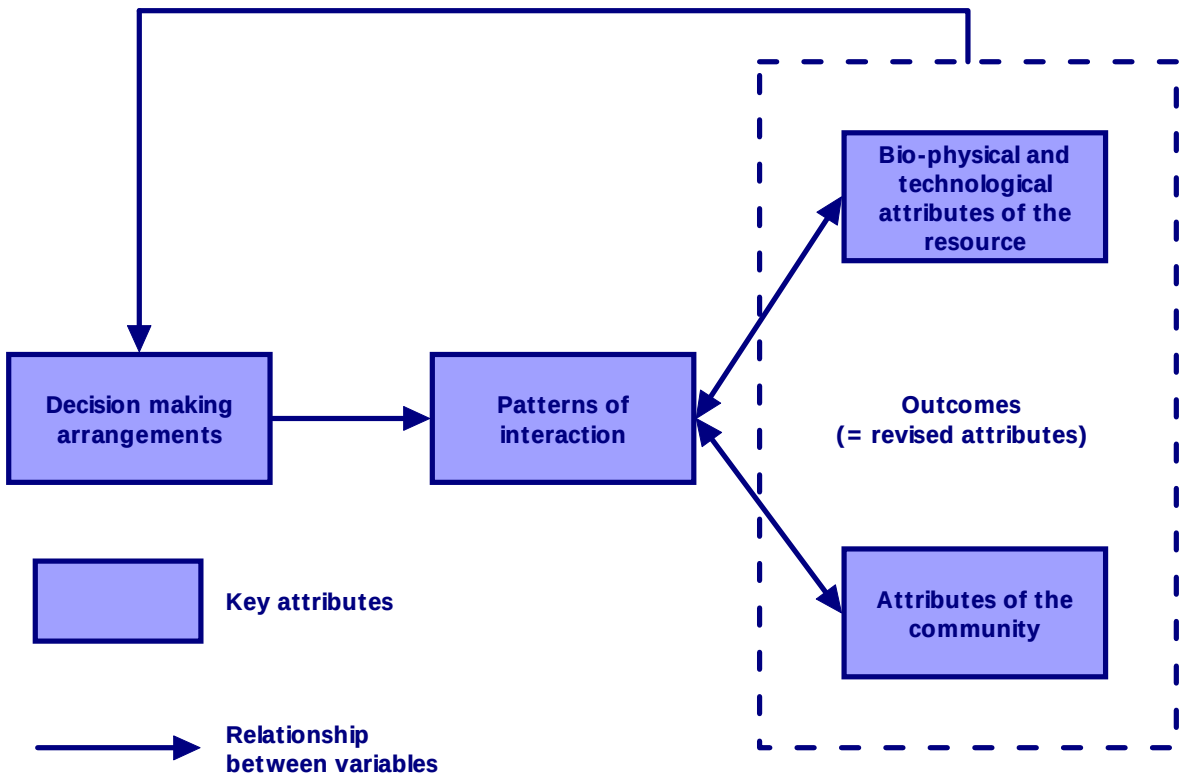
The biological and technical attributes will provide information on the natural capital and the type of information collected might also depend on the types of models used to assess the fishery. The attributes of the community on the other hand can potentially provide information on human, social, financial and physical capital together with the distribution of these. This may be particularly important where poverty alleviation is a management or policy objective.

The next area to consider is the decision-making arrangements. There are two aspects to this. In the first place, particularly for policy or where there may be opportunities to share information between co-managed fisheries, measuring the prevalence of co-management and the extent of devolution of decision-making can be important.

Secondly information will be needed about the individual arrangements for policy making. For this, depending on the fishery, it may be necessary to consider different layers or tiers of decision-making arrangements. Either way the extent of participation and representation in decision-making might be important. Whether the arrangements can effectively make decisions is often a crucial consideration and this can include aspects such as whether graduated sanctions have been put in place and whether there are methods for creating consensus in place.

The patterns of interaction may again need to be considered at different levels but are concerned with how the decisions are operationalised and the reaction to the rules in place. Thus information on whether the rules in place are aimed at meeting multiple objectives, the barriers to implementing decisions, monitoring and enforcement capacity and capability, conflict and compliance might need to be considered. Some of these may also be requirements for evaluating policies.

Examples of the different types of indicators that exist for many of these aspects are provided in the *information systems* guidelines and this provides a valuable resource for developing data collection systems.



A three-stage selection process

While the particular information requirements will depend on the individual management plan (and management context), a three-stage selection process, worked through with the stakeholder groups proved useful in the *adaptive learning* projects:

Stage 1: The first stage, is to identify the information requirements that are ***relevant*** given the management priorities and context, in particular to the local stakeholders. In the first instance those that are either not relevant or not practicable should be discarded.

Stage 2: The second stage is to consider how the information requirement can be met: through information that already exists, or information that needs to be generated. This will have considerable implications for resource allocation.

Stage 3: The final stage is to critically evaluate each of the requirements based on available resources. The sharing of existing information is the least complex, but even this will have costs of collating and of getting the right people together (in terms of time, labour, money) that may not be considered worthwhile. If data collection and analysis to generate new information is required, it is likely to require greater capacity and resources to do so. Finally, if an adaptive approach, one involving changes to changes to management, is being considered then it is, in addition to the other costs, crucial to consider the acceptability and distribution of costs and benefits as well.

Information on the costs and considerations associated with management experiments can be found in the adaptive learning guidelines listed in Part 6.

Similar processes are suggested in the *information systems* and *ParFish* guidelines and at the end of this process you will have a set of information priorities and a data collection strategy based on the management plan and agreed by all stakeholders. It is likely that this will consist of a combination of information to share as well as information that will be generated (through data collection and analysis) and then shared.

Selecting data collection methods

The previous pages described the sorts of information that will need to considered to provide policy makers and fishery managers with decision making support in the future. The *information systems* project has considered the factors that affect the selection of data collection methods given the criteria that have been selected for measuring and evaluating policy and management performance, national and international requirements and the management actions and control measures that are being considered.

These will provide the starting point for the development of the data collection system and may detail specific data requirements. Additional factors that will affect the development of the collection strategy are discussed below:

The operational characteristics of the fishery.

This should be fairly well understood, particularly if efforts have been made to establish a common understanding of the fishery. The operational characteristics are crucial in determining the available sources of data and who is best placed to collect the data. They will also be important in highlighting the opportunities and constraints to potential collection methods and sample stratification.

Available resources

Resources here refers to the human resources—availability and skills as well as the financial and other resources such as availability of sampling equipment and analytical capacity. These will have an important The collection method can be decided upon based on the information type required together with issues such as the required frequency and precision as well as who is best placed to collect the data. Co-management arrangements provide a number of opportunities to share responsibilities between stakeholders to make best use of the strengths of each (but crucially not simply to transfer the costs of collection). as well as the skills and resources available and willingness of stakeholder groups to participate in or be affected by data collection activities.

Photo: Involving users in designing data collection systems: government extension staff in Lao PDR design and test a data collection form (Source: R. Arthur and C. Garaway).

It should also be recognised that stakeholders may have different data requirements for the same aspect. For example fishers may monitor water quality daily in terms of clear, green or brown while the government may need quantitative monthly water quality records. Whether these are included will need to be considered jointly.

Discussing these issues will help to identify what data is needed, how it can be collected and who should collect it. It may also help 'weed out' some information for which the costs of collection exceed the likely benefits from collecting it.

Complete enumeration or sampling

The data requirements and collection methods will also depend on the type of information required and the level of precision and sampling frequency. A decision may also have to be

made regarding the stratification of data collection. A choice can also be made at this stage between quantitative and qualitative data. These decisions are important as they has a bearing on the type of collection methods that can be used and the possibilities for combining the collection of different data types. For example it may be possible to combine requirements for data on illegal fishing activity, expenditure on management activities and attendance at management meetings in a single monthly form. However these decisions will be both informed and constrained by the operational characteristics of the fishery and the available resources as discussed above.

Combining methods into a single strategy

Having decided on the data requirements it should be possible to determine the methods that are required to collect it. This could include qualitative methods such as matrices and rankings as well as biological sampling and combined methods such as questionnaires and interviews. Together all the methods and sampling frequencies can be combined to create a single collection strategy in which all stakeholders have clear roles and responsibilities and within which it is clear what data is collected, when and how.

Further detail on how data types can potentially be combined so that they are collected using the same methods are provided in the *information systems* guidelines.

Principles of collection strategy design

In the practical development of data collection systems the experiences in FMSP projects have suggested that this selection process should be guided by two main principles:

Build on existing systems: Knowing what data is already collected, and how, provides a basis for designing a data collection system. Fishers, or fisher groups, are often well placed to collect the sort of day-to-day data on resource use that government staff would find it difficult (and expensive) to try to collect. They may even already be collecting this data, for example catches and incomes, for their own purposes however informal.

Involve collectors in planning and design: Involving the collectors in planning and design will help them understand ***why*** data is being collected and can encourage them to collect the data accurately. Poor data collection can occur even with highly motivated collectors if they don't understand why collecting in a particular way is so important.

Involvement in design will help to ensure that data collection systems are both practicable and understandable. Ensuring that some or all of the data collected is of relevance to the collector for their own benefit can also improve the quality of the data collected, and the interest in it.

Following from this last point, the quality of data collected is also likely to be increased if those collecting it are involved with the information ***after*** it has been collected. Ways that this has been achieved in FMSP projects has included Involving the collectors directly in the analysis of the data (see example on page 33) and making sure that the analysed information is presented back to the collectors as soon as possible.

All of these aspects can help to create a sense of 'ownership' of the data and the collection process as well as build capacity.

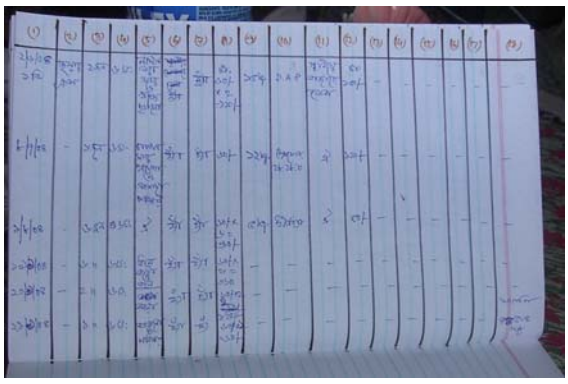


Photo: Building on existing systems: A village record book for recording catch, effort, income and fish consumption (Source: R. Arthur).

Finalising the management plan

The experiences with FMSP projects have suggested that the finalised management plan should address management objectives, information needs, the data collection system and stakeholder roles and responsibilities. It is important that the plan is agreed with all the stakeholder groups. This provides a transparent and accountable agreement making clear that implementation of the plan will be on ***shared*** responsibilities and indicating what these will be.

As mentioned, the process of developing and agreeing the management plan is likely to be an iterative one and that the stages that have been discussed on pages 20-26 are unlikely to be as clear cut and are more likely going to overlap, run con-currently and/or be re-visited. In this respect, while the different objectives, perspectives and constraints of the various stakeholder groups can potentially increase opportunities for improved and more sustainable management, they can also be a source of difficulties when agreeing management activities, roles and responsibilities. Either way, attention should be should be given to monitoring this process and the subsequent implementation of the agreed plan.

Once the actions, roles and responsibilities have been agreed the plan can be finalised. The actual nature of the plan will depend on the individual situation. The *information systems* guidelines have suggested that it might be beneficial to have a common format for local management plans to facilitate coordination and among unit comparisons of management performance and the guidelines provide some suggestions on this (see references in Part 6). In some cases it may be necessary to have a legally established plan or one approved by a local authority.

In both southern Lao PDR and West Bengal it was possible to have successful agreements between the stakeholder groups that were much less formal. The approach was to negotiate a 'contract' amongst the stakeholder groups. Under the terms of this contract, villages agreed to manage the waterbody specifically for community benefit, to record catches and fishing effort and to come back after a year to share their experiences with all other stakeholders and the government agreed to provide some resources and to provide analysis and present results to the villages.

Whatever the exact nature of the individual management plan, it should provide an element of accountability and transparency to the management process. This is important as successful implementation of the management plan is likely to require the cooperation and coordination of a potentially large number and wide diversity of stakeholders and having a clear plan to refer to can help to avoid confusion and potential conflict.

Improving the process

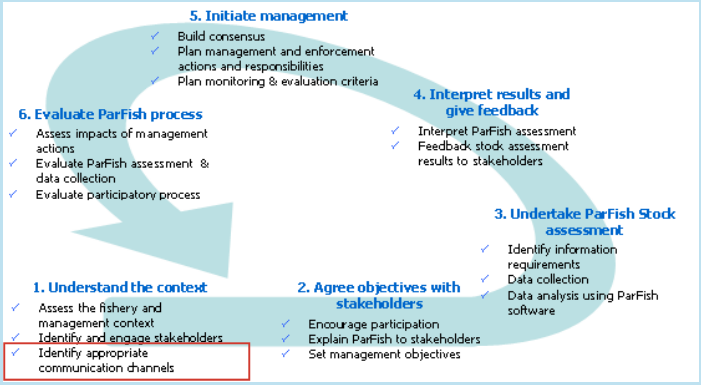
It is unlikely that the management process is going to run smoothly right from the start. Where new methods have been introduced or stakeholders are taking on a new and unaccustomed role there will be mistakes. Experiences from *adaptive learning* have suggested that there are benefits from starting small with a management plan that is not overly ambitious. This keeps the level of risk for those involved low, can help to build trust where this is needed and allows successes to be built on. It is also vital that there is also a system in place to monitor the implementation of the plan to ensure that it is working and delivering the required data. If it is not, the management plan, data collection strategy and communications networks should be adapted and improved. The management plan should therefore be seen as the start of a process of implementation, evaluation and improvement and not a final product.

When should stakeholder communications networks be identified? Different approaches within FMSP projects

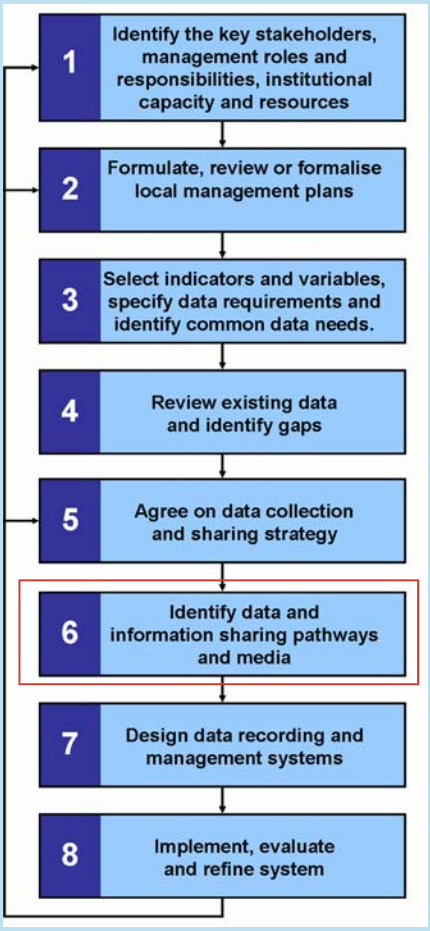
Information sharing systems will always exist to some extent, even if they are only informal. While developing these sharing systems is considered important (see also pages 14 and 15) and is explicitly addressed by a number of the projects, there are differences concerning when this should occur.

It has been found through the experiences of adaptive learning and ParFish that it is useful to map out these systems and to identify potential communication networks early in the process (the ParFish process is shown below). Within both these projects information flows and are considered at the same time as a stakeholder analysis is conducted, i.e. prior to any management planning. This is to ensure that the most appropriate channels are used from the outset to involve all the relevant stakeholders in the process, for communicating results and accessing different knowledge types as well as for creating a common understanding and reaching consensus on management plans. The network is then revised and additional information pathways identified during the planning process. These projects found that identifying communications networks early on makes it more likely that different sources of knowledge and perspectives can be made use of prior to and during management planning, particularly important where co-management requires shared authority and collaborative decision making.

Following extensive field-testing with co-managers in Bangladesh and Thailand, the *Information Systems Project* found that identifying or designing information sharing networks could be effectively achieved once stakeholder information needs to support their management roles and responsibilities (including those related to management strategy implementation and evaluation) have been agreed during the management planning stage, and after agreement has been reached concerning who will collect what data and share with whom to meet these information needs. For completeness, details of the agreed data collection and sharing strategy and information sharing network(s) can then be added to the management plan.



ParFish approach



Eight-stage approach

Diagrams: Identifying information channels in the ParFish approach (left) and the Eight-Stage approach to designing data collection systems from the information systems project (right).

SUMMARY (PART 3)

The FMSP projects have shown that developing and agreeing a management plan is likely to be an involved and iterative process, particularly where the process is collaborative and there are multiple stakeholder groups who need to achieve consensus. However the various projects have used or developed a number of useful tools that can assist in management planning and a number of lessons have been drawn from experiences.

Creating a common understanding

- Fisheries are about more than fish and both the human and bio-physical aspects are complex and dynamic. The IAD framework can provide the basis for understanding both of these as well as their interactions.
- Any understanding needs to be based on the knowledge and perspectives of all the involved stakeholder groups.
- If there are multiple stakeholders involved in decision making it is vital that all information about the fishery and stakeholder objectives is shared and discussed to ensure there is a common understanding on which to build the management plan.
- There are likely to be many objectives for the fishery, reflecting the perspectives and priorities of the different stakeholder groups. Management planning should seek to prioritise these and, where possible and practicable, develop management plans that address multiple objectives.

Developing data collection strategies

- It may be possible to meet several data requirements through the use of single collection methods. Where possible such opportunities to combine collection should be taken.
- Data collection systems that are already in place can be used as a basis for the data collection strategy. They may need to be adjusted in order to ensure all the data that is required is included but they have the advantage of being familiar.
- Involving those who will be collecting the data in design and planning can improve the quality of data collected. It will also ensure that the system developed is practical and that the collector is familiar with how it operates.

Shared responsibilities

- Management priorities should be translated into a management plan that includes clearly defined roles and responsibilities for each stakeholder group. The exact nature of these roles and responsibilities will vary from case to case. This can increase the transparency and accountability of the management process.
- There are advantages to sharing the responsibility for data collection between stakeholder groups. However, this should not be seen simply as an opportunity to shift the cost of collection but of improving the efficiency of the collection strategy and the quality of data collected.

The management plan

- The final management plan should attempt to address, as far as is possible within logistic and financial constraints, the multiple objectives for the fishery. It should also reflect the needs and objectives of those dependent on the fishery and be acceptable to all stakeholders.
- It may be beneficial to standardise the format and content of local management plans to facilitate coordination and evaluation.

A CASE STUDY

The potential benefits of knowledge sharing: an example from the South Pacific

In Pacific island states there has been considerable interest in the use of Customary Marine Tenure as a basis for co-management and more sustainable resource use. An FMSP funded project that used the IAD framework as a basis to examine resource management in selected sites in Fiji and Vanuatu found that there was little evidence that community resource custodians, who were without any training in biology, had any knowledge of the limiting conditions of their resources (for example the capacity of the resource to support multiple users or the processes underlying natural replacement or resource maintenance). Nor was there much evidence to suggest that management decisions were made to ensure the biological sustainability of the resource or equity in the benefits arising from exploitation.

Instead it was found that for some custodians, the primary concern was to maximise revenues from the resources under their control, while other objectives related to paying respects to recently deceased chiefs or other senior figures in the community or ease of monitoring and enforcement. It was found that this resulted in some closed areas that did not provide biological sustainability and that could also result in reduced equity.

For example, in one case of a closed area in Vanuatu, the location of the closure was in front of village. This is shown in the photograph below where the closed area is outlined in red and the village is the white area at the tip of the island on the left. While this was clearly a good location for a closure from the perspective of monitoring and enforcement of the regulation, there appeared to have been little consideration of the biological attributes of the area when deciding and designating the closed area.

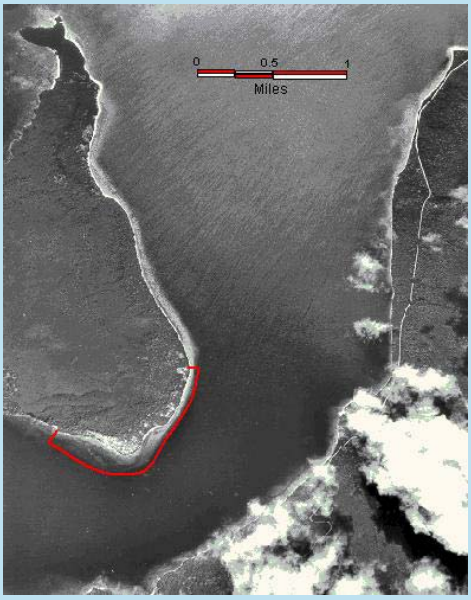


Photo: Closed area near Lelepa island, Vanuatu that effectively discriminated against some fishers (Photo: J. Anderson).

In this case the majority of agricultural activity undertaken by the islanders is on the mainland (on the right of the photograph) and water is collected from there. This means that there is a large daily movement between the island and the mainland. Interviews with women indicated that the closed area was formerly an important fishing ground for them that they used on their way back to the island from the mainland. This area was now not available to them and they reported that given the restrictions on time available due to their various other responsibilities meant that they could not afford the time to travel further to alternative fishing grounds.

Providing the resource custodians with an understanding of the limiting conditions of the resource and some of the potential issues associated with the establishment of closed areas can enable them to be better equipped to establish rules and regulations for the exploitation of the resource under their control that can provide better outcomes in terms of biological sustainability and equity.

IMPLEMENTING THE MANAGEMENT PLAN

Management activities

A number of activities will need to be undertaken in implementing the agreed management plan. These can include activities related to the pattern of interactions (see page 18) such as issuing licences, monitoring fishing activity, enforcing rules and regulations as well as other activities such as implementing stocking or habitat rehabilitation programmes and monitoring the outcomes of management activities. Who undertakes these should be specified in the management plan but based on the experiences of the FMSP projects it is expected that local management institutions would at least have some role in resolving conflicts locally and participation in data collection programmes.

The *information systems* research has described how, in undertaking these activities, these institutions can assist the government in efforts to coordinate local management activities, formulate and evaluate national fisheries and co-management policies and development plans, comply with reporting obligations and inform inter-sectoral planning decisions.

As can be seen from the description of activities above, an important part of implementing the management plan is the collection of data to provide information about both the management process and the outcomes of management decisions. If an adaptive approach has been taken then there may also be information about the dynamics of the fishery that will be generated. Either way it becomes important that the information that is generated is shared effectively with those who need it.

Sharing information

Sharing information within and between different stakeholder groups were particular considerations in both the *adaptive learning* and *ParFish* projects. Both of these projects have developed innovative and effective methods for communicating. Some of the principles that informed the development and use of communications tools during the *ParFish* project are described on the next page. While it may not always be possible to develop materials based on all these principles, it should be the case that attention is always paid to the needs of the recipient of the information, for example the communications methods with which they most familiar and comfortable with (visual, written or spoken) and the language they prefer.

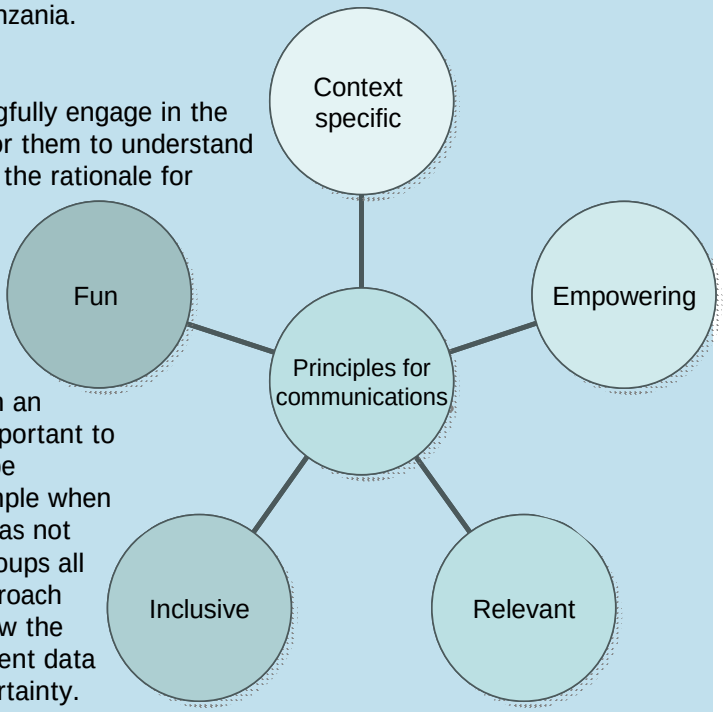
Another example of sharing information is provided on page 33. This is an example from *adaptive learning*. This is an example of a workshop that was held to share the results of management experiments with government extension staff. The staff were not just presented with the information, instead they were provided with the means of generating that information for themselves, in a context in which they could understand it. They were then provided with opportunities to discuss the findings and relate this to their own experiences. This example illustrates some of the key principles for sharing information in a way that enhances the likelihood of getting the information across.

Photo: Eliciting the concerns of women for use in management planning at Nam Houm reservoir, Lao PDR (Source: T. Augustinus).

Generally, when devising methods for sharing information, the more active and learner-orientated these can be, the better. People can learn by hearing, learn by seeing or learn by doing, and it is generally recognised that these three are on an increasing scale of effectiveness. More information on developing and using information sharing methods can be found in the *adaptive learning* guidelines and *ParFish* toolkit listed in Part 6.

Achieving success in communicating

Within the ParFish approach a number of principles to communications have been established to ensure that all the relevant stakeholders are brought on board and sufficiently understand the concepts so they can meaningfully engage in decision making. These principles are explained in more detail below as well as providing examples from applying ParFish in Zanzibar, Tanzania.



Empowering

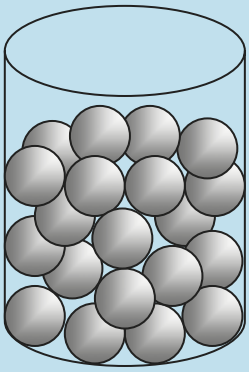
Before stakeholders can meaningfully engage in the ParFish process it is important for them to understand certain concepts. These include the rationale for undertaking stock assessments, how ParFish works and Their participation can affect the results of the analysis.

Relevant

When providing stakeholder with an overview of the concepts it is important to consider what information will be most relevant to them. For example when applying ParFish in Zanzibar it was not necessary to explain to fisher groups all the statistics involved in the approach but it was relevant to explain how the approach can make use of different data sets, and how it deals with uncertainty.

Inclusive

The ParFish approach aims to be inclusive and encourages a wide representation of stakeholders at workshops which are often used as the principle forum for communication. A number of suggestions are given within the ParFish toolkit on how to ensure that workshops are arranged so that the maximum number of stakeholders can attend e.g. special attention needs to be given to timing, location and transport issues.



Fun

ParFish uses games as a method for communicating concepts as getting stakeholders practically involved can be the most effective way of transferring information. An example is given in the ParFish toolkit for communicating uncertainty. The game involved uses a jar full of oranges. Stakeholders are asked to estimate the number of oranges in the jar and write their numbers on large pieces of paper. These are assembled in order to illustrate a probability curve.

Context specific

Language is an important consideration when communications needs to be context specific. It is also possible to use familiar objects when communicating an idea. For example in Zanzibar it was possible to use a local game 'Boa' - which consists of a piece of wood and a series of hollows, and a set of beans—to illustrate the results of over-fishing on the state of a resource.

KEY LEARNING POINTS (PART 4)

Implementing the management plan

- Implementing the plan will require that the stakeholder groups assume the roles and responsibilities that have been agreed in the management plan and contribute to undertaking management activities as agreed.
- Successful implementation of the plan should result in the required information being shared with the relevant stakeholder groups, increased skills and knowledge among stakeholders and stronger operational management institutions.

Communicating with stakeholder groups

- Essentially, and in order of increasing effectiveness, people learn by hearing, by seeing and by doing. This should be borne in mind when considering methods for communicating with stakeholder groups.
- When communicating with stakeholders it is important to consider the audience and their assets in order to know what their communications requirements are. Depending upon level of skill, language, education, and information needs these might be quite different.
- Because the stakeholders that you are dealing with will have other demands on their time, you should consider very carefully both the timing and location of any information sharing activities. Holding an event in the middle of a busy harvesting period for example is unlikely to be well attended.

Training and capacity building

- Training and capacity building are vital elements in the implementation of the management plans and for the longer term success of co-management. An effective, accountable and representative co-management institution will take time to develop and will require support.
- Training and capacity building is an area that can be addressed by government agencies who are able to support or facilitate the provision of training and resources to strengthen the ability of stakeholder groups to take on the roles and responsibilities required and to support the decisions made.

Photos: Assuming roles and responsibilities in West Bengal, India. Left: fishers take responsibility for enforcing management regulations, including patrolling by boat as shown here. Centre: fishers and government staff collaborate in monitoring through the agreed data collection strategy. Here government staff collect data on fish growth. Right: government staff feed back the information generated to fisher groups so that the management plans can be adapted (Source: R. Arthur and P.K. Pandit).

Sharing information: an example of 'learning by doing'

Involving participants in analysing and interpreting the data can have very real benefits for their understanding of the information—increasing the likelihood that it will be used as well as developing their analytical capabilities. In the adaptive learning projects an innovative 'learning by doing' approach was developed to do just this. Government extension staff were given data that they had been involved in collecting and were guided through the analysis and then presented the results and conclusions to each other. While this was a time and energy consuming process it proved very successful in disseminating experimental results and creating ownership of the information, which in turn led to more motivation and interest in project activities.

Workshop Format

To begin with the workshop participants were reminded about the information requirements and the data collection system that had been used. They were then provided with worksheets containing some of the data they had collected themselves and instructions on how to analyse this data. Each worksheet required the production of a simple graph (a bar chart or pie chart) to illustrate the point being made. Working in small groups with two or three worksheets each, the participants performing simple, familiar, calculations and then produced the graphs using either computers or by drawing them on large sheets of paper.

The participants then interpreted the implications of their findings through some 'prompt' questions provided to help them. These questions focussed the discussions within the groups and tried to get the participants to relate the results to their own experiences.

After they had discussed these amongst themselves and with the facilitators from the project team staff (who had done the same exercises previously), the participants presented and discussed the finished graphs with their colleagues. This was a new and welcome experience for the participants who were much more accustomed to having a more passive role in workshops as receivers of information. Once everyone had discussed and agreed the implications of the results, a short statement of meaning was written down underneath it. This process was very successful as a means to share information because having an active role in creating the information, the participants were in a much stronger position to understand it and apply it in their day-to-day work.

The graphs and agreed statements were incorporated into short booklets produced on the day that each participant was able to take with them at the end of the workshop. This provided a resource that the participants could use to share the information and refer back to.

Photos: Government staff in southern Lao PDR analyse the data they have helped collect, present results and then discuss them (Source: R. Arthur & C. Garaway).

EVALUATION

Evaluation provides the opportunity to assess the management process and to refine policies and plans so that they deliver the appropriate outcomes. The FMSP projects have highlighted evaluation as vital if we want to build resilient and responsive co-management arrangements. These projects have provided useful experiences that can be used to assess both information generation and use and the associated decision making arrangements.

Evaluations should ensure that the ***outcomes*** of policy and management are considered together with the ***process*** undertaken to achieve it and the ***methods*** used within this process. While outcomes are of obvious interest, it is important to also examine the process and methods to identify why objectives have not been achieved.

The framework illustrated on the next page was developed during the *adaptive learning* projects to guide evaluation both during and at the end of each management cycle. It combines evaluation of process and methods used with evaluation of outcomes and is organised as a diagnostic tree to highlight potential problems. Pages 35 — 37 deal with each part of this framework in turn. The most important part of the evaluation is that any perceived failures are explicitly addressed and improvements suggested rather than any concealment of failure.

Was the information generated what was expected?

Policies and plans should have specified what information should be generated. Much of this will be to do with assessing the performance of the policies and plans though some may be used to provide some insights into how the fishery (including the human aspects) operate in order to improve management and policy decisions. With *adaptive learning* approaches such information is not just a useful by-product, but one of the principal aims of policies and plans. Either way, whether the process has produced the information it was designed to generate is of critical concern.

The information generated must itself also be evaluated. Did it enable performance to be assessed or reduce the uncertainty that it designed to reduce, and if not, why not? Reasons

Making it better—an example from India

In the adaptive learning project in freshwater rice-fish systems in West Bengal there was uncertainty amongst resource users as to the most appropriate mix of fish species to stock. A rapid appraisal had identified that the farmers had the objective of maximising income yet faced financial constraints. The researchers developed experiments that would investigate stocking mixes that could potentially increase yields, incomes and, at the same time, provide a source of cheap fish, thus meeting development as well as farmer objectives.

The experiments were successful and a mix was identified that could improve yields, incomes and provide cheap fish. However some farmers were reluctant to adopt the practice of stocking the mix as the increased yields meant more work for them. This highlighted how making assumptions can affect the process. In this case the assumption was that farmers would be happy with increased benefits in line with their objectives (income generation). However, minimising costs was also an important consideration for them and this had not been considered. This failure was highlighted and in subsequent work potential costs were more fully discussed with them.

Does bigger mean better? Stocking in West Bengal (Photo P.K. Pandit)

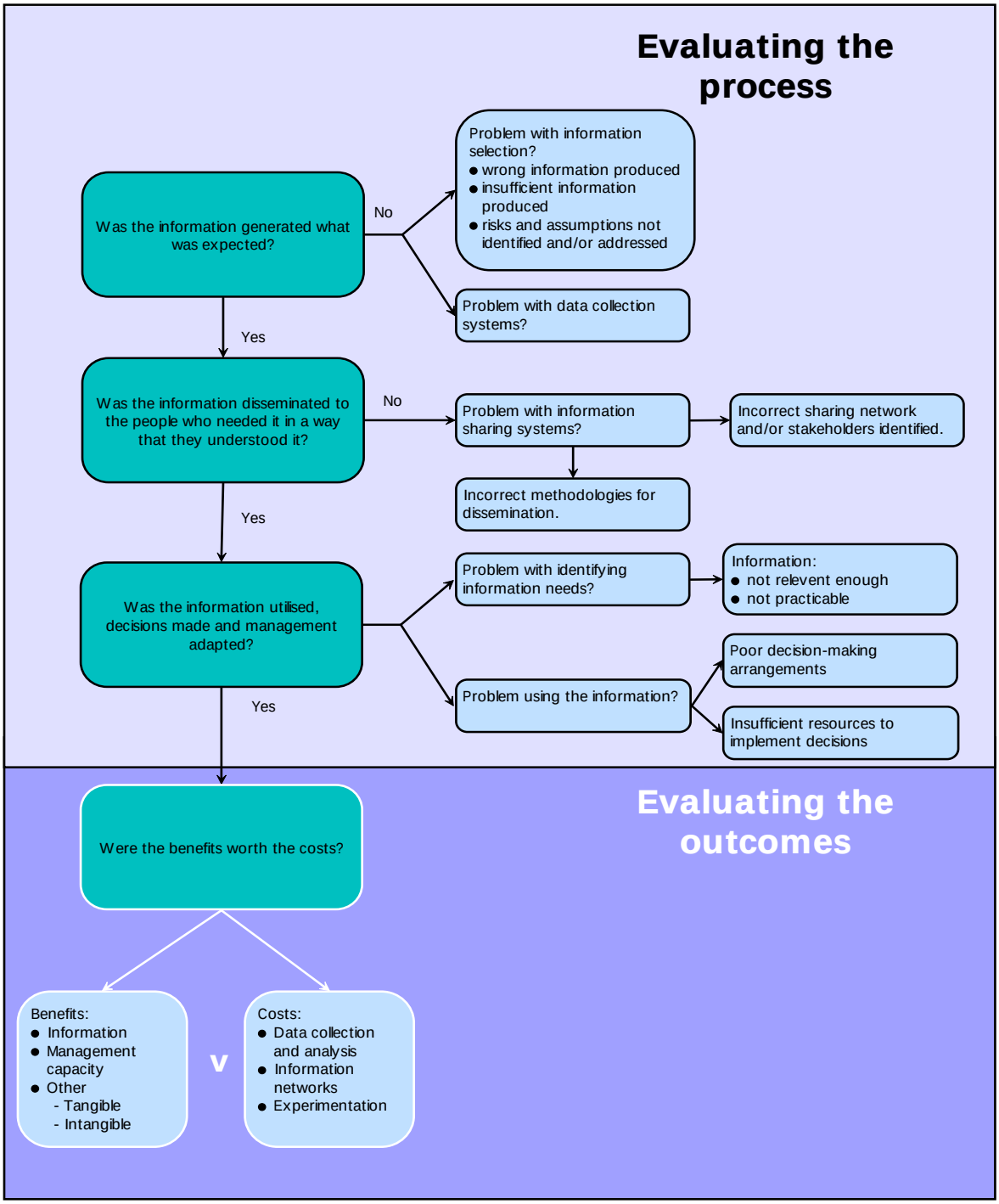


Diagram: Tool for evaluating the management process and outcomes (adapted from Garaway and Arthur 2004).

for lack of success may be due to failures in identifying information requirements or from data collection systems which, in the end, could not deliver the information in the way that it was needed. For *adaptive learning* approaches failure may arise from poor initial experimental design (i.e. even if everything had gone as anticipated, the uncertainty would not have been reduced). In such cases this may be because of insufficient variation between sites or treatments, or not enough replicates.

Finally it may be down to the fact that risks and assumptions were not adequately addressed at the planning stages (see example on the previous page). This may have resulted in insufficient resources or capacity being available for the activities that were planned or that the sense of the relevance or importance of the information being generated was not shared by all.

Was the information effectively shared?

If we are wanting to improve policies and plans then it is vital that decision-makers are provided with the relevant information at the appropriate time and in the appropriate format. The *information systems* experiences have highlighted the benefits of evaluating information networks. For example, a review of the information networks for the Jessor Water body in Bangladesh found that the Beel Management Committee was the most important body for passing information on to a range of stakeholders and that support should be provided to this body to enhance this role.

Experiences with *adaptive learning* have shown that monitoring and evaluating whether information getting to the people who need it in a way that they can understand it was one of the most important ways in which methods for information share could be improved (see also examples on the next page).

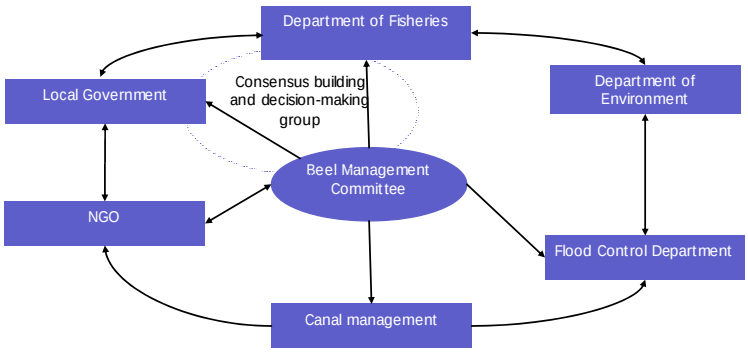


Diagram: Information sharing system for Jessor water body, Bangladesh (from Halls et al. 2005)

Was the information utilised?

The most important aspect is whether information is being used to adapt management plans and ensure that management objectives are being met. Two aspects have been identified in this respect, firstly the information itself and whether this is relevant and secondly the decision making arrangements and whether it is possible to utilise the information.

As the example on page 34 shows it is sometimes the case that the information that is shared is not used. This may be because is not relevant to the needs of the decision-makers and so is unlikely to be used. It may also be the case that while the information is relevant, the constraints faced by fisheries managers mean that it cannot be used. For example, the *ParFish* experience in Zanzibar was that it was possible to develop management plans at a local level but that it would not be possible to implement the plans as external support for enforcement was lacking.

Problems using the information may be due on the one hand to poor decision-making arrangements—including incorrect scale, failure to identify all those who should be involved, conflicts and lack of decision-making ability. The second point may be that the decision-making arrangements are not sufficiently supported so that they are unable to assume the roles and responsibilities that might be needed.

Were the outcomes positive and worth the cost?

For management planning the outcomes should be measured using the agreed criteria and also against the costs of management. This should provide a basis for the next round of management planning. For policy evaluation a wider range of criteria may be being used to measure progress and to highlight any changes that need to be made to policies and governance structures. The *information systems* project has also identified a need to use the evaluation to identify any reasons for policy failure, perversities (unintended results), hypocrisies (suggesting one objective while pursuing another) and absence (neglect resulting in negative outcomes). Where possible these should then be corrected.

Benefits from effective co-management

Some of the benefits seen from using the FMSP co-management tools and methods are illustrated below:

- **Improved management planning**

In West Bengal the use of local knowledge and scientific and technical knowledge to develop a common understanding enabled researchers and fishers to identify researchable constraints and develop acceptable, low risk, management experiments. In one case, these experiments generated information about alternative fishing practices that would enable fishers to increase yields by 15% and income by 11% at little or no additional cost.

- **Increased efficiency**

A review of data needs on the Elenga water body in Bangladesh during the information systems project highlighted that both the local management institution and government require data on the condition of the water body. While they have different uses for this data (the management institution uses it for calculating lease values while the government uses it for flood control planning), they have recognised that they do not need to collect the data independently.

- **Improved data quality**

Involving data collectors in the design and planning of data collection systems helped improve data quality in Lao PDR. The collectors understood why the data was needed and this helped them to collect the right data in the required format.

- **Improved information sharing**

Feedback of the results of a ParFish assessment undertaken for a crab fishery in Andhra Pradesh provided an opportunity for open communication between stakeholders. As a result, the potential impacts of mangrove drainage channels on the crab fishery was identified. Fishers were able to discuss the issue with an NGO responsible for the mangrove rehabilitation programme, and begin to identify how to mitigate the impacts.

- **Increased skills and knowledge**

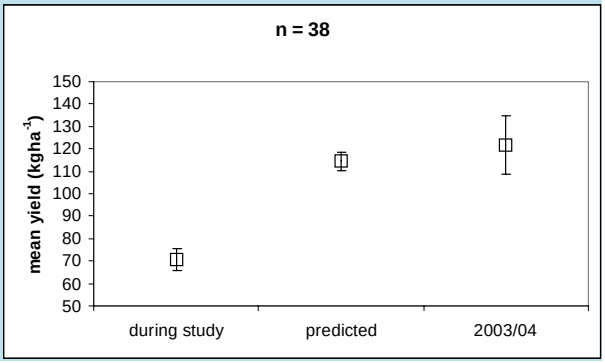
The adaptive learning approach included a commitment to developing skills and increasing knowledge. The latter through the generation and sharing of new information as well as the sharing of existing knowledge. In both West Bengal and Lao PDR participant self evaluations suggested significant and real improvements in both knowledge and skills in a range of categories.

- **Revised attitudes**

In West Bengal there was initially little trust between stakeholder groups, even relations between individual fish farmers were fraught with jealousies and divisions. These attitudes were characterised by statements like: “Farmers do not adopt the correct scientific practices” from government staff and “I would like to learn from the experiences of others but I do not want to share my secrets” from farmers. A commitment to building trust and valuing knowledge types and perceptions led to some changes, as shown in statements by government staff such as “This is a new way of working but it is interesting and it has made working with farmers and understanding their problems easier” and “we can see that some traditional farmers practices work well, now we should try to understand why they work” that showed increased appreciation of the constraints faced by farmers and respect for their practices

- **Increased benefits to those dependent on the fishery**

Adaptive learning in Lao PDR (1999-2002) involved management experiments in small (1-40 Ha), village managed, water bodies to identify species combinations for stocking depending on the trophic status of the waterbody in order to identify appropriate combinations that could improve yields and income. The results from the studies suggested that mean yields could be increased significantly by using the information generated (see graph). A further evaluation two years later (see graph)indicated that yields had in fact increased and that the information that had been generated and shared had contributed to this.



RESOURCES AND FURTHER INFORMATION

Adaptive learning

Arthur, R.I. (2005) Uptake of adaptive learning for fisheries enhancement – final technical report for project R8292 submitted to DfID. MRAG Ltd, London, UK available from www.fmsp.org.uk

Garaway, C.J. and Arthur, R.I. (2004) Adaptive learning: a practical framework for the implementation of adaptive co-management. Lessons from selected experiences in South and Southeast Asia. MRAG Ltd, London, UK available from www.adaptivelearning.info

Garaway, C.J., Arthur, R.I., & Lorenzen, K. (2002) – Adaptive learning for inland fisheries enhancement – final technical report for project R7335 submitted to DfID. MRAG Ltd, London, UK available from www.fmsp.org.uk

Customary Marine Tenure (CMT)

Anderson, J.D. and Mees, C.C. (1999) The performance of Customary Marine Tenure in the management of community fishery resources in Melanesia. Final Technical Report submitted to DfID. MRAG Ltd London, UK. Available from www.fmsp.org.uk

Data collection and information sharing

Halls, A.S., Arthur, R., Bartley, D., Felsing, M., Grainger, R., Hartmann, W., Lamberts, D., Purvis, J; Sultana, P., Thompson, P., Walmsley, S. (2005). Guidelines for Designing Data Collection and Sharing Systems for Co-Managed Fisheries. Part I: A Practical Guide. FAO Fisheries Technical Paper. No. 494/1. Rome, FAO. 2005. 42p. http://www.fao.org/fi/eims_search/publications_form.asp

Halls, A. S., Arthur, R., Bartley, D., Felsing, M., Grainger, R., Hartmann, W., Lamberts, D., Purvis, J; Sultana, P., Thompson, P., Walmsley, S. (2005). Guidelines for Designing Data Collection and Sharing Systems for Co-Managed Fisheries. Part II: Technical Guidelines. FAO Fisheries Technical Paper. No. 494/2. Rome, FAO. 2005. 108p. http://www.fao.org/fi/eims_search/publications_form.asp

Halls, A.S., Howard, C., Walmsley, S. (2005). Evaluation and Uptake Promotion of Data Collection Guidelines for Co-Managed Fisheries (R8462). Final Technical Report prepared for DfID. Bath, Aquae Sulis Ltd, 62pp + Annexes. http://www.fmsp.org.uk/r8462.htm

Halls, A.S. (2005). Fisheries Data Collection & Sharing Mechanisms for Co-Management: Final Technical Report, MRAG Ltd, London, February 2005, 31pp. http://www.fmsp.org.uk/r8285.htm

Floodplain management

Hoggarth, D.D., V.J. Cowan, A.S. Halls, M. Aeron-Thomas, J.A. McGregor, C.J. Garaway, A.I. Payne and R.L. Welcomme (1999). Management guidelines for Asian floodplain river fisheries. Part 1: a spatial, hierarchical and integrated strategy for adaptive co-management. FAO Fisheries Technical Paper 384/1, FAO, Rome

Hoggarth, D.D., V.J. Cowan, A.S. Halls, M. Aeron-Thomas, J.A. McGregor, C.J. Garaway, A.I. Payne and R.L. Welcomme (1999). Management guidelines for Asian floodplain river fisheries. Part 2: a summary of DFID research. FAO Fisheries Technical Paper 384/2, FAO, Rome

ParFish

Medley, P.A; Walmsley, S; Howard C (2005) Uptake of Participatory Fisheries Stock Assessment (PFSA) Toolkit: Final Technical Report. London: MRAG Ltd. available from www.fmsp.org.uk

Walmsley, S.F., Howard, C.A. & Medley, P.A. (2005) Participatory Fisheries Stock Assessment (ParFish) Guidelines. London: MRAG. available from www.fmsp.org.uk

Walmsley, S.F., Medley, P.A. & Howard, C.A. (2005) Participatory Fisheries Stock Assessment (ParFish) Software Manual. London: MRAG. available from www.fmsp.org.uk

Venkata, R, G; Medley, P and Walmsley, S (2005) Report on the ParFish Case Study Project undertaken for the stock assessment of mud crab fishery of Coringa mangroves in Andhra Pradesh, India.

Other references and resources

Oakerson, R.J. (1992) Analyzing the commons: a framework, In: D.W. Bromley (Ed.): Making the commons work: theory, practice and policy. ICS Press, San Francisco

Abbott, J and I. Guijt (1998) Changing views on change: participatory approaches to monitoring the environment. SARL Discussion Paper No. 2, July 1998.

Borrini-Feyerabend, G., M. Pimbert, M. Taghi Farvar, A. Kothari and Y. Renard (2004) Sharing power. Learning by doing in co-management of natural resources throughout the world. IIED/IUCN/CEESP/CMWG, Cenesta, Tehran.

Hartanto, H., M.C.B. Lorenzo and A.L. Frio (2002). Collective action and learning in developing a local monitoring system. International Forestry Review 4(3): 184-195.

IFAD (2002) Managing for impact in rural development: a guide for M & E. IFAD, Rome www.ifad.org/evaluation

Maine, R.A., Cam, B. and Davis-Case, D. (1996) Participatory analysis, monitoring and evaluation for fishing communities: a manual. FAO Fisheries Technical Paper No. 364, FAO, Rome.

McAllister K, (1999). Monitoring and evaluating process, outputs and outcomes. CBNRM Programs Branch IDRC, Ontario, Canada

Pinkerton, E. (Ed.) (1989) Co-operative management of local fisheries: new directions for improved management and community development. University of British Columbia, Vancouver.

Pretty, J.N., Guijt, I., Thompson, J. and Scoones, I. (1995). Participatory learning and action: a trainers guide. IIED Participatory Methodology Series. IIED, London, UK

Wilson, D.C., J.R. Neilsen and P. Degnboul 2003 The fisheries co-management experience: accomplishments, challenges and prospects. Fish and Fisheries Series 26. Kluwer Academic Publishers, Dordrecht

Websites

www.fmsp.org.uk
Website of the Fisheries Management Science Programme containing outputs from FMSP project and other useful information and links relating to fisheries management science.

www.adaptivelearning.info
Website established by the adaptive learning project and containing project reports and guidelines as well as useful links.

www.onefish.org
Website with information and links to many useful resources on fisheries and fisheries co-management.