# Guidelines for Designing Data Collection and Sharing Systems for Co-Managed Fisheries:

# System Requirements Reports – Description and Summary Of Reports for Level 1 and 2

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Contents

# 1 Introduction

System Requirement Reports (SRRs) were prepared by project collaborators typically with input and advice from their local research partners. Many of these partners are target beneficiaries of this research and the focus of FAO Fisheries Technical Paper that forms the main project output.

For a range of geographic areas, environmental regimes, and fisheries types, the content of the SRRs aimed to provide, at four different management levels, a broad picture of the (i) range of data and information requirements that exists, (ii) typically available manpower, resources and institutional capacity, (iii) structure and operations of co-managed fisheries, (iv) existing and potentially appropriate data collection tools, sources and methods, (v) existing data storage and processing methods (if any), (vi) requirements and opportunities for data and information sharing and (vii) lessons and experiences of previous or existing attempts to develop data collection and sharing mechanisms.

These SRRs together with this Summary Report for Levels 1 and 2 were further reviewed and discussed during the Guidelines Development Workshop as the basis determining the scope and content of the FAO Paper to aid fisheries Departments and their local partner institutions design and implement data collection and sharing systems to support the co-management of aquatic resources (See Guidelines Development Workshop Report).

## 1.1 Management Levels

System Requirements were reported for four distinct management levels:

Level 1 – Local Management Institutions (Fisher Communities)
Level 2 - National Management Institutions (Fisheries Departments)
Level 3 - Regional Level Management Bodies (eg SADC, MRC)
Level 4 – International Management Advisory Bodies (FAO)

## 1.2 Stakeholder Involvement

The information included in the System Requirements Reports was, wherever possible compiled in a participatory with the management institutions that are the focus of the reports. The content aimed to reflect the outcome of careful thought and discussion between the management institutions and the project staff responsible for submitting the report. Focus management institutions were encouraged to justify wherever possible the system requirements or opportunities they identified, or opinions they expressed, particularly in the context of their management roles and responsibilities and available institutional capacity.

## 1.3 Preparation

In preparation for compiling the SRRs, project collaborators and their partners were encouraged to familiarise themselves with the content of the following reports:

R7042 – Information Systems for the Co-Management of Artisanal Fisheries. Sections 3 & 4 provide very relevant background including co-management arrangements, design considerations, opportunities for sharing information, and identifies generic information requirements to support national level management roles and responsibilities. Chapter 5 which provides useful information on data collection approaches draws heavily from FAO (1999 –see below)). The report can be downloaded from *http://www.fmsp.org.uk/FTRs.htm*

R7834 – Interdisciplinary Multivariate Analysis for Adaptive Co-Management. Contains useful information on co-management roles and responsibilities, and a range of simple indicators for monitoring and evaluating the performance of local management institutions and initiatives, and for coordinating their activities. The report can be downloaded from *http://www.fmsp.org.uk/FTRs.htm*

FAO (1999) - Guidelines for the routine collection of capture fishery data. FAO Fish. Tech. Pap. 382. Provides guidelines for routine collection of data at national level.

FAO (2003) New Approaches for the improvement of inland capture fishery statistics in the Mekong Basin. Contains relevant country reviews, thematic papers and new approaches for collecting fisheries data.

Coates (2002). Inland capture fishery statistics of Southeast Asia: current status and information needs. Contains country relevant reviews, recommendations for improvements, and raises questions regarding data for monitoring sustainable livelihoods.

FAO (2002) Sample-based fishery surveys – a technical handbook. Clearly written sections covering issues such as accuracy, precision, bias, sample size requirements…etc.

These documents were identified to help the project collaborators and their partners to complete each section of the report by:

- Providing explanations of the relevance of the information,
- Providing a source of relevant information.
- Raising awareness of the issues surrounding data collection and sharing systems.
- Raising awareness of, and helping to identify, potentially appropriate data and information requirements, data collection sources and tools, and information sharing systems in support of different management objectives, decision-making approaches, and institutional capacity.

References to these reports particularly R7042 were also made in the tables of contents (ToCs) of the System Requirements Reports (see Section 2.5).

### 1.4 Process Documentation

Report authors were also encouraged to record *process notes* to accompany each section of their SRR to include important issues that arose when compiling the information with project partners that would be relevant to include in the final Guidelines. These included problems encountered by partners attempting to identify/provide the required information and successful approaches that were adopted to resolve them, including useful tips for conceptualising and addressing problems or issues.

### 1.5 Structure and Content of the SRRs

In order ensure that the reports included relevant information to help shape the FAO manual and to facilitate comparisons, the SRRs were rigidly structured around ToCs agreed by all the project collaborators during the Project Planning Workshop (See Project Planning Workshop Report). The ToCs for each management level, together with the 'Guidance Notes' to help compile the reports issued to each collaborating institution can be found in Annex 1.

## 1.6 **Details of the SRRs Prepared**

| Country | Level | Ecosystem | Report Title | Project Collaborator and Institution | Contributors |
|---|---|---|---|---|---|
| | | Riverine | Case Study Report – Kali Nadi, Bangladesh | WorldFish Centre, Parvin Sultana | Beel Management Committee<br>Local Stakeholders<br>PROSHIKA NGO |
| | | Floodplain (Beel) | Case Study Report – Ashurar Beel, Bangladesh | WorldFish Centre, Parvin Sultana | Beel Management Committee<br>Local Stakeholders<br>CARITAS NGO |
| | | Floodplain (Beel) | Case Study Report – Goakhola-Hatiara Beel, Bangladesh | WorldFish Centre, Parvin Sultana | Beel Management Committee<br>Local Stakeholders<br>Branchte Sekha NGO |
| | | Floodplain (Beel) | Case Study Report – Dhum Nadi Beel, Bangladesh | WorldFish Centre, Parvin Sultana | Beel Management Committee<br>Local Stakeholders<br>BRAC NGO |
| | | Floodplain (Beel) | Case Study Report – Rajdhala Beel, Bangladesh | WorldFish Centre, Parvin Sultana | Beel Management Committee<br>Local Stakeholders<br>CARITAS NGO |
| Uganda | 1 | Lake (George & Kyoga) | Integrated Lake Management Project. Level 1 Local Management Institutions | MRAG, CARE | Dirk Lamberts, Charlotte Howard |
| Laos<br>Cambodia<br>Thailand<br>Vietnam | | Floodplain River | Information Needs of local management institutions in the Lower Mekong Basin. | Mekong River Commission, Wolf Hartman | Khim Kaing, Chhoun Kimchea, Resource users and DoF staff from Kandal, Kampong and Chhang Provinces, Sommano Phounsavath, Thomas Augustinus, Resource users and DLF staff from Vientiane Municipality and Bolikhamsay Province, Kanokporn Deeburee, Malasri Khamsri, Resource users and DOF staff from Udon Thani, Khon Kaen and Sakhorn Nakhorn Provinces, Ha Phuong Truong, John Sollows, Resource users and staff from DARD and People's Communes from Daklak Province |
| Cambodia | 2 | Floodplain River | Information needs of the Cambodia Department of Fisheries for the co-management of fisheries | FAO/STREAM | Malene Felsing, Chan Ratana, Chan Tho, Chheun Sarik, Chhun Sony, Chhun Vannak, Deap Polin, Dy Moeun Naryin, Eric Meusch, Graham Haylor, Haiko Meelis, Heng Ponley, Kaing Khim, Keo Sovathepheap, Kou Huleang,Nao Thuok, Nem Kano, Nouv Buntha, Nut Ly, Paul Bulcock, Pech Bunna, Sam Nuov, Sem Viryak, Soeung Salinin, Somony Tha, Souk Vin, Srun Lim Song, Thach Pannady, Thor Sen Sereywath, Tit Phea Rak, Un Kanika Un Veng, Ung Rachana, Ung Soleakhena, William Savage, Yath Sim, Yo Vichny. |
| Lao PDR | 2 | Floodplain River | Report on Systems Requirements for National Management Institutions ("Level 2") in Lao PDR | MRC (MRRF) | Wolf D. Hartmann, Somphanh Chanpensay et al. |
| Philippines | 2 | All | System Requirement Report for Level 2 – National Management Institutions, for the Bureau of Fisheries and Aquatic Resources in the Philippines | FAO/STREAM | Malene Felsing, Bernadette Soliven, Carmencita Tocino, Felipe Hilan Nava, Florendo Baragan, Grace Lopez, Graham Haylor, Jojo Razon, Jose Paclibare, Lilia Pelayo, Maria Christina Canlas, Marjurie Grutas, Miguel Bumagat, Muriel Camu, Nelson Canlas David, Nory Eleserio, Paul Bulcock, Prescilla Regaspi, Reuben |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | Ganaden, Rex Margen, Rodrigo De Vera, Rogelio Amatorio, Romeo de Sagun, Romeo Recide, Rosarie Areza, Villamor Santos, William Savage, Winifredo G. Amandy |
| Tanzania | 2 | Marine | Levels 1 And 2 Fisher Communities And District Level Managers Within The National Framework: Tanga Region, Tanzania | RFIS Project | John Purves |
| Vietnam | 2 | All | Report on Systems Requirements for National Management Institutions ("Level 2") in Viet Nam | MRC (MRRF) | Wolf Hartmann (MRRF), Nguyen Van Trong, Research Institute of Aquaculture No. 2 in Ho Chi Minh City, John Sollows, Consultant, MRRF, Davide Fezzardi, Socio-economic Advisor and Erland Jensen, FMIS Advisor, STOFA, MOFI, Danida, Hanoi. |
| Mekong Basin Countries | 3 | Riverine & Floodplain | Report on Systems Requirements for Regional Management Organizations ("Level 3"): The Case of MRC | MRC | Wolf Hartmann |
| International | 4 | All | Level 4 – International Management Advisory Bodies | FAO | Richard Grainger; Devin Bartley |

The reports can be individually downloaded at http://fmsp.org. Level 1 and 2 reports were summarised in preparation for the Guidelines Development Workshop (see Section 2 below). Level 2 reports for Cambodia and the Philippines can also be downloaded from the STREAM website: http://www.streaminitiative.org/Library/ .

A synthesis of the material was also presented at the Guidelines Development Workshop in the form of a series of PowerPoint Presentations. These can also be downloaded at at http://fmsp.org (see SRR Synthesis PPT files).

## 2 Summary of Level 1 Reports

### 2.1 Bangladesh

This section summarises all 5 reports received from Bangladesh relating to community-based fisheries management (CBFM) initiatives supported under the DFID-funded CBFM1&2 Projects. These initiatives focus upon the community-based management of 4 beels (Ashuruar, Goakhola-Hatiara, Rajdhala, and Dhum Nadi Beel) and one section of river (Kali Nadi).

The information contained within these reports was generated by means of a review of CBFM project reports and documents, focus group discussions with different stakeholder groups, and consultation with the local management committee and NGO staff supporting the initiatives. Full details of the methodology can be found in the reports.

*Fisher Communities and management Structures*

Table 1 summarises the key characteristics of each co-management fisher community.

***Management Institutions and Structure***

The fisheries operating at each study site are managed under similar institutional arrangements (Figure 1). All are based around the Beel or River Management Committee comprising elected representatives from the villages surrounding the waterbody or fishery. The MC invariably receives advice from the Local and District Fisheries Officers and from Local Advisory Bodies or Government leaders.

Some also include members of sluice gate management committee. The MCs operate beneath a (Beel) Cluster Committee (BCC) comprising representatives from each management committee, together with a member of staff from the DoF. DoF staff may also be responsible for the collection of licence fees to access government owned waterbodies.

The (B)CCs were created to harmonise and coordinate management activities among neighbouring MCs. Representatives from these BCCs are expected to form an overarching Central Committee (CC) responsible for integrated floodplain management and representing the needs of all floodplain dependent stakeholders. A representative from each MC also forms a Community Based Organisation (CBO) to share knowledge and ideas among the CBOs through the CBO network and associated newsletters.

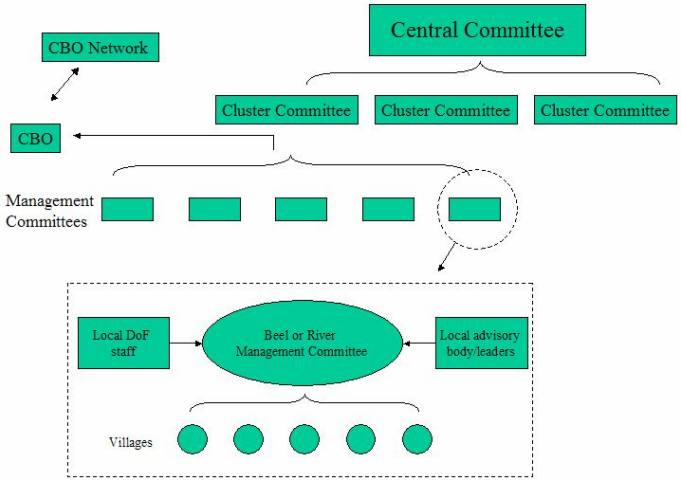


Figure 1 The generalised Institutional structure of co-managed fisheries in Bangladesh

**Table 1** Key Features of each fisheries co-management case studies in Bangladesh

| Name | Area (ha) | Location | Beneficiaries | Property/Access Rights | Livelihood Dependency on fishing | Fish Consumption |
|---|---|---|---|---|---|---|
| Ashurar Beel (AB) | 543 | Dinajpur District | 527 (mostly landless) from 25 villages | Government owned land (*Jalmahol*) and privately owned seasonal floodplain land. Jalmahol is leased to the BMC | 60% of fish for incomes and 25% for food. Fishing is a primary occupation for only approximately 6% of community. Most are involved in farming, labouring and small-scale trade. Fishing is mainly a part-time activity. | Varies seasonally according to availability and price of fish and according to species. More small fish are consumed locally than large fish[1,2]. |
| Goakhola-Hatiara Beel (GB) | 250 | Narail District | 355 from 5 villages | Privately owned seasonal floodplain land. Open access during flood season. | All HH fish for income or for food during monsoon. Fishing primary occupation of just 3% of community. | As above |
| Rajdhala Beel (RB) | 53 | Netrakona District | 594 HH in 4 villages | Government owned land (*Jalmahol*) leased to the BMC. Restricted access. | All HH fish for income or for food during monsoon. Fishing primary occupation 7% of community | As above |
| Dhum Nadi Beel (DB) | 58 | Rangpur District | 1800 HH | Government owned land (*Jalmahol*) leased to the BMC. Restricted access. | 25% of HH fish for income or for food during monsoon. Fishing primary occupation 7% of community | As above |
| Kali Nadi (KN) | 1000 | Kishoreganj District | 263 in 11 villages | Open access except privately owned kathas | Fishing primary occupation 66% of community | As above |

1 This has important implications for designing catch surveys based upon fish consumption.
2 Cultured fish are also sold and therefore consumed alongside wild-caught fish. The proportion of cultured fish consumed also varies significantly from year to year, ranging from 2%-10%. This too has implications for catch surveys based upon fish consumption or market surveys.

***Roles and Responsibilities of the MCs*:**
The roles and responsibilities of the management committees were identified as including:

- Representing the interests of the fishing community.
- The overall management of the fishery (waterbody) including establishing and implementing rules and regulations concerning fishing activities.
- Collecting and managing funds to cover the cost of licences, fisheries enforcement activities, stocking and infrastructure development.
- Putting forward proposals made by the fishing community.
- Administration and fund raising activities.
- Awareness building among local government institutions.
- Control of water levels in the case of fisheries operating in flood control compartments
- Conflict resolution
- Liaising with local government institutions
- Ensuring the equitable distribution of income from fishing activities among community members.
- Organising group fishing and enforcement activities on a rota basis.
- Auctioning landings

***Links with other institutions and stakeholders***

Under the CBFM project, each MC is supported by a local NGO that is responsible for implementing the CBFM project activities, mobilizing communities, helping to ensure fair representation, assisting with credit and savings programmes and facilitate communication between the MCs and local government institutions. Local government institutions provide advice, help resolve conflicts and help negotiate *jalmohal* licences. Local DoF staff provide technical advice and support and help coordinate management plans among neighbouring MCs. District Fisheries Officers may be responsible for *Jalmahol* revenue collection, provision of technical assistance and the supervision of the MC management activities. DoF staff may also be involved in helping to enforce rules, resolve conflicts and to facilitate communication with government institutions. The WorldFish Centre supports action research and monitors its partners activities. Finally a Community Based Organisation (CBO) Network exists to link the BMC to similar CBOs to help influence policy, resolve conflicts and to coordinate activities. Monthly meetings are often held between WorldFish staff, DoF and MC members to discuss progress and issues.

***Institutional Capacity***

GB MC members have received training in leadership and awareness building skills, waterbody and fisheries management and accounting practices. Most members are literate and some have technical knowledge. The MCs typically have the capacity to formulate and implement management plans including stock and harvesting strategies. Most have the capacity to create and enforce their own rules and regulations, and many claiming 90% compliance. The MCs have bank accounts with member contributing to a central fund. Some funds are substantial but loans may also be provided by NGOs for stocking and infrastructure development purposes.

***The Fisheries***

The fisheries exploited by the communities include the following features and attributes:

- Multispecies >90 species
- Some (eg Rajdhala Beel) are based mainly (70%) upon stocked carp spp.
- Common gears include gillnets, traps, liftnets, hook and line.
- Highly seasonal (peak during monsoon and drawdown).
- Fishing during dry season restricted to residual waterbodies
- Annual landings have generally fluctuated during last 5 years. Fishing effort has been seen to increase monotonically in several cases although there is little evidence of sustained declines in CPUE.
- Siltation is reducing the depth and size of beels and blocking connecting channels to the main river.
- Several beels have no fixed landing sites.
- Water levels may be controlled by means of a sluice gates in flood control embankments.
- Salinity of inflowing rivers has increased during the last two decades.
- Fish diseases can be frequent and significant.
- Fish kills can be common due to hypoxia caused by decomposing vegetation.

***Management Measures***

A variety of management measures are employed by the MCs including:

- Fish sanctuaries
- Bans and restrictions on brush-pile fishing
- Closed seasons between April and September
- Effort controls via licenses and rotating access rights
- Gear bans (gill nets, bamboo fences and small mesh seines)

- Controls over dewatering residual waterbodies
- Stocking
- Habitat restoration
- Rotating guard duties.

***Fish Disposal***

- The majority of fish is sold to local traders on nearby roadsides.
- Small indigenous fish are often retained for local consumption.
- Fish landed at night is generally destined for the local market. Fish landed during the day is transported to more distant markets.

### *2.1.1 Data and information Requirements*

Data and information requirements of the MCs are determined by their management plans, objectives and their performance evaluation criteria.

***Management plans***

Management plans have been established by all five MCs including schedules of work. The plans do not to follow the typical format but instead appear more *ad hoc* focusing predominantly on the development of institutional arrangements and practices rather than on resource management. The following rules and planned activities are described in plans:

1 Improve representation in rule making.
2 Improve beel infrastructure.
3 Establish a sluice gate to control hydrological conditions in the beel.
4 Establish a second sanctuary within the beel.
5 Establish sanctions for non-compliance
6 Undertake training in fisheries management
7 Identify alternative livelihoods for community members
8 Undertake fund raising activities.
9 Effectively enforce management rules
10 Register MC as CBO
11 Impose sanctions for non-compliance with rules
12 Develop infrastructure
13 Restock waterbody with rare indigenous species
14 Control pollution
15 Restore habitat
16 Stock fish in accordance to DoF recommendations
17 Establishment access rights for genuine fishers
18 Reduce fishing effort

***Management Objectives***

Management objectives expressed by the MC and its members include:

1 Improved catches
2 Reduction in fishing intensity
3 Greater fish diversity
4 Improved income from other aquatic organisms eg snails, mussels etc and alternative livelihoods.
5 Rehabilitation of natural fish stocks.
6 Maintain sufficient water levels to ensure the survival of fish during the dry season.
7 Establish access rights to waterbodies
8 Refine stocking strategies to increase yields
9 Improve the equitable distributional of benefits

10 Optimise stocking densities

***Management Performance Evaluation Criteria***

The MCs have adopted a number of status and proxy indicators to evaluate their management performance including Table 2.

Table 2 Evaluation Criteria reported by the five Management Committees and their communities and their related objectives.

| Evaluation Criteria | Related Objective |
|---|---|
| Total catch weight | Production/Yield & Resource Sustainability |
| Average size of fish caught. | Production/Yield, Resource Sustainability, Revenue |
| Increased abundance of rare species. | Production/Yield, Resource Sustainability/Biodiversity, Revenue |
| Water remains in dahas for a longer period of time. | Resource Sustainability |
| Depth of water in deepest parts of beel (daha) increased. | Resource Sustainability |
| Establishment of dry season channels between dahas | Resource Sustainability |
| Presence of *blackfish* spawning stocks in residual water bodies (protection of spawning stock). | Production/Yield, Resource Sustainability/Biodiversity, Revenue |
| Increased abundance of other aquatic organisms and maintenance of ecosystem integrity. | Production/Yield, Resource Sustainability/Biodiversity, Revenue |
| Presence of a sanctuary for conservation purposes | Resource Sustainability |
| Paddy harvested on time | Integrated floodplain management |
| Improved attendance at BMC meetings | Representation in rule making, Institutional sustainability |
| Improved compliance with rules | Production/Yield, Resource Sustainability, Revenue |
| Transparent accounting practices | Institutional sustainability |
| Size of committee funds | Institutional sustainability |
| Decreasing dependence on credit | Institutional sustainability |
| Coherent constitutions | Institutional sustainability |
| Management capacity | Institutional performance and sustainability |
| Enabling legislation | Institutional performance and sustainability |
| Representation in rule and decision-making | Institutional performance and sustainability |

***Decision-making methods***

Management decisions are made during monthly meetings held by the MC typically with the participation of DoF and NGO representatives on the basis of:

1 A ‘resolution book’ that contains records of decisions and recommendations made at previous MC management meetings.
2 Records of catches taken from the waterbody.
3 Records of income and expenditure associated with the partial exploitation of reserves, collection of eggs and fry from the beel, and pen culture.
4 Records of stocked fish and organised fish harvests including financial records relating to stocking, lease and other harvest costs.
5 The above information is used to monitor income and manage its distribution.

Typically, catch and effort data are ***not*** routinely recorded for fisheries exploiting non stocked species, and non-group fishing activities. Further details of these data recording programmes and activities are described below. These meetings also provide opportunities to review progress and discussions important issues.

***Data and information requirements***

Data and information requirements identified by the community as required to support their management activities including the implementation and evaluation of their management plans were:

- Incidence of poaching in the sanctuary areas
- Compliance with the closed season
- Compliance with gear bans
- Catch and effort data
- Number of species landed
- Water depth in the dahas.
- Causes of fish diseases and remedial action
- Optimal stocking densities and composition
- Stock size
- Environmental impact of different gears
- Optimal reserve size
- Location of fishing boundaries

In several instances, the CBFM2 Project employs a member of the BMC to collect catch and effort data from the beel fisheries. The BMCs are seeking opportunities to self-fund these monitoring programme and believes that the number of sampling days in each month should be increased to ensure that the large daily catch variation is captured by the surveys. The BMCs have requested formal training for this purpose.

They reported that catch data will provide insights into the total stock size, types of fish landed and individual benefit from fishing. In this way they hope to understand how to improve their management. They also believe that environmental factors are important, particularly the influence of water depth on dry season survival rates, and species composition. The BMCs are also interested in improving their understanding of fish diseases and its potential impact on their fishery. They also expressed concerns over the safety of eating diseased fish.

### *2.1.2 Existing Data Collection Systems*

Existing data collection systems have also been described under 'Decision-Making Methods'. Decisions made at the monthly MC management meetings are recorded in the 'resolution books'. MCs employ their own programmes to record quantities of fish landed from their waterbodies and reserves when the latter are periodically fished. Some keep maintain records of stocked fish and organised fish harvests including financial records relating to stocking, lease and other harvest costs. This includes information on non-stocked (wild) fish species, but not typically not relating to catches landed by non-MC members. The main purpose is to calculate the cost and returns from the fishery for distribution of net income to the participants. In some cases, monitoring is informal without any written records.

Formal analysis of the data is undertaken only by WorldFish. The MCs informally assess their management performance on the basis of their own records and supported by advice from DoF and NGO staff. At Kali Nadi, the RMC maintains a resolution book, but has no formal catch monitoring programmes. Presently, they rely on informal monitoring and evaluation.

***Required Accuracy and Precision.***

These concepts are generally poorly understood by local communities. However, they recognise that sampling frequency of the CBFM project funded CAS should be increased to

capture the large variability in daily catches and effort. The Rajdhala Beel MC requires 100% accuracy but accepts that in reality it may be 90% due to poaching.

***Requirements of Potentially Appropriate Data Collection Systems***

The MC and their members identified a number of important requirements for developing locally appropriate data collection systems:

- Systems should be simple systems employing gear-based CAS, household monitoring programmes or market surveys in local language.
- A workplan/schedule for data collection should exist.
- Maps or diagrams illustrating the position of data collection locations should be provided.
- A list of data collectors and a roster should be available.
- Expenses should be available for enumerators.
- Systems should include an environmental component eg water depth monitoring
- Systems to feedback information to the community members including directly dependent stakeholders should be developed.
- Designs should be cost-effective in terms of time devoted compared to the value of the information.
- Programmes should be comprehensive and inclusive covering both stocked and wild fish species.

***Attitudes towards participatory data collection systems***.

All communities expressed interest in establishing or developing further their own data collection programmes, but acknowledged that they, together with any data analyses, would need to be simple and may not be sustainable in the long term unless they were financially supported. Training in appropriate methodologies and technical advise on designing and implementing programmes would also be required.

At Dhum Nadi, the BMC identified the need for technical advice to guide management activities including stocking rates and species. They also expressed a need for assistance with the analysis and interpretation of the data to help understand the outcomes of their management activities.

At Kali Nadi the MC recognised that there is currently little prospect of establishing a participatory data collection systems until appropriate enabling legislation exists to support the RMC management plans. Fishers at Kali Nadi also expressed uncertainty over the purpose of external data collection systems and reported no effective feedback from them.
Opportunities exist to establish participatory data collection systems although technical support from outside the community will be required to help analyse the data, interpret the results and present it to the community in a palatable and understandable format.

### *2.1.3 Data storage and processing methods*

Some of the MCs maintain paper records in support of the monitoring programmes and management meetings, but data processing is limited to the needs of their informal assessments (see above).
See resolution book above

The CBFM2 project conducts its own monitoring programmes geared largely to evalting the development impact of the project. Data are stored in a database and tabulated and analysed using SPSS. There is little evidence that the results of any analyses of these data are adequately feedback to the community. The DoF currently lacks the capacity analyse and interpret these data.

*2.1.4 Identification of appropriate data sharing mechanisms*

***External Data and Information***
Beyond their own fisheries, the MCs expressed an interest in receiving information from external sources including:

- Information on fish diseases, water quality and pollution and their impact on their fishery
- Data collected under 'external' DoF CAS programmes
- Abundance of rare species of fish
- Information on causes of flash floods and how to control them
- Information on the ecological niches of different species of fish
- Reports describing management success and failure in other areas of Bangladesh lessons.
- Information on optimal stocking densities and feeding regimes.
- Information of optimal size of reserve areas
- Information on marketing and preservation of fish.
- Information on the impact of gears on the fish stocks and the environment

***Information for sharing with other communities***
The communities expressed willingness to share information on:

- Sanctuary management
- Fish species caught in the sanctuary
- Catch and effort data if they collected it.
- Experiences of attempting to re-establish rare species
- Stocking rates and sizes to determine the optimal stocking strategies.
- Market data
- Consumption data
- Household income and expenditure data

Communities also expressed interest in writing articles describing their management experiences for the CBO newsletter.

Indeed, the RMC at Kali Nadi recognise the potential of the CBO newsletter for disseminating their ideas, knowledge and experiences. They also believe that the newsletter could be used to raise awareness among government institutions of their needs to improve the management of the river fisheries and lobby government institutions over management issues such as the creating of enabling legislation to support their management plans.

*2.1.5 Existing or previous attempts to develop data collection and sharing systems*

At Ashurar Beel, a CAS programme geared primarily towards stocked carp species has been in operation since 1995 involving DoF staff and CBFM members. This programme is believed to have been inaccurate.

At Ashurar and Goakhola Beels and Kali Nadi, two parallel surveys have been undertaken since 1997 under the CBFM project: a CAS, and a household (HH) monitoring programme. These have been largely geared towards project impact monitoring rather than assessing the performance of community-based management activities. The results have been largely inconclusive because of the imprecision of the CAS programmes.

Catch is estimated weekly or bi-weekly from a census of the number of gears (by type) operating on the sampling day and samples of catch rates by species from these gear types.

The enumerator was employed by DoF but later by the CBFM project. The CAS survey has been criticised for using predefined survey dates which often fails to capture the highly variable daily catch rates particularly from dewatering operations and liftnets.

The HH monitoring programme is conducted by local educated women during seven consecutive days in each month and records from 30 respondent households, their fishing effort and catch by recall, fish consumption (weight of species before cooking), and other food consumption information.

## 2.2 Uganda

This section summarises the findings of a report prepared by MRAG and CARE describing existing and potentially appropriate data collection and sharing mechanisms to meet the information requirements of local communities engaged in co-management of the fishery of Lake George in Uganda.

The process of introducing co-management of fisheries resources in Uganda has been facilitated by the Integrated Lake Management project (ILM), funded by DFID. The project started in October 1999 and is nearing completion of its 5-year life span. A main characteristic of ILM has been a very high level of stakeholder participation in all elements of the project and in the establishment and development of co-management of the fishery resources of Lake George.

The information contained within the report was generated from a review of the numerous activities and subsequent project reports that have been produced throughout the ILM project Including a number of specific workshops on information needs were held during the ILM project (see Table 1 of the report). During these workshops, a mechanism for community-based collection and use of data was developed and refined through training activities and feed-back from initial experiences.

### *2.2.1 The Fisher Communities and Management Structures.*

Lake George is situated in the southwest of Uganda, in Central/East Africa. It is one of five major lakes in Uganda. Lake George lies on the equator at an altitude of 914 m covering a water surface area of 260 km2 with a catchment area of 9,700 km2. The lake is very shallow with a mean depth of 2.5 m and a maximum of about 4 m.

About 75% of the lakeshore lies within the boundaries of the Queen Elizabeth Protected Area (QEPA), under the stewardship of the Uganda Wildlife Authority. This has implications for the use of the lake and for the livelihood strategies of the people living in the fish landing sites within the boundaries.

The lake supports a commercial fishery, whose fleet size has been controlled by central government through licensing since the 1950s. There are six landing sites on Lake George, with another two on the Kazinga Channel supporting a population of about 13,000 people, most of whom live within QEPA.

These features of Lake George present challenges to integrated lake management. The presence of the national parks, particularly QEPA, present challenges in terms of livelihood options and access to other natural resources (such as fuel wood) for those living in fishing villages within the Protected Area boundaries.

More than 60% of the populations' livelihoods are directly dependent on fishing.

***The Local Management Institution***

The management of Lake George is assigned to a lake-wide management institution, - the Lake George Basin Integrated Management Organisation (LAGBIMO). The stakeholders involved in forming LAGBIMO felt it was essential to take a basin-wide approach to management, but also realised that they had limited capacity to do so. The focus of LAGBIMO is primarily on the lake itself and its immediately adjacent catchment, on the communities directly benefiting from the lake and on the local governments, and other agencies, benefiting from, and responsible for the lake. Some basin issues have been identified and incorporated into a management plan. Figure 1 below summarises the direct and indirect beneficiaries of the fishery.

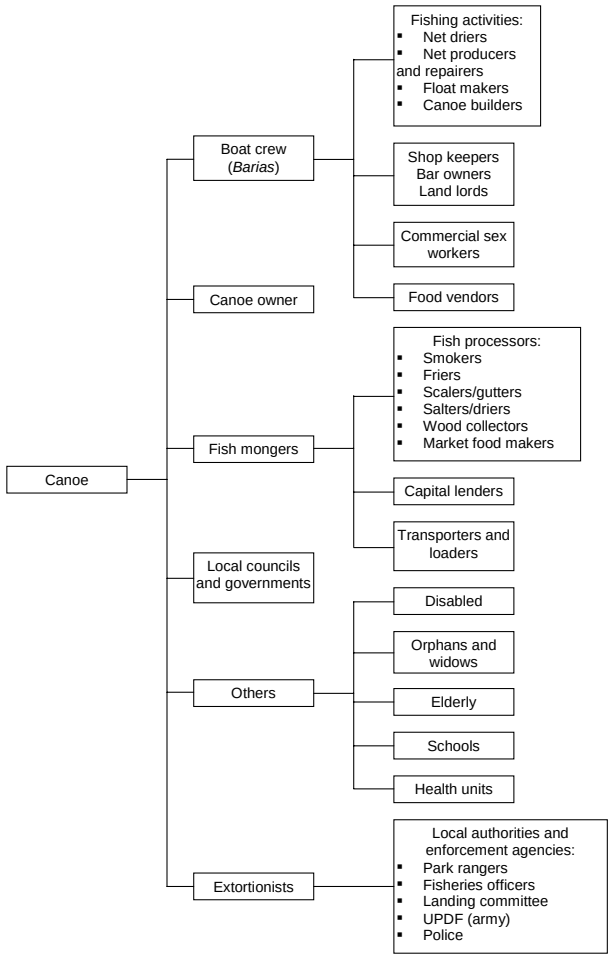


Figure 1 The direct and indirect beneficiaries of the Lake George fishery

LAGBIMO was established by three cooperating local riparian governments: Bushenyi, Kamwenge and Kasese, and all stakeholders involved in fishery from the eight landing site communities of the Lake. The formation of LAGBIMO lead to the development of an integrated lake management plan (see later).

***Management Objectives***

The overall aim of the integrated management approach implemented through LAGBIMO is poverty reduction through improved livelihoods resulting from sustainable management of lake basin natural resources.

Fisheries make significant contributions to poverty reduction and economic growth by providing food, employment and incomes for millions of people. Therefore, lake management has focused upon managing the fishery resources. However, since many of the factors that influence resource productivity arise on land, lake management in Uganda is increasingly becoming more integrated and is taking a basin management approach.

The objectives of LAGBIMO, as set out in its Constitution, are to:

- Promote poverty eradication and the social and economic development of the Lake Basin communities;
- Ensure collection, exchange and use of information in order to improve the management and sustainable use of the Lake George Basin natural resources;
- Increase social and economic benefits to all the parties, especially to the poor sections of the local communities within the lake basin;
- Promote alliances by encouraging operational, economic and other partnerships among the respective central government agencies, the co-operating local governments, private sector, local communities and civil society organisations;
- Develop a framework whereby local communities can effectively participate in, and tangibly benefit from, the management of the lake basin natural resources;
- Establish and manage funding mechanisms and financial resources for the sustainable management of the Lake.

LAGBIMO has the following structure:

· Lake-wide Assembly (LWA)
· Executive Committee (EC)
· Fisheries Management Committee (FMC)
· Finance, Planning and Budgeting Committee (FPBC)
· Secretariat

Every Committee includes representatives from communities, sub-counties and districts. The two standing committees, FMC and FPBC, have developed detailed terms of reference to guide their operations and logical frameworks to set out what they want to achieve, how and by when. Figure 2 summarises the functions of the LAGBIMO. At present, LAGBIMO is supported financially by ILM and contributions from local government. Initiatives are in place, including the annual payments made by each Beach Management Unit (BMU), to ensure that the LAGBIMO remains financially viable and sustainable.

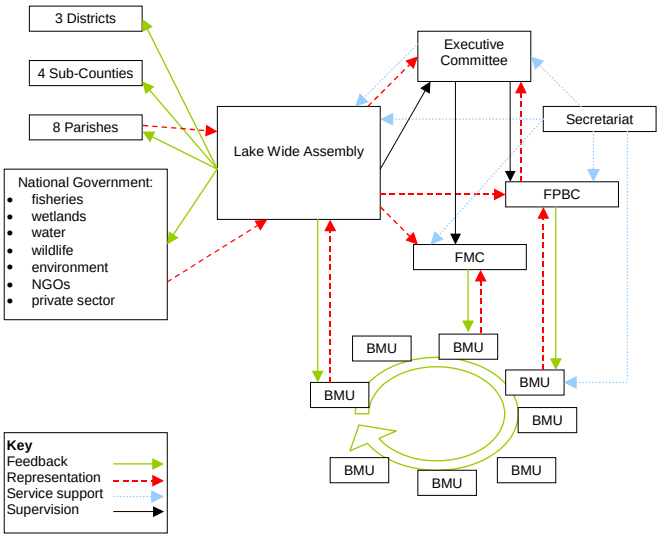


Figure 2. LAGBIMO functions

***Management Plans***

The Lake George Basin Management Plan (LGBMP) seeks the sustainable management and use of Lake George natural resources for the improved livelihoods of poor communities. The implementation of the plan is anticipated generate the following:

- Information for participatory and integrated planning at all levels generated, used and disseminated.
- Fish resources sustainably used and managed.
- Post harvest fishery efficiencies improved.
- Livelihood security of lake dependent communities improved.
- Equitable access to, and benefits from, natural resources within lake dependent communities.
- Sustainably managed environment within the lake and its basin.
- Improved capacities of BMU and other LAGBIMO structures to participate in integrated lake planning and management.
- Sustainable funding for integrated lake management in place.
- Monitoring and evaluation systems at all levels of LAGBIMO development and implemented.

See Section 4.1 and Table 5 of the report for further details

The BMU form the lowest tier (functioning unit) in the LAGBIMO management structure and operate in close collaboration with local and central government. The eight BMUs are required to represent the interests of all local stakeholders.

The Parish or Village Executive Committee is charged with monitoring and supervising the operations of BMUs. The Chief Administrative Officer of the district local council has overall responsibility and reports directly to the Commissioner of the Department of Fisheries Resources (DFR).

Each BMU is required to develop its own fishery management (and beach development) plans and advocate for their integration in other local development plans.

Representation on the BMU Committee by each stakeholder group is as follows:

- 30% boat owners

- 30% crew (fishing labourers/barias who do not own boats)
- 30% other stakeholder groups including fish processors, boat makers, local gear makers or repairers, fishing equipment dealers, managers, and chatterers
- 10% fish mongers

A BMU Committee will, wherever possible, comprise 30% women members. BMUs require modest funds that are sourced from:

- Fishing permits
- Profit generated from the sale of fish landing site rights.
- Tax on fish landings.

***Management Control Measures***
Effort is controlled via the boat licences issued by district government under the scrutiny of the BMU Committee. A fixed number of licences exist. New licences become available after confiscation of existing licences as a result of illegal fishing activities. National regulations also exist concerning gear and catch restrictions:

- Minimum landing size for Nile tilapia (ngege) of 11 inches.
- Minimum (stretched) mesh size of 5" gillnet, with a maximum number of nets/boat as 10 to be used passively,
- Hooks must not be less than size 7 and the total number/boat should not exceed 100.

Currently, BMUs do not set their own rules or formulate their own management plans. This component of the co-management is still under development. DFR staff currently continues to monitor fisheries for illegal activities. While the arrangements are not final, it is expected that the communities and co-management entities will take more responsibility and action in monitoring and control.

### *2.2.2 The Fishery*

Four main species of fish are targeted (local names in brackets): Oreochromis niloticus (ngege), Protopterus aethiopicus (mamba), Clarias gariepinus (male) and Bagrus docmak (semutundu). Several other species may also be found in the catch: Oreochromis leucostictus (bambala), Barbus altianalis (njingule), Mormyrus kannume (kasulubani), Labeo forskalli (ningu). Of these 'minor' species, bambala is caught most frequently, with the remainder being a rare part of the catches.

Engineless plank canoes of between 12 and 18 feet (6-12 planks) are predominantly used in the fishery operated by a two man crew and usually deploying gillnets or hooks.

***Status and trends***
Records of 1950-1988 showed that the average total fish catch from Lake George was 3,141 ± 159 tonnes and varied between 1,487 and 5,097 tonnes. The estimated annual catch in 1997 based on 547 boats on Lake George was 6,800 tonnes, while a 2000 survey estimated it at 2,512 tonnes based on 426 boats on both Lake George and Kazinga channel. Dunn (1989) estimated the theoretical MSY figure of 3,000 tonnes on Lake George.

Although potentially significant, landings from the hook and line and trap fisheries appear to be unreported in the catch statistics.

Catches are landed at 8 landings sites, two of which are illegal.

***Environmental influences and threats***

- Heavy metal pollution from mining operations is considered the most important environmental threat.
- Siltation and agrochemical runoff arising from hillside agriculture.
- The Mubuku hydropower and irrigation schemes are expected to have a substantial impact on the water budget for the lake. It also carries the risk of changed water quality.
- Organic enrichment from untreated sewerage.

### *2.2.3 Data and Information requirements of the LAGBIMO*

***Management plans***

See above

***Management objectives***

The objectives of the lake-wide management plan (LGBMP) are to:

- Improve the livelihoods of poor lake basin communities.
- Ensure a healthy, clean and productive environment within the basin.
- Sustainably and effectively manage the Lake George basin fishery for increased productivity and improved livelihoods.
- Develop integrated, poverty focused and participatory planning systems for sustainable management of basin resources.
- Support a co-ordinated and effective conservation management approach and community-QEPA relations.

Within this inter-sectoral lake-wide management plan, the fishery management plan has developed its own specific objectives. The FMC recognised that Lake George and the Kazinga Channel must be managed for commercial fisheries and that a range of social, economic and environmental aims needed to be included in the overall management objective. These comprised the following:

· Increased fish catch
· Increased income from fishery activities
· Increased standard of living
· Increased employment
· Sustainable management of fisheries resources for improved livelihoods
· Environmental protection
· Fisheries development

Taking these into account, the following single management objective statement was developed and agreed: "Maximised poverty focussed and gender sensitive access to, and benefits from the sustainable exploitation of fisheries resources within a clean and healthy environment".

***Information requirements to evaluate management performance and regulate the fishery***

Data and information requirements to evaluate management performance in relation to these objectives and to control and regulate the fishery were identified during a workshop involving representatives of all stakeholders as being:

Biological

- What is the daily catch size (kg)?
- What is fish catch per boat per day?
- In which months are catches highest and lowest?
- Average catch per canoe?
- What kinds of species are caught and which are dominant?
- What types of baits are used and how are they obtained?

Technical
- How many canoes are on the lake?
- How many illegal boats by landing site?
- How many canoes and size of boats do you use?
- How many of boats by type are present?
- How many illegal nets and boats are destroyed annually?
- What types of nets are used?
- What kind of gear size and number do you use?
- What size of nets/hooks are in use?
- What kind of fishing practices are used
- What is your fishing time i.e. duration
- What type of nets do you use i.e. single or double?
- How many registered experimental and unlicensed fishers?
- Where are the fishing grounds for each landing site?

Marketing and Socio-economic
- What is monthly income from fish catches by landing site?
- Which markets are fish sold to?
- What processing methods are in use?
- What is fish price per landing site?
- How do you market your fish and the means of transport used?

Miscellaneous
- What is the landing population?
- What data collection equipment is there at landing sites?
- Who are the foreign people involved in fishing?
- What are the problems met on the lake e.g. crocodiles, hippos?
- What is your landing population by sex and age?
- Are there illegal landing sites?
- What are the organisations (community-based organisations & NGOs) found on the landing sites?
- How are fish handled after landing site do you have potable water?
- Do you have fisheries staff?
- How can an outsider access other landing sites?

The stakeholders identified the following types of fishery information as what they need for planning and management of the fishery resources:

- Catch (kg) per boat per day
- Catch per boat per day of each fish species
- Cause of differences in catch rates (seasonal)
- Types of fish caught (sampled and unsampled)
- Fishing method (sampled and unsampled)
- Fishing gear type
- Number of gears per boat
- Which landings use illegal methods
- Boat type
- Breeding grounds

- Fishing grounds
- Fish processing methods
- Fishing income
- Best markets for fish

Government fisheries staff added the following:

- Number of different fishery stakeholders
- Number of illegal boats
- Number of gears,
- Gear size (mesh and hooks)
- Hanging ratio of nets
- Colour of nets
- Length of boats

In spite of the apparent understanding that **"…the usefulness of information for the community, as well as for government must be apparent"** it is difficult to understand the purpose of much of this information. This must be made explicit in terms of how decisions will be made on the basis of it. ie How will this information be used to manage the fishery – what the underlying cause and effect relationships/models? Is this simply a wish list? It is critical to ask the questions: How will management decisions be made on the basis of this information and what will be done? How accurate and precise does this information need to be?

### *2.2.4 Existing and potentially appropriate data collection systems*

***Previous systems***
Fisheries officers collected data on catches and effort only. Samples were small and biased giving rise to inaccurate and imprecise estimates.

***Existing Systems***
A new participatory fisheries information collection and analysis system was developed based on FAO systems and that satisfied requirements of all levels involved in the co-management of the fishery resources. The information collected is transferred to local government and the LAGBIMO Fisheries Management Committee to inform lake-wide planning and management, before being passed on to central government to inform national policy and planning.

The system is based upon the 'Scenario B' CAS employing a census of effort in space and sampling of catch and effort in time (see Halls et al (2000 p117). Catch and effort is sampled on four to eight randomly selected days in each month. No prior notice is given to fishers on survey dates. Local rules have been established at each landing site for information collection. These include setting times of landing catch and ensuring catches pass through the survey check points on survey days.

Catch Assessment (CAS) forms were designed for use at all relevant levels of management. These forms are included in Annex 3 of the report. The system was introduced on Lake George in December 2001. The CAS forms are used in the collection of basic data and information on catch volume, composition, value and effort.

All data collection is done at the BMU level. Data collectors appointed by each BMU at the landing sites receiving part of the catch as renumeration for their services, usually one fish per boat surveyed. The number of recorders has been agreed by BMUs in consultation with

local fisheries officers. Single weighing check-points have been established at each landing site for recording fish catches. All fish in catches is being weighed and counted. Sub-sampling the catch is avoided.

LAGBIMO supports one Fisheries Officer to supervise the appointed data collectors at each GBMU. The same officer will combine and analyse data from all landings to provide lake-wide information.

The ILM Project provided initial support to information collection by funding, where appropriate, recording shades, information storage facilities in community and government offices and items of field equipment (rain coats, weighing containers).

The information system builds upon the current local government community information collection systems and is not intended to interface with the fishery enforcement decision and activities.

The sub-county fisheries officer serves as a transfer and collection point for information. The officer collects copies of CAS 1 (BMU-level) and CAS 2 (parish-level) forms by 15th of each month and completes a CAS 3 form to the district FO before the end of the same month. The district Fisheries Officer (DFO) then completes a CAS 4 form and submits that to district authorities and to DFR, Entebbe, by end of the same month (Figure 3). DFR produces synthesised information for the entire lake (CAS 5).

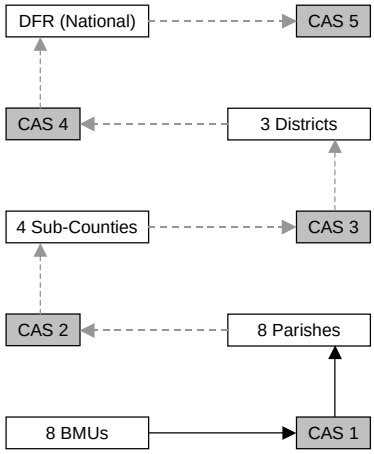


Figure 3. Data collection activities and actors. Solid arrows indicate original data, dashed arrows indicate flow of synthesized information.

***Experimental fishing***

Nightly catches of ngege (Oreochromis niloticus) per net (4.5 inch mesh) landed by a local experimental fishing team is also being employed as an indicator of the status of the fishery.

***Attitudes towards participatory data collection systems, required incentives etc***.

A major point of concern, both among communities and local government and DFR staff was the relationship between data collection and enforcement. It was questioned whether data should be collected from illegal fishers while ignoring the fact that they are illegal. If they are to be monitored, it was suggested that enforcement should be in place. It was stressed that while care should be exercised to ensure that enforcement does not sabotage data collection, the monitoring system is not intended for undermining enforcement practices. Indeed, it may well be used as a tool for determining whether illegalities are a threat to the

fishery and hence used for future management decisions, which may include enforcement measures.

Apart from some minor problems with Fisheries Officers claiming part of the catch for their services, there seems to be an overall positive attitude by fishers and boat owners towards the collection of data about the catches.

Community data recorders were expected to sample all fishing boats landing at a designated landing site on 4 to 8 sampling days per month. In reality, they sampled far fewer boats than expected (only about 25%). There are also concerns that the census of effort (numbers of boats landing on each sampling day) is not accurately recorded. The crude measure of effort (boat days) when combined with the catch data, may not be precise enough to detect changes in abundance (see later).

### *2.2.5 Data storage and processing methods.*

ILM has provided the BMUs with box files for storage of the CAS data recording sheets. At district level, computers have been supplied and staff trained in data analysis.

Each BMU produces a quarterly fishery report using the analysis of information obtained from the CAS system operating at their landing site. Each report will provide the foundation of fishery management discussions and planning. Information from the CAS system will form the basis of regular reporting by government officers to their reporting officers.

The information collected under the CAS can provide the following processed outputs:

(i) Total fish catch
Total fish catch can be calculated in different ways for different purposes:

- for different periods, e.g., per day, month and year;
- for different geographical areas, e.g., per landing site, parish, sub-county, district, lake and nationally;
- for different gears;
- for different fish species;
- for all gears and all species combined.

(ii) Fishing effort
The government has for many years attempted to regulate fishing effort on Lake George by restricting the number of licensed fishing boats with the legal right to fish. It also combined this regulation with a second rule that restricted the number of gillnets and hooks that were allowed to be used by each licensed fishing boat.

The actual situation is, however, very much different to this. Fishers use a variety of ways of illegally increasing fishing effort in order to increase catches and incomes. These include:

1 increasing the unit size of gears by using muchira nets, made by joining two gill to double the depth of the net;
2 Increasing the number of gears above the legal limit, e.g., many long-lines use up to 1200 hooks and many fishers deploy over 30 gillnets per night;
3 Increasing the catching power by using illegal active fishing methods such as Kikubo (driving fish by beating the water) and ponda ponda (boat seining);
4 Extending the fishing period into both day and night;

5 Increasing the number of fishing units by using unlicensed fishing boats (often combined with the use of illegal gears or methods).

Knowledge of fishing effort is critically important to planning and management. It is essential that an accurate estimate of effort be obtained from the CAS. Currently, there is concern that the total numbers of boats active during the sampling day is not accurately recorded, potentially underestimating effort and therefore total catch.

### *2.2.6 Identification of potentially appropriate data sharing mechanisms*

***Opportunities and pathways for sharing.***

***Opportunities for sharing***

Opportunities exist to share data collected under the CAS among all the existing administrative levels of parish, sub-county, district and lake-wide. The data should be used to aid the formulation and evaluation of local government development plans. For the plans to be effective and the value of the fisheries understood, the CAS data should also be complemented with other types of data including social, economic and environmental planning information.

Nationally, catch data are compiled to provide an overall indication of the scale and significance of fisheries to the country. This information, when combined with others, is used to guide broad national planning and policy decisions. National catch data are transferred internationally to FAO where global catch data compilation is undertaken.

There is, however, capacity to absorb and use data from other sectors that is currently underutilised. In part, this integrated management planning happens through the interaction with local government planning and monitoring, but this is still at an early stage, and the efficacy of the existing approach is yet to be assessed.

***Existing Sharing Systems***

The BMU data collector works with the fish guard or the FO at the landing site and parish level, recording catch, effort and price data using CAS 1 forms. They compile this information using CAS 2, which they forward to the sub-county, which in turn uses CAS 3 to summarise the information received. At the district level, the form used is CAS 4 (Figure 4). At each level, the information contained in the CAS forms is used in the local government planning process, i.e., for the development of Parish Development Plans, Sub-county Development Plans and District Development Plans respectively.

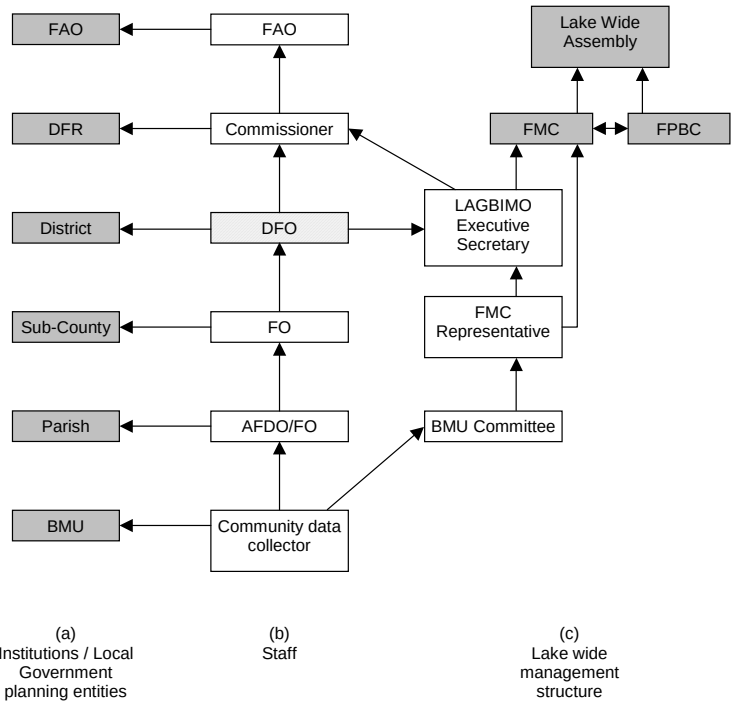


Figure 4. Fisheries information flow and use in planning. The greyed boxes indicate instances where data analysis and use in planning occur. The hashed box (DFO) indicates the level where data are stored and processed on computers

**NB** It has been noted by some of the planners that the CAS forms do not provide enough information on the state of the fishery, and there is a need for further data analysis and interpretation.

The DFO coordinates the distribution of this information throughout his district and sends it to LAGBIMO. The DFO also sends information to DFR as a contribution to the compilation of the state of fisheries in Uganda. DFR is then responsible for making policies, laws and plans based on the information collected. DFR then sends this information on to FAO, which uses the information for normative activities.

The DFOs also send the information regarding their district to the Executive Secretary of LAGBIMO.

The first computer comes in at the district level in the DFO's office. The computer is at the district level by the DFO to store and analyse the data received. The analyses and interpretations are then passed to the Executive Secretary and DFR. The data collectors use calculators for the analysis of the data at their level. This allows communities to take decisions based on the information they collect. This in turn motivates data collectors and fishers to participate in the data collection as they can see immediate impact and outcomes of their efforts.

The LAGBIMO Executive Secretary is responsible for compiling information at lake-wide level for planning purposes. The information from the districts is compiled and sent to the FMC members. The FMC could also acquire this information from its BMU representatives members. The outcome of the FMC meeting is distributed to the other committees in LAGBIMO.

***Information use***

BMUs have been actively analysing their data and drawing conclusions about some relevant trends in their fishery. Their challenge is to translate any conclusions into appropriate and effective management actions.

## 2.3 Laos,Cambodia,Thailand,Vietnam

The report presented the findings from numerous meetings, workshops, group and individual interviews, user self-assessment exercises, and consultations with more than 250 stakeholders involved in the co-management of 17 lakes and reservoirs in the LMB under the MRRF Project between June – November 2003. Details of the methodologies used are described on pages 8-9 of the report.

### *2.3.1 Fisheries Communities and management Structure*

- In Cambodia, the local management institution comprises the village and is referred to as a Community Fishery (CF). CFs have the capacity to formulate and implement local management managements within the overall framework of the country's legislation. Several CF's may exploit the same waterbody. Provincial and District Fisheries Officers implement activities according to a national sector development plan and fisheries legislation on behalf of the Government.

- In Lao PDR, the local management institution is called the Reservoir Fisheries Management Committee (RFMC) and is officially recognized by the provincial and district governments. The RFMC's "jurisdiction" is the water body, for which it develops a management plan and fishing rules and regulations. Provincial and District Fisheries Officers implement activities according to a national sector development plan and fisheries legislation on behalf of the Government.

- In Thailand, the local management institution is called Or-Bor-Tor (OBT). Usually, a reservoir is shared and managed by more than one OBT. A group of fishers (this is a bit vague?) develops a fisheries management plan for implementation by the OBT within the water body area under its jurisdiction. Similarly, fishing regulations, in particular the establishment and enforcement of conservation zones are being formulated. On the government's side, the provincial fisheries offices are providing management services to OBTs, upon solicitation.

- In *Viet Nam*, the local management institution is the Fisher Union (FU), with jurisdiction over reservoir fisheries management within a district. The Fisher Union has village-based fisher groups. The Fisher Union develops a water body-wide management plan and fishing regulations. On the government's side, it is the provincial Department of Agriculture and Rural Development which carries out management activities. At reservoirs targeted by MRRF, staff from the Research Institute for Aquaculture No. 3 (RIA 03) facilitates the implementation of management measures.

Summary

| Riparian Country | Local Management Institution | Description |
|---|---|---|
| Cambodia | Community Fishery (CF) | Stakeholders from one or more villages exploiting a single water body |
| Laos PDR | Reservoir Fisheries Management Committee (RFMC) | Stakeholders, including village headmen from one or more villages exploiting a single water body |
| Thailand | Or-Bor-Tor (OBT) | Represents groups of 'fishers' exploiting a single waterbody under its jurisdiction |
| Viet nam | Fisher Union (FU) operating at the District Level | FU develops and implements management plans for single waterbodies on behalf of village-based fisher groups. |

***Fisheries and Socio-economic profiles***

Table 1 Summaries some important characteristics of the study sites.

In *Cambodia*, fishing plays a crucial role in maintaining household livelihoods and food security throughout the year for villagers living around reservoirs. The majority of the catch is destined for their own consumption, providing the most important source of animal protein for rural families. Only very valuable species are sold at local markets, and are an important source of cash income. Agriculture is more important in terms of generating income with fishing providing supplementary income. Fishing Lots (formerly government-leased waterbodies) have recently become a major source of income.

In Lao PDR, the importance of fisheries varies substantially between families and across seasons. Nutrition wise, fish is very important, as it is consumes by all households surrounding the reservoir.

In Thailand, fishing is important both as a commercial activity as well as for household food security. Fermented fish particularly important as a means to increase family income through work done by women.

In Viet Nam, fishing is very important in terms of food security and income for most fishers at Lak Lake and Ea Soup reservoir. It is the main source of income for 60%-80% of the union members.

Table 1: Sizes of water bodies, numbers of fishing villages and fishers, MRRF targeted water bodies, LMB

| Waterbody | Size (in ha) | No. of villages | No. of fishers | Observations |
|---|---|---|---|---|
| Cambodia | | | | |
| Chhroy Chhek | | 5 (13) | 408 | Total 4,300 people |
| Boeung Chen Loeun | | 5 | 616 | total of 7,330 people |
| Teuk Char/Thmor Da | | 4 (176) | 150 | Total 5,450 people |
| FL No. 18 | 7,327 | 16 | Approx. 11,200 | Total 14,500 people; In 3 of 15 communes in district |
| FLs Nos. 13-15 | | 19 | ? | 3 CF federations |
| Lao PDR | | | | |
| Nam Houm | 500 | 5 | 82 | |
| Nam Souang | 1,100 | 2 | 88 | |
| Pak Beung | 300 | 7 | 91 | |
| Huai Siet | 150 | 5 | 40 | |
| Thailand | | | | |
| Huay Luang | 3,100 | 3 (12) | 530-790 | |
| Nam Oon | 8,600 | 4 (27) | 1,200<br>2,920 | Full-time<br>Part-time |
| Kaeng Lawa | 1,700 | 3 (13) | 458<br>1,011 | Full-time<br>Part-time |
| Viet Nam | | | | |
| Lak Lake | 658 | | 270 (220) | In brackets: union members |
| Buon Tria | 141 | | 11 | |
| Ea Soup | 240 | | 72 (52) | In brackets: union members |

***Institutional Structure and Management Responsibilities***

***Cambodia***

- Each CF is headed by a set of five committee members, one of whom is a woman. It sets up its constitution and by-laws and its own fishing regulations, which are accepted by local people, local authorities and technical line agencies.

***Laos***

- Under the Management of River and Reservoir Fisheries component, decentralised government units and local users (villages) jointly plan, implement and evaluate the local management plans. DOF staff provide technical advice and support.

- Responsibilities of the RFMC include planning, implementing and monitoring; more specifically:

    - Identify and set up conservation zones of reservoir
    - Coordinate with technical departments DAFO, PAFO in order to promote fisheries development for the reservoir;
    - Cooperate with the surrounding villages and various government agencies.
    - Implement reservoir management plans by using local people participation approach;
    - Control fishing methods in the reservoir include the using of fishing gears;
    - Formulate fishing regulations and establish permanent and seasonal CZs;
    - Coordinate with villages surrounding the reservoir and various government agencies at district and provincial level for yearly stocking;
    - Advise fishermen to use appropriate fishing gears as indicated in the fishing regulations;
    - Patrol conservation zones on people who use illegal fishing gear;
    - Set-up fisher groups in each village and use them as controlling network.(e.g. NH and NS reservoirs);
    - Develop sources of income (through fisheries activities) for RFMC development Funds;
    - Solve any problems related to fishery matters occurring in the reservoirs and report to concerned agencies (in case these are above the responsibility of RFMC).
    - Coordinate with the villages surrounding the reservoir and fisher committee at district level (DAFO) to hold meetings, publicize fishing regulations and others matters related to reservoir fishing;
    - Give advice, suggestions, and education; apply fines for use of illegal fishing gears.

***Thailand***

- Villages within a sub-district represented by the OBT propose activities related to reservoir management. These may be subsequently included in the OBT plan. The OBT is therefore effectively the interface between local communities and outside supporters such as provincial administrative organization and politicians.

- Responsibilities include:
    - Establishment of conservation zones,
    - Improving fish processing, and
    - Stocking

***Viet nam***

- Fisher Unions typically have a board with fishers representing communes. The FU is responsible for:
    - Managing all fishing activities,
    - Collecting tax from non-members and members of the union,
    - Managing savings and credit programmes,
    - Communicating with government at different levels,
    - Organisation and participation in the enforcement of fishing regulations.
    - Infrastructure development
    - Organizing training courses for fishers.
    - Stocking

The FU meets monthly to discuss issues and plan activities for the following month.

***Institutional Capacity***

In Cambodia and Laos, the Institutional capacity of the CFs and the RFMCs, both in terms of financial resources and human (knowledge) is considered to be low.

In Vietnam, Fisher Unions generate funds from membership fees and taxes. The Australian Embassy has provided some funding for stocking, credit and savings inputs, purchase of gears and boats, enforcement activities and communications. The fishers have limited formal education and are poor. Before the unions were established, they had little or no access to local authorities.

***Links and Relationships with other institutions and stakeholders***

In Cambodia, the CFs operate under the Community Fisheries Development Office (CFDO) at the Department of Fisheries (DoF), responsible for promoting and facilitating the CF establishment, management and development. The CFDO aims to maintain close collaboration with the DOF's Inland Fisheries Research and Development Institute (IFReDI). It also have an active role in the setting up and maintaining the Community Fisheries Monitoring System and the processing and analysis of data and other information.

In Laos, the reservoirs are co-managed by three main stakeholders: the RFMCs, the DAFO/PAFO of DLF and LARReC. They are jointly involved in the planning, implementation and evaluation of management plan activities including:

- Joint management plan formulation;
- Joint management plan evaluation and adaptation (yearly);
- Joint management plan activity planning.

In Thailand, MRRF supports technical activities for building managers' capacity. The OBT provides some funds to support management activities. Other funds are provided by provincial administrative organizations and politicians.

In Viet Nam, the FU and its fisher groups depend on the approval of authorities at higher (mainly provincial) administrative levels. The FU works closely with local government to enforce the ban on the use of destructive gears use in the lake (patrolling activity). The Union pays a tax of VND 8 million per year to the District for this purpose. Local governments also help the FU to resolve local conflicts.

*2.3.2 The Fisheries*

- Cambodia - Multispecies > 25 species, indigenous spp of fish stocked into reservoirs.

- Laos – Fishers report declines in catch rate and overall catch. Reduction in species richness, changes in catch composition. Dam construction, disease, overexploitation are blamed.
- Thailand – Fishery is based upon Nile tilapia and carps which reproduce in the reservoir. Total catch in 2001 was 780 t.

- Viet Nam, some lakes are not stocked. Production may be based on indigenous species including shrimp.

***Environmental influences/threats***

- Habitat degradation
- Fish disease during years of low rainfall
- Pollution from cage-culture
- Irrigation systems affecting water levels.
- Annual hydrological conditions
- Siltation

***Fisheries Status and Trends***

Lao PDR

- Production from reservoirs is high.
- Catches underestimated because the statistics exclude catches by subsistence fishers.
- Gears include: Gill nets, traps, lift nets, cast net and fishing rods. Illegal gear types used are: Poison, explosives and electro fishing (active fishing with gill net is also considered an illegal method of fishing).

Thailand

- Some anecdotal evidence of decline in CPUE.
- Market for reservoir fish weaker than for river spp.
- Gears include: gillnet, and lift net

Viet Nam

- Anecdotal evidence of a decline in catches of high value species
- Gears include: gillnet, and lift net, traps, long lines, rod and lines, cast nets, fence nets.

***Landing Sites***

Landing sites are usually places where fishers meet traders, and are located near roads etc. In some Lao reservoirs, there is one main landing site, which is operated by a fish trader, who has obtained (through auction or payment of a license fee to the district authorities) a monopoly on fish trading from the respective reservoir. In Thailand and Viet Nam there are about 3-4 landing sites at each reservoir.

***Management Control Measures***

*Cambodia*

CFs have established their own rules/regulations, as set out in their management plans. Planned activities set out in the plans are regularly monitored and reviewed by the government counterparts (see above). CF committee meetings involving members are held monthly to report on the implementation and status of CF activities.

*Lao PDR*
The Reservoirs are open access, although property/access rights to some areas within them have been claimed by owners of fish cages and fish pens. Fishing is prohibited within permanent or seasonal conservation zones. Seasonal conservation zones are located close to river mouths, which are spawning habitats for several species. In all reservoirs there are rules that prohibit illegal fishing gears. These are: explosives, poison and electro fishing.

*Thailand*
A closed season operates from 16 May–15 September during which only 'small gear' can be used. Gear bans are also enforced. Conservation zones have been established in some reservoirs.

*Viet Nam*
Control measures established by the FU include harvest reserves, access restrictions, and gear restrictions. Electro-fishing and seine nets are banned. None community-members are excluded. In some reservoirs the FU stocks the reservoir, funded by taxes collected from fishers and other sources of money.

***Fish Disposal***
In Viet Nam, about 80% of fish caught from the lake is sold at local markets. The rest is taken to Buon Ma Thuot by middleman (shrimp, and some high value species). At the other reservoirs, most fish caught is sold at local markets. Any excess fish may be transported to Lak by middleman.

### *2.3.3 Identification of Information Requirements*

***Management plans***
Fisheries management plans are being formulated on an annual basis following negotiations between the local management body and local government staff (except in Viet Nam).

Initially, the MPs to meet various objectives were formulated on the basis of the results of Participatory Rural Appraisal (PRA) exercises was undertaken to identify the main management problems and issues.

Each management plans usually comprises 5-8 main areas of intervention, such as:

- the development of management organizations;
- establishing of fisher groups;
- conservation zone,
- environmental awareness building;
- stocking;
- fish processing;
- capacity building for reservoir co-managers;
- monitoring and evaluation;
- developing alternative or supplemental source of income;
- establishing of patrol groups;
- patrolling;
- training of conservation volunteers;
- dredging of reservoir;
- provision of infrastructure for water management;
- etc.

In Viet Nam, activities are usually planned in the short-term although long-term goals can be set.

The MPs for Cambodia but more so Laos are particularly comprehensive (See Annex 3 and 4 in the report) and include:

- Explicitly defined objectives and corresponding management performance evaluation criteria.
- Detailed activities to achieve each objective including objectively verifiable indicators to assess performance against each activity, institutions and individuals responsible for coordinating or facilitating the activities, timetable for completion and budget.

***Management Objectives***

Management objectives were identified as:

- Manage, conserve, protect and develop fisheries resources in a sustainable way; assure sustained yields from the fishery of residents;
- Maintain and keep a healthy environment in and around the reservoir to guarantee the utilization of aquatic resources for fishing, agriculture, domestic consumption and tourism;
- Enhance the capacity of reservoir managers to establish and implement their reservoir management plan;
- Assure sustained or increased income for fishers members;
- Encourage mutual support and welfare;
- Improve communication and collaboration with local officials;
- Gain support for co-management from policy makers, and to improve understanding of the factors affecting co-management performance.

***Decision-making Methods***

At most sites (all except *Vietnam*), management plans are reviewed, evaluated and refined on an annual basis at the end of the planning-implementation cycle.

*Cambodia*

Decision-making surrounding each management objective is undertaken on the basis of discussion/consultations with CF members and related stakeholders in the local areas. Qualitative and semi-quantitative data is used to support this process (see later and also Annex 8 of the report). No formal models are used and monitoring data is generated from monthly interviews with respondents.

Management activities undertaken, issues arising and important observations made during each month are recorded in the CF Notice Book. Information recorded includes:

- The activities undertaken and status of the CF management plan implementation;
- Numbers of conflicts and illegal fishing events;
- Enforcement activities;
- Number of interventions in stopping illegal fishing activities;
- Progress with respect to CF livelihood activities (including expenditure and income recording), such as the cow/rice bank; women handicraft activities; sale of fishing gears etc.

Catch monitoring is conducted once per year using questionnaires with key informants. Information recorded includes:

- High and low season catch per gear per day (to see the variation of fish catch per gear);
- Gears used and mesh size;
- Mean catch per gear and by species during the high and low season;
- Numbers of fishers in high and low season by fishing gear;
- Numbers of fishing days by fishing gear per week and per season and per fisher;
- Species composition in the reservoir
- Number of motorized boats and non motorized boats by high and low season and by number of days.

The CF management plan review is also reviewed annually with CF committee members, village chiefs, some patrol members and CF members in the each MRRF site by using a checklist. SWOT analysis is also used to examine the strengths, weakness, opportunities, and threat of CF management plan implementation and find out the solutions for setting up CF management plan in the following year. The information used to support the review of the MP includes:

- Number and types of activities done and not done, and the reasons/causes;
- Percentage achievement of each activity done;
- Percentage of satisfaction and no satisfaction by each activity, and the reasons/causes;
- Strengths, weakness, opportunities, and threats of CF management plan implementation and recommendations.

The results are reported to Provincial DOF and CFDO/DOF and used to review or refine the plan. Proposed changes/improvements to the existing monitoring system:

- Extend monitoring programme to include fish catches from river sites. (CF in former fishing lots) too;
- Monitoring methods and timing should be standardized in all areas (by technical agencies/provincial DOF/CFDO)
- Information to evaluate the sustainability of CF management
- Information to assess the effectiveness of CF regarding compliance with regulations;
- A sustainable cost-effective information system that can operate without donor/project support.
- Information on the number of fish traders and fish price in the area;
- Ecological information in the area;

*Lao PDR*

Management decision-making is undertaken jointly between the RFMC and a district coordinator from DAFO. The management plan (which is adapted yearly) is then formally approved (yearly) by the provincial and central authorities (that is PAFO and DLF) in a one-day meeting in the country's Living Aquatic Research Center (LARReC) of the Ministry of Agriculture and Forestry (MAF).

The following is the information *requirements* were identified by users and district officers:

- Trends in fish catch and species composition: Participants in meetings expressed an interest in generating information on stock trends and variations in species composition. It was mentioned that this would be done through Catch per Unit Effort (CPUE) surveys. As expressed by an RFMC member: 'We want to be able to compare species that are caught less and those that are caught more and how this change over time'. By knowing this RFMCs can stocking ceratin species to compensate for any declines.
- Numbers of fishers: RFMCs already monitors the numbers of active fishers exploiting the reservoir. This activity they would like to continue and possibly improve by also monitoring people, from villages further away, using the reservoir.
- Catch recordings by traders: Traders only record the total amount of fish that are traded. It was proposed that they also start to record the species of fish that are traded.
- RFMC members activity monitoring: It was suggested that each RFMC members monitor/report on their activities; that is the activities they have carried out within the activities under their responsibility.
- Monitoring rule-breakers: At all reservoirs (except HS) RFMCs should monitor the number of infringements to the rules in a more systematic manner including details of the number of violations, type of violation and measures taken.
- Monitoring stocking: Participants also showed interest into monitoring the amount and the species of fish that are stocked (this is however, to some extent monitored by DAFO).
- Monitoring fish disease: Participants from NH and NS reservoir expressed interest towards monitoring the development of fish diseases.

*Thailand*

Management decisions are made on the basis of information that is *informally* shared between fishermen (for example, conservation zones were established based on fishermen's perception of declining catches). Information is shared and utilized during yearly management plan review meeting.

Data and information requirements were identified as:

- Total catches and trends for key species;
- Type of fishing gear used;
- Numbers of fishermen;
- Reasons for catch variability
- Perception of success of management plan activities (by users and government).
- Ecological data

*Viet Nam*

Management decisions are taken based on the following principles: Monthly review and planning meetings with members; developing regulations in consultation with both members and local authorities; include advice from MRRF in decision-making; book-keeping; management is as adaptive as possible; monitoring of personal income; data collected and analyzed by MRRF is being reported back to the unions as recommendations for their consideration in making regulations and decisions.

Data and information requirements were identified as:

- Total fish production of water bodies (per species). This data is needed for fishers to investigate the trends of production and what species need to be protected. Based on the trends of production, the fishing regulations can be changed regularly. Presently, though, regulations are based on fishers' perception of trends in the

fishery. It is felt that the unions need to give more attention to controlling the fence net fishery, since this gear catches a great variety of species, including fingerlings. Data-collecting is not a priority activity for the Unions, but members see the value of the information.

- Constraints to improving existing systems included:
    - Finance
    - Fishers time to collect data and information

### *2.3.4 Identification of appropriate data collection tools, sources and methods*

***Existing systems***

*Cambodia*
Existing data collection sources, tools, methods are described above. Example results are presented in Annex 9 of the report.

*Lao PDR*
Currently, only limited information is collected by the DAFO and RFMC.

DAFO records the following data:

- Numbers of cage-culture operations,
- The quantity of fish (in kg.) traded from the landing site.

The RFMC records the following data:

- No. of fulltime fishermen,
- number of people violating fishing regulations (and the action taken against).

Currently, LARReC and MRRF are involved in the following monitoring activities: LARReC has facilitated three catch assessments. Only one survey has produced results that are relatively reliable.

MRRF facilitates yearly reviews of management plans. On this occasion experiences made by RFMC members concerning the fisheries and its management are shared, recorded and published in form of a bilingual '"Review of Reservoir Management Plans" report.

*Thailand*
The Inland Fisheries Centre (MRRF counterpart organizations) collects data on:

- CPUE,
- number of fishermen,
- number of boats,
- fishing gear used, and
- general physical information on the reservoir.

The Patrolling Unit: carries out a catch assessment survey. Fish traders maintain log books with information on landings and prices. Village leaders record cases of rule violations, record amount and species of fish that are stocked. Police stations record cases of rule breaking (see Table below).

| Subject | Place | Agencies involved | Methods used |
|---|---|---|---|
| Catch assessment | KL, NO, HL | MRRF | Questionnaire (fishers), gear types, yearly |
| Catch assessment | NO, Songkram River | NO Conservation Unit | Catch (kg) from traders, multiplied by no. of boats, four days/month (average amount of fish/day?) |
| CPUE | HL | Udon Thani IFRDC | Gillnet test fishing by staff of IFRDC |
| Fish processing | HL, NO, KL | Village headmen | PIM (log/note book system) |
| Conservation zone management | | | |
| Violation of fishing regulations | NO, Songkhram River | NO Conservation Unit | Occurrence book, police station |

A Participatory Impact Monitoring (PIM) system (see Annex 7 of the report), developed by fishers and local government officers is presently being applied by village headmen and leaders of women groups in the monitoring of conservation zones and fish processing activities. This employs a system of annual questionnaires and logbook reporting to evaluate the impact of fish conservation zones and details of fish stocking, marketing and processing activities.

*Viet Nam*
Presently, fishers collect data on stocked fish in two reservoirs (ES; BT). In ES, a group of five fishers volunteer to collect data. They record their own daily catches and those of another three fishers living near them. This means that the catch data of 20 fishers will be collected every day (1/4 of all fishers at ES). Catch data is focused on stocked species (Grass Carp, Bighead Carp, Rohu, and two indigenous species). In BT, due to the small number of fishers (approx. 10) at that reservoir, all fishers will record their own daily catches.

However, fishers don't have the time to collect the data without payment, and cannot analyze the results themselves. These surveys were useful for indicating particular problems with the fishery, such as species in decline, species selectivity of various gears, and in particular, the non-selective nature of fence nets.

***Required accuracy and precision***

*Thailand*
Fishers and government staff believe that data should be very precise in order that people trust the data.

*Vietnam*
Improving the precision of data in Viet Nam became too costly.

***Improvements to existing system***

*Cambodia*
Major improvements need to be made to systems for the defective dissemination of information to local people.

*Lao PDR*

On several occasions the idea of developing a monitoring system based upon log-book reporting has been discussed. It is expected that, when the log-book system is functioning, the DAFO and PAFO can copy data from these books and compile them in similar information systems at the district and provincial level. Here, the main purpose is that data should stay at the administrative level where it is collected.

*Thailand*
More of the information collected by the government should be fed back to fishers. Evaluation of government data by fishermen should be improved. Managers (users and government) and data collectors should be the same people.

*Viet Nam*
Monthly surveys should be reinstated. The results of the surveys should be feedback and discussed with the unions at workshops every year or when needed.

***Attitudes of communities towards participatory data collection systems***
*Cambodia*

- The participatory data collection approach is time consuming and participation therefore requires re-numeration from lost income generating activities. Failure to do so will result in low rates of participation and inaccurate information and data.
- A clear explanation of the objective and process of information gathering has to be given to the people, and the usefulness of information collection for them has to be emphasized.
- Moreover, the results of information gathering should be presented again to the people to make sure that there is agreement on information provided by those who have participated in its collection (through a focus group discussion), so that they can listen to, discuss and revise any shortcomings, inaccuracies and inconsistencies of information and data, which otherwise would become untrustworthy.

*Lao PDR*

- DAFO/PAFO have expressed interest in a 'log-book' recording system for villagers (RFMC members).

*Thailand*

- Both government and local managers have a positive attitude to participatory data collection systems. An important incentive for data collectors is that the data should be relevant to their own needs and interests. Any costs incurred by the fishers must be met by government.

*Viet nam*

- Fishers are neutral about the quick survey exercises: neither interested nor bored. However, many do not feel motivated to give accurate answers. They cannot afford to collect data for free, but are generally willing to cooperate with data-collectors, if it does not take too much time.

***Attitudes of communities towards formal data collection methods***

*Lao PDR*

- RFMC members have expressed interest in recording data that can be used for evaluating and improving the reservoir management plans.

*Thailand*

- Community members feel negative if the information is not fed back to them. In Viet Nam, communities have no objection, if they are paid to collect the data! The data should be collected quickly so fishers can get their catch to market.

### *2.3.5 Identification of potentially appropriate data sharing mechanisms*

***Opportunities and pathways for sharing***

*Lao PDR*
Co-management structures are established at four reservoirs, which provide sharing pathways between users and government levels. It would be appropriate to use these existing pathways, starting upwards from the lowest to higher administrative levels.

*Thailand*
OBT is supposed to link government officers with villagers. Therefore, OBT is also a centre for information. The district also provides information directly to the villagers. How? The village leaders always read/share information through the loud-speaker and monthly meetings at the village level. This information is usually from the OBT or the government officers. Information sharing between fishermen is usually informal, or through the OBT.

*Viet Nam*
Formal reports on production and trends to local and provincial governments are required. Workshops to report and discuss the same results to fishers and local governments???.

***External data and information***

*Lao PDR*
The local management communities are interested in receiving information about their reservoirs which require technical skills to collect/or obtain – Why, what, elaborate??.

The RFMC committee members have expressed interest in specific services provided by the LARReC and MRC. The information requested includes:

- A Tourism/sports fishing survey: RFMC members at Huay Siet reservoir have expressed interest in developing the tourism activities around the reservoir. A small survey will look into these possibilities, which may include sports fishing.

- Fish Disease Survey: People from Nam Houm reservoir have reported problems with fish diseases, especially with fish that are raised in cage-culture. The MRRF will facilitate a survey (incl. provide a specialties in fish diseases), to monitor and examine what diseases the fish are infected with, and the possible causes of these diseases.

- Mobile Hatchery Operation: In Bolikhamxay province, especially at Pak Peung reservoir, people report that there is a lack of fingerlings for cage-culture activities and stocking activities. RFMC members have expressed interest in utilizing the mobile hatchery, demonstrated during the ‘stock enhancement workshop’, to produce fingerlings. It has further been expressed that people would like to produce fingerlings from local species. A survey will be carried out that develops a system for the use of the mobile hatchery.

- Cage culture research: People at Nam Souang reservoir still argue that lack of local feed and puffer fish is a constraint for starting up cage culture activities. The cage culture proposal, which looks into the use of local feed and puffer-fish proof cages, will be carried out in 2004 (se proposal).

- Marketing Survey: RFMC members at Nam Houm reservoir have expressed interest in getting involved in fish marketing / trading. Yet, not much is known about fish-marketing or fish-trading procedures at the reservoirs. Moreover, government regulations on this issue are not clearly formulated /or known.

- Monitoring (CPUE analysis): Several Catch Assessment Surveys have been carried out in conjunction with local fishers at reservoir in Naxaythong district and Bolikhamxay province. However, the CAS have been difficult to implement and therefore, reliable results have been limited. A simple survey technique, closely supervised by 'experts' has been requested.

*Thailand*
There is an interest in information relating to the fish processing and marketing opportunities; aspects of fisheries law (particularly citizens' rights). Fishers are also interested in information from government agencies and their actions (inside and outside the fishery sector) that affect reservoir ecology.

*Viet Nam*
Weather forecasts; technical information; marketing information, credit policies of banks, development plans of various governments, information on local fisheries situation were mentioned.

**What information would the community be willing to share or is currently sharing?**
In Lao PDR, communities are willing to share all information. In Thailand, villagers are prepared to share all information related to their life and fisheries management. Villagers currently share data on catches and gear use. In Viet Nam, villagers are prepared to share information on fishing and management experiences.

***Identification of requirements for data sharing***

Lao PDR
- monitoring systems should be relevant to the needs of the data collectors
- Data should be shared with local enumerators
- Information should be as simple as possible while still being relevant for management;
- information should be as cheap as possible (at RFMC and DAFO level possibly only the cost of notebooks).
- It is also recognised that the format required to monitor RFMC management activities for their own evaluation needs may be different from that of the government.

*Thailand*
- The format should be simple and easy to understand:
- Posters, statistics in simple graphs, to be explained to and disseminated through village meetings;
- Standardization is only required when information has to be compared over time or between cases;
- Cost should be low, and never exceed the benefit gained from utilizing this information;

- Information availability should be in time for management interventions.
- Most important: If both government and users have been part of developing the information, they usually also consider it reliable.

*Viet Nam*

- Transportation and travel costs.

*2.3.6 Existing or previous activities to develop data collection and sharing systems.*

*Thailand*

- The Catch assessment survey (log book) has suffered from a lack of skill and motivation on the fishers behalf to complete the logbooks.

- The Catch assessment survey based upon interview fishers by fishery officers: only officers analyse the data. This method cost 30,000 THB per reservoir.

- The Catch assessment survey based upon standing crop and CPUE estimates: only officers collect and analyse data. No participation of the local people. Information from these CAS should be shared among resource users via posters, regular meetings, simple and coherent reports. Review meeting is a way of monitoring where information is collected, shared and used simultaneously. It is effective, cheap, and highly motivating for all managers. Although it is not very systematic, the “review meeting” collects historical and present information from a wide variety of sources.

*Viet Nam*

- Fishers contracted to collect data were paid US$10 to US$30/month. Formal surveys cannot be sustained by the fishing community itself, and the data analyses are beyond their capacity.

## 2.4 Synthesis of Level 1 reports

The existing data collection and sharing systems to support the management co-management of inland fisheries resources in countries in Africa and Asia have been reviewed in this section. Requirements for and opportunities to improve these systems have also been examined. A summary of the findings of this review, together with conclusions and recommendations drawn from them are given below.

### *2.4.1 Process documentation*

Report authors were encouraged to record and include *process notes* to accompany each section of their SRR, describing important issues that arose when compiling the information with project partners that could be used in the manual to illustrate issues and problems surrounding the development of information systems. However, these notes were generally lacking in all Level 1 reports. These process notes will be sought from project partners during the Guidelines Development Workshop.

### *2.4.2 Local Management Structures*

- The local management institution is typically a committee representing the interests of villagers and local stakeholders exploiting or depending upon the fisheries resources of a defined water body (eg lake, reservoir, section of river) or operating from a particular beach and include: Beel or River Management Committee (B/RMC), Beach Management Unit (BMU), Reservoir Fisheries Management Committee (RFMC), Community Fishery, Fishing Union or Or bor tor (OBT).

- These local bodies are typically involved in jointly formulating, implementing and evaluating management plans with DoF staff, sometimes via a higher-level management decision-making body such as a 'Cluster' or 'Central Committee', or 'Lake-Wide Committee' when over-arching management plans or the coordination of management plans of more than one Committee is required.

- Committee members usually comprise elected village representatives including village headmen. Local DoF staff may represent the government on the committee, provide technical advice and support and ensure that management plans are formulated within the overall framework of the countries legislation.

*2.4.3 Roles and Responsibilities of the Management Committee:*

The roles and responsibilities of the management committees summarised in Table 1

Table 1Local Management Institution Roles and Responsibilities P- partial (covers only part of fishery or for specific purposes only.)

| Role/Responsibility | Details | Uganda (BMU/FMC) | Tanzania | Bangladesh (B/RMC) | Cambodia (CF) | Laos PDR (RFMC) | Thailand (OBT) | Vietnam (FU) |
|---|---|---|---|---|---|---|---|---|
| | Identifying priorities/objectives | √ | √ | √ | √ | √ | √ | √ |
| | Setting rules and regulations | | √ | √ | √ | √ | √ | √ |
| | Formal Monitoring | P | P | P | P | P | P | P |
| | Informal Monitoring | √ | ? | √ | √ | √ | √ | √ |
| | Enforcement (control) | | √ | √ | √ | √ | √ | √ |
| | Surveillance | | √ | √ | √ | √ | √ | √ |
| | Conflict resolution | | ? | √ | √ | √ | √ | ? |
| | Informal (discussions /feel good) | √ | ? | √ | √ | √ | √ | √ |
| | Formal (data analysis) | | ? | ? | ? | ? | ? | ? |
| | Communicating results of evaluation | √ | ? | √ | √ | √ | √ | ? |

P - Usually limited to monitoring returns on investments made by the community such as stocking programmes. Usually omit information concerning illegal of outsider fishing activities. Often infrequent (annual) and non-comprehensive.

In Uganda, the BMUs will eventually formulate their own management plans, but currently this is still a lake wide process influenced largely by DoF via the Lake-wide Assembly and based largely upon existing fisheries legislation applied lake-wide.

*2.4.4 Links with other institutions and stakeholders*

Links with other institutions including details of their roles are summarised in Table 2 elow.

Table 2 ummary of the links between local management bodies and other co-management institutions and their roles.

| Institution | Role | Uganda (BMU/FMC) | Tanzania | Bangladesh (B/RMC) | Cambodia (CF) | Laos PDR (RFMC) | Thailand (OBT) | Vietnam (FU) |
|---|---|---|---|---|---|---|---|---|
| | Provision of technical advice | | | √ | | √ | | |
| | Licence revenue collection | | | √ | | | | |
| | Co-ordination of management plans. | | | √ | | | | |
| | Enforcement | √ | | √ | √ | √ | | √ |
| | Conflict resolution | | | √ | | | | √ |
| | Facilitate communication | √ | | √ | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Monitoring/Data collection | √ | | | √ | √ | | |
| | Evaluating MPs | √ | | | √ | √ | | |
| Research Institutions | Joint involvement in planning implementing and evaluating MPs with RFMC | | | | | √ | √ | |
| | Supports action research and monitors its partners activities | | | √ | | | √ | √ |
| | Capacity building | | | | | | √ | √ |
| NGOs | Implement donor project activities facilitate communication with local government institutions | | | √ | | | | |
| Community-Based Organisations | Influence policy, resolve conflicts and to coordinate activities. | | | √ | | | | |

*2.4.5 Institutional Capacity*

- Generally low both in terms of finances and human resources.
- Generally a poor level of education
- Finance usually raised by means of taxes, licence or membership fees or profits from stocking programmes.
- Donor projects usually aim to build capacity by means of training awareness programmes.
- In Bangladesh, IC seems to be higher - most project participants are literate and some have technical knowledge. The MCs typically have the capacity to formulate and implement management plans including stock and harvesting strategies. Most have the capacity to create and enforce their own rules and regulations, and many claiming 90% compliance. Some funds are substantial but loans may also be provided by NGOs for stocking and infrastructure development purposes.

*2.4.6 The Fisheries*

The fisheries exploited by the communities include the following features and attributes:

- Multispecies upto 90 species
- Some based mainly (70%) upon stocked fish.
- Common gears include gillnets, traps, liftnets, hook and line.
- Often seasonal (peak during monsoon and drawdown).
- Fishers often report declining catch rates and species diversity but available data are invariably too imprecise or inaccurate to draw any conclusions concerning status of fisheries.
- Habitat degradation including siltation, dam construction, changes to hydrological conditions, heavy metal pollution, agrochemical run-off, and organic enrichment from sewerage and cage culture are common causes of concern.
- Landing sites may be fixed or vary.
- Fish disease is also a common cause of concern. Outbreaks can be frequent and significant.
- Although potentially significant, landings from some components of the fishery are not included in the catch statistics.

*2.4.7 Management Measures*

A variety of management measures are employed by the MCs including:

- Effort controls via licenses and rotating access rights
- Closed areas (fish sanctuaries)

- Closed seasons
- Gear bans and restrictions (gill nets, bamboo fences, small mesh seines, posons, elctro-fishing, explosives, minimum mesh and hook sizes).
- Landing size restrictions
- Stocking
- Habitat restoration

### *2.4.8 Fish Disposal*

- Fish typically sold to local traders on nearby roadsides or landing sites.
- Small (low value) indigenous fish are often retained for local consumption.

### *2.4.9 Data and information Requirements*

Data and information requirements of the MCs are determined by their management plans, objectives and their performance evaluation criteria.

***Management plans***

- Management plans have been established under all the co-management initiatives examined usually in a participatory manner between the local management body, local DoF staff and the donor project staff.

- In the LMB, local management plans are formulated and reviewed on an annual basis following negotiations between the local management body and local government staff (except in Viet Nam).

- Management objectives and plans are formulated on the basis of the results of Participatory Rural Appraisal (PRA) exercises was undertaken to identify the main management problems and issues.

- The plans do not to follow the typical format but instead appear more *ad hoc* focusing predominantly on the development of wider institutional arrangements and co-practices and activities rather than on the management specific fisheries resources, including:

    - Improving representation in rule making.
    - Establishing various rules and regulations, including access rights and effort reductions
    - Establishing or developing infrastructure
    - Establishing or developing effective enforcement capacity
    - Establishing sanctions for non-compliance
    - Building local management capacity including environmental awareness building.
    - Identifying alternative livelihoods activities
    - Undertaking fund raising activities.
    - Effectively enforcing management rules
    - Creating enabling legislation
    - Restocking and habitat rehabilitation strategies
    - Pollution control and habitat enhance/protection activities.
    - Developing effective monitoring and evaluation programmes and dissemination mechanisms.

- Presumably, as effective institutional arrangements and management systems are developed or established, the emphasis may shift towards refining management strategies in relation to specific stocks or fisheries

The MPs described for Laos are particularly comprehensive (See Annex 3 and 4 in the report) and include:

- Explicitly defined objectives and corresponding management performance evaluation criteria.
- Detailed activities to achieve each objective including objectively verifiable indicators to assess performance against each activity, institutions and individuals responsible for coordinating or facilitating the activities, timetable for completion and budget.

*2.4.10 Management Objectives*

Reported management objectives included:

- Improved/increased catches
- Optimise stocking densities
- Increased income / standard of living
- Increased employment, but reduction in fishing intensity
- Greater fish diversity
- Improve the equitable distributional of benefits
- Environmentally sustainable management for improved livelihoods
- Rehabilitation of natural fish stocks.
- Enhance the capacity of reservoir managers to establish and implement their reservoir management plan.
- Improve communication and collaboration with local officials;
- Gain support for co-management from policy makers, and to improve understanding of the factors affecting co-management performance.

*2.4.11 Decision-making methods (and management plan performance evaluation)*

The evaluation of the performance of management plans in relation to the objectives described above is generally ad-doc and unsystematic. Management plans may be reviewed monthly or yearly.

Default or status indicators and their proxies are used to evaluate the performance and outcomes of management activities described in the management plan. These may be monitored both formally and informally, routinely or sporadically, and with full or limited coverage.

In Bangladesh, management decisions are made or reviewed monthly on the basis of:

- A ‘resolution book’ that contains records of decisions and recommendations made at previous MC management meetings.
- Records of catches taken from the waterbody.
- Records of income and expenditure associated with the partial exploitation of reserves, collection of eggs and fry from the beel, and pen culture.
- Records of stocked fish and organised fish harvests including financial records relating to stocking, lease and other harvest costs.

Typically, catch and effort data are ***not*** routinely recorded for fisheries exploiting non-stocked species, and non-group fishing activities.

Data and information requirements identified by the community as required to support their management activities including the implementation and evaluation of their management plans were identified as:

- Incidence of poaching in the sanctuary areas
- Compliance with the closed season
- Compliance with gear bans
- Catch and effort data
- Number of species landed
- Water depth in the dahas.
- Causes of fish diseases and remedial action
- Optimal stocking densities and composition
- Stock size
- Environmental impact of different gears
- Optimal reserve size
- Location of fishing boundaries

In several instances, the CBFM2 Project employs a member of the BMC to collect catch and effort data from the beel fisheries. The BMCs are seeking opportunities to self-fund these monitoring programme and believes that the number of sampling days in each month should be increased to ensure that the large daily catch variation is captured by the surveys. The BMCs have requested formal training for this purpose.

They reported that catch data will provide insights into the total stock size, types of fish landed and individual benefit from fishing. In this way they hope to understand how to improve their management. They also believe that environmental factors are important, particularly the influence of water depth on dry season survival rates, and species composition. The BMCs are also interested in improving their understanding of fish diseases and its potential impact on their fishery. They also expressed concerns over the safety of eating diseased fish.

In Uganda, the Lake's integrated management plan is informed by data collected and assimilated by the BMUs, and the FMC with the aid of local fisheries department staff. Presently, this data is restricted to catch, effort and value data that can be disaggregated by species, BMU, district sub-county, parish and licenced and unlicensed canoes. It will not however, provide the necessary information to evaluate management performance in relation to the range of other social, economic and environmental objectives identified.

During a workshop involving representatives of all stakeholders, a host of data and information requirements to were identified presumably in relation to these wider objectives. However, in spite of the apparent understanding that **"…the usefulness of information for the community, as well as for government must be apparent"** it is difficult to understand the purpose of much of this information. The use of this information in terms of management decision-making in relation to specific objectives must be made explicit, together with the required accuracy and precision of the data. In other words, they must be framed within the management plan and management decision-making context. Currently, the following appears little more than a wish list:

Biological

· What is the daily catch size (kg)?

- What is fish catch per boat per day?
- Cause of differences in catch rates (seasonal)
- Types of fish caught (sampled and unsampled)
- In which months are catches highest and lowest?
- Average catch per canoe?
- What kinds of species are caught and which are dominant?
- What types of baits are used and how are they obtained?

Technical

- How many canoes are on the lake?
- How many illegal boats by landing site?
- How many canoes and size of boats do you use?
- How many of boats by type are present?
- How many illegal nets and boats are destroyed annually?
- What types of nets are used?
- What kind of gear size and number do you use?
- What size of nets/hooks are in use?

  Number of illegal boats
- Number of gears,
- Gear size (mesh and hooks)
- Hanging ratio of nets
- Colour of nets
- Length of boats
- What kind of fishing practices are used
- What is your fishing time i.e. duration
- What type of nets do you use i.e. single or double?
- How many registered experimental and unlicensed fishers?
- Where are the fishing grounds for each landing site?

Marketing and Socio-economic

- What is monthly income from fish catches by landing site?
- Which markets are fish sold to?
- What processing methods are in use?

  Number of different fishery stakeholders
- What is fish price per landing site?
- How do you market your fish and the means of transport used?

  Fish processing methods
- Fishing income
- Best markets for fish

Miscellaneous

- What is the landing population?
- What data collection equipment is there at landing sites?
- Who are the foreign people involved in fishing?
- What are the problems met on the lake e.g. crocodiles, hippos?
- What is your landing population by sex and age?
- Are there illegal landing sites?
- What are the organisations (community-based organisations & NGOs)
- How are fish handled after landing site do you have potable water?
- Do you have fisheries staff?
- How can an outsider access other landing sites?
- Fishing method (sampled and unsampled)
- Fishing gear type
- Number of gears per boat
- Which landings use illegal methods
- Boat type

· Breeding grounds
· Fishing grounds

In the LMB countries, except *Vietnam*, the local management plans are reviewed, evaluated and refined on an annual basis at the end of the planning-implementation cycle.

*Cambodia*
Decision-making surrounding each management objective is undertaken on the basis of discussion/consultations with CF members and related stakeholders in the local areas. Qualitative and semi-quantitative data is used to support this process. No formal models are used and monitoring data is generated from monthly interviews with respondents.

Management activities undertaken, issues arising and important observations made during each month are recorded in the CF Notice Book. Information recorded includes:

- The activities undertaken and status of the CF management plan implementation;
- Numbers of conflicts and illegal fishing events;
- Enforcement activities;
- Number of interventions in stopping illegal fishing activities;
- Progress with respect to CF livelihood activities (including expenditure and income recording), such as the cow/rice bank; women handicraft activities; sale of fishing gears etc.

Catch monitoring is conducted once per year using questionnaires with key informants. Information recorded includes:

- High and low season catch per gear per day (to see the variation of fish catch per gear);
- Gears used and mesh size;
- Mean catch per gear and by species during the high and low season;
- Numbers of fishers in high and low season by fishing gear;
- Numbers of fishing days by fishing gear per week and per season and per fisher;
- Species composition in the reservoir
- Number of motorized boats and non motorized boats by high and low season and by number of days.

*Lao PDR*
Management decision-making is undertaken jointly between the RFMC and a district coordinator from DAFO. The management plan (which is adapted yearly) is then formally approved (yearly) by the provincial and central authorities (that is PAFO and DLF) in a one-day meeting in the country's Living Aquatic Research Center (LARReC) of the Ministry of Agriculture and Forestry (MAF).

Evaluation is largely informal but includes the following limited formal data collected by DAFO and RFMC:

- Numbers of cage-culture operations,
- The quantity of fish (in kg.) traded from the landing site.
- Number of fulltime fishermen,
- Number of people violating fishing regulations (and the action taken against).

The following is the information *requirements* and improvements to existing data collection systems identified by users and district officers:

- Trends in fish catch and species composition: Participants in meetings expressed an interest in generating information on stock trends and variations in species composition. 'We want to be able to compare species that are caught less and those that are caught more and how this change over time'.
- Numbers of fishers: Whilst the RFMCs already monitors the numbers of active fishers exploiting the reservoir this should include fishers non-member villages.
- Catch recordings by traders: Traders only record the total amount of fish that are traded. It was proposed that they also start to record the species of fish that are traded.
- RFMC members activity monitoring: It was suggested that each RFMC members monitor/report on their activities; that is the activities they have carried out within the activities under their responsibility.
- Monitoring rule-breakers: At all reservoirs (except HS) RFMCs should monitor the number of infringements to the rules in a more systematic manner including details of the number of violations, type of violation and measures taken.
- Monitoring stocking: Participants also showed interest into monitoring the amount and the species of fish that are stocked (this is however, to some extent monitored by DAFO).
- Monitoring fish disease.

*Thailand*

Management decisions are made on the basis of information that is *informally* shared between fishermen (for example, conservation zones were established based on fishermen's perception of declining catches). Information is shared and utilized during yearly management plan review meeting, and may also include data obtained from several different sources recorded at different frequencies:

The Inland Fisheries Centre records and compiles the following information annually on the basis of questionnaires:

- CPUE,
- number of fishermen,
- number of boats,
- fishing gear used, and
- general physical information on the reservoir.

Information is also generated by fish traders who maintain log books with information on landings and prices. Village leaders record cases of rule violations, and the quantity of fish stocked where applicable. Police stations record cases of rule breaking (see Table 2 elow).

| Subject | Place | Agencies involved | Methods used |
|---|---|---|---|
| Catch assessment | KL, NO, HL | MRRF | Questionnaire (fishers), gear types, yearly |
| Catch assessment | NO, Songkram River | NO Conservation Unit | Catch (kg) from traders, multiplied by no. of boats, four days/month (average amount of fish/day?) |
| CPUE | HL | Udon Thani IFRDC | Gillnet test fishing by staff of IFRDC |
| Fish processing | HL, NO, KL | Village headmen | PIM (log/note book system) |
| Conservation zone | | | |

| | | | |
|---|---|---|---|
| management | | | |
| Violation of fishing regulations | NO, Songkhram River | NO Conservation Unit | Occurrence book, police station |

A Participatory Impact Monitoring (PIM) system (see Annex 7 of the report), developed by fishers and local government officers is presently being applied by village headmen and leaders of women groups in the monitoring of conservation zones and fish processing activities. This employs a system of annual questionnaires and logbook reporting to evaluate the impact of fish conservation zones and details of fish stocking, marketing and processing activities.

Data and information *requirements* were identified as:

- Total catches and trends for key species;
- Type of fishing gear used;
- Numbers of fishermen;
- Reasons for catch variability
- Perception of success of management plan activities (by users and government).
- Ecological data

*Viet Nam*

Management decision-making is largely informal based upon advice from MRRF, personal income monitoring and volunteer enumerators at two reservoirs who collect catch data relating to stocked species. This catch assessment programme appears to have been unsustainable because of the lack of incentives and poor understanding of the purpose of the data.

Data and information *requirements* were identified as:

- Total fish production of water bodies (per species). This data is needed for fishers to investigate the trends of production and what species need to be protected. Based on the trends of production, the fishing regulations can be changed regularly. Presently, though, regulations are based on fishers' perception of trends in the fishery.

### *2.4.12 Existing Data Collection Systems*

- In Bangladesh, local management bodies employ their own programmes to record quantities of fish landed from their waterbodies and reserves when the latter are periodically fished. Some maintain records of stocked fish and organised fish harvests including financial records relating to stocking, lease and other harvest costs. This includes information on non-stocked (wild) fish species, but typically not relating to catches landed by non-members. The main purpose is to calculate the cost and returns from the fishery for distribution of net income to the participants. In some cases, monitoring is informal without any written records.

- In Uganda, a participatory CAS is undertaken by BMU members to generate the data described above. The information collected is transferred to local government and the LAGBIMO Fisheries Management Committee to inform lake-wide planning and management, before being passed on to central government to inform national policy and planning. The system is based upon the 'Scenario B' CAS employing a census of effort in space and sampling of catch and effort in time (see Halls et al (2000 p117). Data collectors receive part of the catch as

renumeration for their services, usually one fish per boat surveyed. ***Experimental fishing:*** Nightly catches of ngege (Oreochromis niloticus) per net (4.5 inch mesh) landed by a local experimental fishing team is also being employed as an indicator of the status of the fishery.

- LMB countries – see above.

*2.4.13 Required Accuracy and Precision.*

- These concepts are generally poorly understood by local communities. However, the management committees in Bangladesh recognise that the sampling frequency of the CBFM project funded CAS should be increased to capture the large variability in daily catches and effort.
- It was also recognised that data should be precise in order that people trust and value it, but that costs associated with improving precision should also be borne in mind.

*2.4.14 Potential Improvements to existing systems*

Cambodia
Proposed changes/improvements to the existing monitoring system:

- Extend monitoring programme to include fish catches from river sites. (CF in former fishing lots) too;
- Monitoring methods and timing should be standardized in all areas (by technical agencies/provincial DOF/CFDO)
- Information to evaluate the sustainability of CF management
- Information to assess the effectiveness of CF regarding compliance with regulations;
- A sustainable cost-effective information system that can operate without donor/project support.
- Information on the number of fish traders and fish price in the area;
- Ecological information in the area;

*Laos*
see above

*Vietnam*
Constraints to improving existing data collection systems included:

- Finance
- Fishers time to collect data and information

*Bangladesh*
Local Stakeholders in Bangladesh identified a number of desirable or necessary characteristics of locally appropriately data collection systems:

- Systems should be simple systems employing gear-based CAS, household monitoring programmes or market surveys in local language.
- A workplan/schedule for data collection should exist.
- Maps or diagrams illustrating the position of data collection locations should be provided.
- A list of data collectors and a roster should be available.

- Expenses should be available for enumerators.
- Systems should include an environmental component eg water depth monitoring
- Systems to feedback information to the community members including directly dependent stakeholders should be developed.
- Designs should be cost-effective in terms of time devoted compared to the value of the information.
- Programmes should be comprehensive and inclusive covering both stocked and wild fish species.

*Uganda*

- It has been noted by some of the planners that the CAS does not provide enough information on the state of the fishery, and there is a need for further data analysis and interpretation.

*2.4.15 Attitudes towards participatory data collection systems.*

- Most communities expressed interest in establishing or developing further their own data collection programmes, but acknowledged that they, together with any data analyses, would need to be relevant, simple and may not be sustainable in the long term unless they were financially supported. Training in appropriate methodologies and technical advise on designing and implementing programmes would also be required.
- This should include clear explanations of the objective and purpose of information gathering.
- Results of monitoring programmes should be discussed with the enumerators so that any shortcomings, inaccuracies and inconsistencies can be revised or reviewed.
- In Lao PDR, the DAFO/PAFO expressed interest in a 'log-book' recording system for villagers (RFMC members).

*2.4.16 Attitudes of communities towards formal data collection methods*

- Information collected by external agencies should be feedback and shared with the local management body.
- Data collection from fishers should be undertaken quickly so as to avoid disruption to their working day or normal activities.

*2.4.17 Data storage and processing methods*

The majority of data is stored on paper records. Information relating to management planning and implementation is typically recorded in book format eg the 'Resolution Book' used by local management institutions in Bangladesh or the 'Community Fisheries Notice Book' used in Cambodia and include details of:

- The activities undertaken and status of the management plan implementation;
- Numbers of conflicts and illegal fishing events;
- Enforcement activities;
- Number of interventions in stopping illegal fishing activities;
- Records of stocked fish and organised fish harvests including financial records relating to stocking, lease and other harvest costs.

- Progress with respect to other livelihood activities.

Various ad hoc logbook and questionnaires methods have been used to generate basic catch, effort, cost and earnings data. It is assumed that these data are processed manually.

In Uganda, catch, effort and price data are recorded onto CAS data recording sheets. All the processing and raising is done via hand calculation and recorded onto the same sheets. Records are stored in box files. At district level, computers have been supplied and staff trained in data analysis. Each BMU produces a quarterly fishery report using the analysis of information obtained from the CAS system operating at their landing site. At the district level, the catch, effort and value estimates can be selected according to:

- different periods, e.g., per day, month and year;
- geographical areas, e.g., per landing site, parish, sub-county, district, lake and nationally;
- gear type;
- fish species;

*2.4.18 Identification of appropriate data sharing mechanisms*

***Opportunities and pathways for sharing***
In Bangladesh the CBO network and newsletter provides opportunities for disseminating BMC knowledge and experiences.

In Uganda, opportunities exist to share data collected under the CAS among all the existing administrative levels of parish, sub-county, district and lake-wide to aid the formulation and evaluation of local government development plans. Nationally, catch data are compiled to provide an overall indication of the scale and significance of fisheries to the country. This information, when combined with others, is used to guide broad national planning and policy decisions. National catch data are transferred internationally to FAO where global catch data compilation is undertaken.

There is, however, capacity to absorb and use data from other sectors that are currently underutilised. In part, this integrated management planning happens through the interaction with local government planning and monitoring, but this is still at an early stage, and the efficacy of the existing approach is yet to be assessed.

In Lao PDR, the co-management initiatives at four reservoirs provide sharing pathways between users and government levels. It would be appropriate to use these existing pathways, starting upwards from the lowest to higher administrative levels.

In Thailand, OBT has a responsibility to facilitate information sharing between government officers and villagers. Village leaders share information with their people through loud-speaker and monthly meetings at the village level. This information is usually from the OBT or the government officers. Information sharing between fishermen is usually informal, or through the OBT.

***External data and information***
Beyond their own fisheries, the local management institutions expressed an interesting in receiving the following information:

- Information on fish diseases, water quality and pollution and their impact on their fishery

- Data including CPUE collected under 'external' DoF CAS and other research programmes.
- Abundance of rare species of fish
- Information on causes of flash floods and how to control them
- Information on the ecological niches of different species of fish
- Reports describing management success and failure in other areas of Bangladesh lessons.
- Information on optimal stocking densities and feeding regimes.
- Information of optimal size of reserve areas
- Information on marketing and preservation of fish.
- Information on the impact of gears on the fish stocks and the environment
- Information to help identify and develop alternative livelihood activities relating to tourism and cage culture, fish trading, fingerling production
- Citizens rights
- Sources of credit

***Information for sharing with other communities***

All the communities studied expressed willingness to share information on all aspects of their management activities including:

- Sanctuary management performance
- Fish species caught in the sanctuary
- Catch and effort data if they collected it.
- Experiences of attempting to re-establish rare species
- Stocking rates and sizes to determine the optimal stocking strategies.
- Market data
- Consumption data
- Household income and expenditure data

In Bangladesh, communities expressed an interest in writing articles describing their management experiences for the CBO Network Newsletter. One of the local management committees believed that the newsletter could be used to raise awareness among government institutions of their needs to improve the management of the river fisheries and to lobby government institutions over management issues such as the creating of enabling legislation to support their management plans.

***Requirements for data sharing were identified as:***

- Information should be as simple as possible while still being relevant for management.
- The format required locally may differ from that of the government.
- The format should be simple and easy to understand.
- Posters, and statistics expressed in simple graphs could explained and disseminated through village meetings;
- Standardization is only required when information has to be compared over time or between cases;
- Costs should be low, and never exceed the benefit gained from utilizing this information;
- Timeliness for management interventions.

*2.4.19 Existing or previous attempts to develop sharing systems*

In Uganda, catch, effort and price data are processed at BMU level. This information is then forwarded from the Parish to the district level. At each level, the estimates are raised with an appropriate raising factor for each level or strata using the appropriate form. At each level, the data are used in the local government planning process, i.e., for the development of Parish Development Plans, Sub-county Development Plans and District Development Plans respectively.

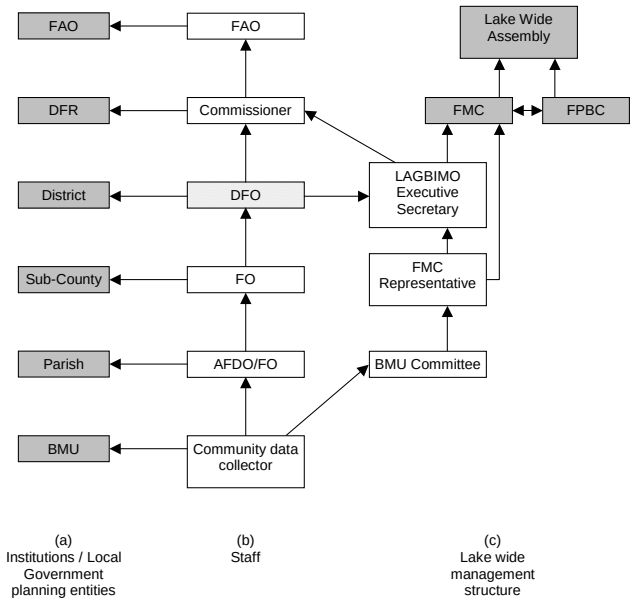


Figure 1 Fisheries information flow and use in planning. The greyed boxes indicate instances where data analysis and use in planning occur. The hashed box (DFO) indicates the level where data are stored and processed on computers.

The DFO coordinates the distribution of this information throughout his district and sends it to LAGBIMO. The LAGBIMO Executive Secretary is responsible for compiling information at lake-wide level for planning purposes and send it to the FMC members. The FMC could also acquire this information from its BMU representatives members. The outcome of the FMC meeting is distributed to the other committees in LAGBIMO.

The DFO also sends the information to DFR as a contribution to the compilation of the state of fisheries in Uganda. DFR is then responsible for making policies, laws and plans based on the information collected. DFR then sends this information on to FAO, which uses the information for normative activities. The DFOs also send the information regarding their district to the Executive Secretary of LAGBIMO.

# 3 Summary of Level 2 Reports

## 3.1 The Lower Mekong Basin Countries and the Philippines

### *3.1.1 DoFs and associated stakeholders*

*Cambodia*
In Cambodia, the government agency responsible for fisheries management is the Department of Fisheries (DoF) under the Ministry of Agriculture, Forestry and Fisheries (MAFF). Within the DoF, issues pertaining to the co-management of fisheries fall under the responsibility of the Community Fisheries Development Office (CFDO). The DoF and CFDO national offices are located in Phnom Penh.

*Philippines*
The national agency responsible for fisheries in the Philippines is the Bureau of Fisheries and Aquatic Resources (BFAR), a line agency under the Department of Agriculture (DA). BFAR has a national office and regional offices in the sixteen geographic regions of the country. Local management authority is held by Local Government Units (LGUs) who can grant fishery privileges (for oyster, mussel and other aquatic beds, milkfish fry areas and the issuance of licenses for fishing vessels of 3 gross tons or less) and impose rentals, fees or charges without the permission from any national agency.

*Thailand*
The Department of Fisheries (DOF) of the Ministry of Agriculture and Cooperatives is the main government organization responsible for fisheries management, and is entrusted with management, research, including the development of technologies, statistical data collection, extension work and conservation of fisheries resources, as well as providing policy support to the government in order to achieve the sustainable fisheries management in Thailand.

The implementation of conservation measures particularly in marine and coastal fisheries is the responsibility of the newly formed Ministry of Natural Resources and Environment. Consequently, parts of DOF have moved to the Ministry of Natural Resources and Environment.

*Vietnam*
The Ministry of Fisheries is the national authority responsible for fisheries management, including the development and formulation of policies for the fisheries sector. However, at the operational level, provincial, district and commune level People's Committees make policy decisions. In Viet Nam, as in all four MRC member countries, provincial government offices have a high degree of autonomy.

Viet Nam's current policies give communities an active role in fisheries management, an equitable share in resource property rights and shared responsibilities for conservation and management. However, these policies are vague, as they do not state how this sharing of management is to take place.

***National and sectoral policy environment***

*Cambodia*
The Department of Fisheries with support from the World Bank are drafting a Fisheries Master Plan 2001 – 2011, which is expected completed in June 2004.

The 1987 FIAT Law, that defines the framework of the management, harvesting, utilisation, development and conservation of fisheries resources in the Kingdom of Cambodia, is currently being revised. The objectives of the law are to ensure the sustainable fisheries management for the social-economic and environmental benefits including the conservation of biodiversity and cultural heritage. The law provides enabling legislation for Community Fisheries.

*Philippines*

- LGUs 'shall share with the National Government the responsibility in the management and maintenance of ecological balance within their territorial jurisdiction subject to the provisions of this code and national policies'.

- Local stakeholder interests are represented by Municipal Fisheries and Aquatic Resource Management Councils (MFARMCs) formed by fisherfolk organisations / co-operatives and NGOs in the locality and are assisted by the LGUs and other government entities.

- Although explicitly stated in the legislation, **the exact role of the LGUs, FARMCs and government agencies is still poorly appreciated by many stakeholders**.

***Roles and responsibilities***

*Cambodia*

The roles and responsibilities of the DoF, the Fishery Administration and the CFDO are outlined in the draft Master Plan for Fisheries 2001 – 2011. Most represent objectives or modes of operation. Those particularly reliant on data and information for management rather than sector development purposes are:

- Formulate and implement policies and strategies
- Define, classify and identify fisheries for mapping purposes.
- Prepare and implement a management and fisheries development work plan for each class of Fishery Administration.
- Describe and quantify all kinds of fishing gears, fishing materials, and means of transportation and fisheries resources.
- Participate in the management and conservation of fisheries resources according to By-law and management plans of Community Fishing Area in compliance with Law and other Legislation related to the Fishery Sector.
- Set up fish sanctuaries in the Community fishing area, flooded forest protection and replanting, deepening shallow streams and lakes to improve ecosystems and fisheries environment.
- Ensure that members of Community Fisheries have equal rights of access to fisheries resources in a sustainable manner.

- Relevant CFDO roles and responsibilities are:

    - Assisting communities **formulate and implement plans** for the sustainable use of living aquatic resources.
    - **Monitoring and evaluation** of community fisheries activities
    - **Preparing and disseminating guidelines**, rules and regulations related to community fisheries

- **Facilitating information exchange** among to enhance the development of community fisheries.

- The Monitoring & Evaluation Section of the CFDO responsibilities include:

  - Gather, review and summarise CF fisheries activities reports from provincial offices
  - Document occurrence of conflicts and determine their causes…
  - Establish, maintain and regularly update a database on community fisheries.

*Philippines*
The responsibilities of the BFAR relevant to fisheries management include:

- Issue licenses and permits to achieve Maximum Sustainable Yield (MSY) as determined by scientific studies or best available evidence.
- Establish a broad strategy with LGUs, FARMCs, private sector & other agencies to ensure that fisheries and aquatic resources are judiciously and wisely utilised and managed in a sustainable fashion.
- Prepare and implement a comprehensive National Fisheries Industry Development Plan.
- Establish & maintain a comprehensive Fishery Information System
- Co-ordinate with LGUs and other agencies to enhance productivity and develop marketing programmes in fishing communities.
- Law enforcement, *formulation and enforcement* of all rules and regulations governing the conservation and management of fishery resources, **except in municipal waters**, and to settle conflicts of resource use and allocation in consultation with the National FARMC (NFARMC), LGUs and local FARMCs.
- Assist building capacity of LGUs in management, regulation, conservation and protection of fishery resources.
- Formulate rules and regulations for conservation & management of straddling & highly migratory fish stocks.
- Co-ordinate LGUs in consultation with FARMCs in the development, conservation, protection, utilisation and management of fisheries and aquatic resources.
- Co-ordinate the establishment of Monitoring, Control and Surveillance (MCS) system in LGUs in consultation with FARMCs.

The Department of Environment and Natural Resources (DENR) Coastal and Marine Management Office support these roles and responsibilities, particularly in relation to marine and coastal resources.

LGU roles and responsibilities:

- Protection and conservation: establishing closed seasons, fish refuges and sanctuaries.
- Planning and implementing of fisheries projects and activities at the provincial and municipal levels.
- Regulation: issuing licenses and permits, registry systems, granting of fishery privileges, establishing mechanisms of exclusion, prioritisation, etc.
- Enforcement: setting up patrolling and enforcement mechanism through the Bantay Dagat and other means that involve Barangay officials and communities
- Legislation: formulating and planning ordinances that reflect the needs of the improved coastal resource management

- Extension: technical assistance: providing appropriate technology and research, credit, and production assistance to municipal fishers and communities.
- Data collection to inform policy

FARMCs:
The role of the FARMCs in coastal and fisheries management include:

- Prepare and recommend policies and plans for integration into local development plans
- Provide guidelines on the development of projects and issuance of permits and licenses to the LGUs and other agencies
- Assist with the enforcement of fishery laws, rules and regulations in municipal waters
- Local fisheries and coastal zone management (Vague)
- Assisting with the formulation of policies for the protection, sustainable development and management of fishery and aquatic resources, and assist with the preparation of fisheries industry development plans.

Other:

- The Fisheries Division of the Bureau of Agricultural Statistics (BAS), is the agency responsible for the official collection of data on the fishery.
- It has been proposed that the Bureau of Agricultural Statistics (BAS) should be responsible for the co-ordination and monitoring of research activities of the agencies involved in fisheries, and assisting with the formulation of research plans.
- The Fisheries Resource Management Project (FRMP) proposed a fisheries resource management work process for the different levels of management (barangay, municipality, provincial, regional and national). The proposed framework for the national level is shown in Figure 1 of the report.

*Thailand*

The roles and responsibilities of DOF can be summarized as follows:

- to implement various acts; e.g. the Fisheries Act (1947), the Wildlife Conservation and Production Act (1992), and other relevant legislation;
- to conduct studies, research and experiments in all fields of fisheries;
- to explore, analyse, and research fishing grounds beyond the Thai territorial waters; and to promote fisheries cooperation with other states;
- to promote and develop all occupations relating to fisheries by transferring the appropriate technology to fishers and farmers;
- to implement other duties as DOF is legally empowered to, or any task assigned by the Ministry of Agriculture and Cooperatives or the Cabinet.

Under the 1997 Constitution, the Royal Thai Government has passed the responsibility for management of local aquatic resources to the Tambon and Provincial Administrative Organisations (TAO and PAO). These organisations are also responsible for setting their own development agenda, providing technical support and utilizing budgets transferred from technical departments like DOF.

*Vietnam*
The Ministry of Fisheries (MOFI) has a very complex institutional structure (see Figures 1&2 of the report) and the sharing of management responsibilities with local management bodies is vague.
*Tanzania*

In Tanzania the roles and responsibilities/functions of the different govt offices is going through transition at the moment – still a lot of uncertainty.

Main roles of the Fisheries Division, particularly reliant on data and information are:

- Contribute to national treasury through licence and export fees.
- Meeting national and international reporting obligations and responsibilities including CCRF, UNLOS,CITES CBD.
- Formulation and implementation of policy
- Joint formulation of management plans and regulations
- Enforcement and surveillance
- Monitoring and evaluation
- Research and training
- Co-ordination of other stakeholders
- Facilitate and promote information sharing
- Provision of technical advice
- Support local management plans by helping to evaluate and co-ordinate them and provide feedback.

Ability to undertake these roles is severely hampered by lack of resources, skills, IC etc.

"The difficulties in classifying the roles and responsibilities of various stakeholders in a collaborative management system (as a basis for identifying information needs) should not be underestimated" "Many of the roles and responsibilities in the systems are still evolving"

*Laos*

According to the order of the Minister of Agriculture and Forestry, the roles and responsibilities of the Department of Livestock and Fisheries are the following (MAF Order 1146/02):

- To transform guidance, policies, strategies and plans of Ministry of Agriculture and Forestry into action plan, projects to support development of livestock, veterinary and fisheries in entire country.
- To co-ordinate with relevant agencies (in the same and different ministries, organizations and local authorities) in surveying socio-economic situations, natural resources and their potential uses in livestock and fisheries areas.
- Collecting and compiling information regarding livestock, veterinary and fisheries in the whole country. This includes establishment of statistic and its networking in these areas. The information will be used as guiding and directing for planning and disseminate to all concerned parties such as producers and villagers.
- Inspection, control and quarantine
- Support the enforcement of Village Management Plans
- Roles and responsibilities largely unclear "…the rights and duties regarding resource management of authorities at national, provincial, district and village level as well as of local communities have to be clarified"

Table 1DoF/state Management Roles and Responsibilities

| | Role/responsibility reliant upon data and information | Details/comments | Uganda | Tanzania | Philippines | Cambodia | Laos PDR | Thailand | Vietnam |
|---|---|---|---|---|---|---|---|---|---|
| **Non-Co-managed Resources Sector** | Develop and Evaluate National Policy and Development Plans | Including PRS, MDG.. | | √ | √ | √ | √ | √ | √ |
| | Comply with national and internal reporting responsibilities | | | √ | √ | √ | √ | √ | √ |
| | Comply with International Management Responsibilities | CCRF, CITE, CBD… | | √ | √ | ? | √ | √ | √ |
| | Formulate management plans/strategies | Largely development plans | | √ | √ | √ | √ | ? | ? |
| | Implementation, enforce and evaluate management plans/strategies | Includes monitoring | | √ | √ | √ | √ | √ | √ |
| **Co-Managed Resources Sector** | Formulation and enforcement of local management plans | Assist communities formulate and implement plans (includes enforcement and provision of technical advice) | | √ | √ | √ | √ | √ | √ |
| | Monitoring, evaluation and coordination of local management plans | Monitoring, evaluation or coordination of community fisheries activities. | | √ | √ | √ | | √ | |
| | | Preparing and disseminating guidelines, rules and regulations related to community fisheries | | | | √ | √ | √ | |
| | | Facilitating information exchange among to enhance the development of community fisheries. | | √ | | √ | | | |

***Institutional capacity and resources including manpower, finances etc.***

*Cambodia*

- DoF staff are well educated but suffers from shortage of well-trained staff in the fields of fisheries management, economics, sociology, marketing, and engineering.
- Enforcement capacity is restricted by the limited numbers of poorly trained staff, lack of surveillance resources. Prior to the establishment of the community fisheries, corruption amongst provincial fisheries officers was widespread.
- Resources are extremely limited at the CFDO office. Most functions are funded by external projects.
- DoF staff from all levels (district, provincial, central) find it hard to access information on aquatic resource management. The exceptions are those working on internationally funded projects. Low budgets, salaries and motivation are common..

- The CFDO training needs have been identified as: 'Planning for Monitoring & Evaluation', 'Staff Development', 'Computer Training' and 'English Training'. Few people needed further training in participatory and focus group discussion methods.
- CFDO budget allocations fall short of those required to meet the goals set out in the Master Plan.
- An understanding of the roles and responsibilities of different stakeholders in co-management is limited.

*Philippines*

- BFAR employs 1400 staff and conducts extensive staff development plan.
- Funding is generally scarce.
- Communication media and computers are available in most BFAR offices, but staff generally have to share access to computers and the internet. The exception is higher-ranking officials who often have access to the internet (but rarely utilise it).
- The majority of government departments aim to computerise their operations, and so computer and internet access is likely to increase steadily in the near future.

- The Fisheries Division of the Bureau of Agricultural Statistics (BAS) currently employs 15 staff, whose duties include the planning of surveys and analysis and presentation of data collected. The Statistics Planning Division of the BAS designs the survey; data collection is carried out by contractual staff, and the data processing by the IT Division of the BAS.

*Thailand*

- DOF employ nearly 3000 staff, more than half of which have degree level qualifications.

***Links and relationships with other departments, organisations and institutions***

*Cambodia*

- At the central level, information flow between DoF and other government departments occurs via highly bureaucratic channels, and little information exchange occurs.
- At provincial level, government departments work more closely together, and commonly share offices.
- Currently little interaction occurs between the central DoF offices and those at provincial levels.
- CFDO is meant to meet monthly with:
    - The Inspection Office about illegal fishing,
    - The Exploitation Office about gear definition,
    - The Fisheries Domain about CF boundaries and information dissemination about illegal fishing,
    - The IFReDI about research and policy development,
    - The Planning & Accounting Office about planning and statistics (the Planning Office will be involved in the design and maintenance of the community fisheries monitoring system).
    - The Aquaculture Office about rice-field community fisheries, community and small-scale pond culture management, and
    - The Administration Office about administration.

- However, many staff feel that the working relationship and sharing of knowledge between different offices of the DoF are somewhat lacking.
- Interaction between communities and DoF staff is minimal unless the DoF is working with an NGO or IO. Contact mainly occurs through Commune, Village, or community fishery Committee Chiefs, who report on illegal fishing activities to the provincial DoF officer.
- District DoF officers responsible for enforcement activities, and the collection or estimation of fisheries statistical information, have close contact with the community. Their policing function can distort the statistics collected.
- In spite of the efforts of the CFDO and support agencies, ineffective communication remains between local communities, the provincial fisheries offices and the CFDO.

*Philippines*

- BFAR funds all BAS fishery data collection activities. The BFAR and the Department of Environment and Natural Resources (DENR) are generally aware of each others activities, but limited collaboration occurs in the formulation of coastal / fisheries management plans, etc.
- Provincial BFAR offices maintain strong links with LGUs, and are responsible for much of the training of local government extension workers in fisheries and aquaculture techniques, including training local 'fish wardens' how to recognise fish killed by illegal fishing methods such as toxins and explosives.
- The activities of the FARMCs are closely co-ordinated with BFAR at all levels. See Figure 2 in the report.

*Thailand*

- DOF is collaborating with government, private and academic as well as community and village organizations and institutions.
- Community participation in fisheries management and development (planning and decision-making on resource utilization and conservation) is via village committees, district councils or Tambon Administration Organizations (TAO). Local fishery officers at provincial or district levels act as contacts to the communities, providing extension services, information, coordination, and transfer of technology to the communities.

***Description of co-management arrangements and activities (if any)***

*Cambodia*

- As described under the draft Fisheries Master Plan 2001 – 2011: **'communities will allocate use rights and obligations within the DoF's overall framework for managing Cambodia's aquatic resources'.**
- CFDO vision: 'The establishment of a strong, self-reliant CF throughout Cambodia who have *equitable access* to and manage in a *sustainable* manner, fishery resources in partnership with …the CFDO and provincial fishery offices, thereby *improving fisheries dependent livelihoods*'
- The CFDO is meant to work closely with the Provincial offices and the Community Fisheries Development Units (CFDUs). The CFDUs also receive support from NGOs

and IOs who also act as a link between communities and the CFDO (similar to Bangladesh). The Provincial Fisheries Offices provide monthly status updates to the CFDO.

- Most Co-management activities have been restricted to those undertaken under the Management of Reservoir and River Fisheries (MRRF) Project (see Section 3.3).

*Philippines*

- The Fisheries and Aquatic Resources Management Councils (FARMCs) form the basis for fisheries co-management in the Philippines. A major internationally funded project, the Fisheries Resource Management Project (FRMP) is working with the FARMCs and the LGUs to develop the capacity for sustainable community management of municipal fisheries.
- FARMCs provide the framework for the various stakeholders within the fisheries sector in the Philippines to participate in policy formulation and the planning and implementation of fisheries programmes.
- The FARMC is a multi-sectoral body of fisher folk representatives from municipal and commercial fisheries, 'fishworkers' (casual or long term employee in the fishing industry), representatives from NGOs and the private sector, representatives from the LGU (planning and development officer, chairperson of the Agriculture and Fisheries Committee of the Sangguniang Bayan (municipal legislative body) and a representative from the DA / BFAR.
- At the national level, the National FARMC is an advisory body to the Department of Agriculture in the formulation of national policies for the protection, management and sustainable development of fisheries in the Philippines.
- FARMCs (M/C/IFARMCs) act as advisory bodies to LGUs, assisting in management of local fisheries resources.
- Decentralisation of management responsibility for fisheries management to the municipalities has resulted in a situation where there are more than 800 autonomous entities in charge of managing the fishery. The municipalities lack the experience, expertise and funding to adequately carry out fisheries management.

*Thailand*

There are a number of initiatives, both within DOF as well as promoted through outside agencies. A key feature is the recognition of the changing institutional context for aquatic resources management. In the near future DOF will increasingly assume an advisory role whilst sub-district administrations, or Or Bor Tor's, will interface more closely with the community, in order to address their needs more effectively. This joint effort to work together at provincial, district, Or Bor Tor and community level will result in a better use of limited resources, and also resulting in sustainability and good governance. Initiatives in co-management include: Village Fish Pond (VFP) Project; Community Fisheries Project; The CBFM project; LBCRM; CHARM; MRRF.

### *3.1.2 The Fisheries*

*Cambodia*

- Many of Cambodia's fisheries resources are widely thought to be fully exploited, over-exploited or depleted.

- Inland fisheries >500 species, 100 occur regularly, mainly cyprinids and snakeheads.
- For enforcement (and licensing purposes) the inland fisheries are categorised into three groups:

(i) Industrial fishing in 'fishing lots' (auctioned every two years). A closed season is enforced.

(ii) Middle-scale fishing gear (outside the fishing lots and in the middle of the Great Lake and rivers). Requires license from the DoF. Same closed season.

(iii) Family-level fishing (constrained) but allowed to operate during both open and closed seasons.

- Marine Fishery - 470 spp fishery categorised as 'Coastal' and 'Commercial'.
- Coastal fisheries are small scale fishing to depths of up to 20m. Boast licence required for engines>33hp: $7/year/hp. Gear restrictions: trawls, lights, illegal gear.
- Commercial fisheries: from 20m zone to EZZ. Boast with engines >50hp must be licensed. $7/year/hp. Gear restriction: pair trawling, lights, illegal gear. Closed season only for mackerel.
- Community fisheries: 141. CFDO reports that none have management plans (MRRF report otherwise! see above), 20% have management committees and only 13% have set rules and regulations.

*Philippines*

- The Philippine fishery is divided into municipal and commercial fisheries. Municipal fisheries describe operations within municipal waters (<15km from the shoreline) using fishing vessels <3 gross tons. Municipal waters to include streams, lakes, inland bodies of water and tidal waters within the municipality.
- Despite an abundance of guidelines, the exact delineation of the 15 km in areas where multiple islands dot the coastline is contentious and this year commercial fishers are suing municipal fishers for entering what they perceive to be their waters.
- Commercial fishing is classified as: Small scale (passive or active gear utilising fishing vessels of 3.1 gross tons up to 20 gross tons); Medium scale commercial fishing – fishing utilising active gears and vessels of 20.1 gross tons to 150 gross tons; and Large scale commercial fishing – fishing utilising active gears and vessels of more than 150 gross tons.

Thailand

- Coastal waters have high organic productivity, habitat and fish diversity.
- But habitat degradation is widespread due to pollution, aquaculture, mangrove removal and overexploitation.
- Irrigation and dam construction is widespread and water quality of many rivers has declined.
- Coastal shrimp farms have impacted on mangrove nursery areas.
- Stocking of inland and coastal waters and fish and shellfish culture are common practices.

***Resource and Environment***

*Cambodia*

- Coastal erosion is a threat to coastal/marine fisheries
- Agro-chemical run-off and competition for water resources threatens inland fisheries

*Philippines*

- The Philippines consists of about 7,100 islands, with an estimated coastline area of 17,460 km. The country's territorial waters cover an estimated 2.2 million km2 (BFAR, 2001b).
- Inland water resources are estimated to include 338,000 ha of swamplands, 253,000 ha fresh and brackish fish ponds and 250,000 ha of other inland water bodies such as lakes, rivers and reservoirs (BFAR, 2001b). The major lakes of the Philippines are Laguna de Bay (area: 90,000 ha), Lake Lanao (34,700 ha and Lake Taal (23,400 ha).

***Status and trends***

*Cambodia*

- Inland Fishery: DoF statistics significantly underestimate actual landings.
- Marine Fisheries: Landings show monotonic increase.

*Philippines*

- Fishery dominated by marine sector, but substantial inland fishery exists.
- The total fish production in the Philippines in 2002 was estimated at 3.4 million metric tons. From 1992 to 2001, the average annual growth rate of the Philippine fisheries was about 2%, with the aquaculture sector showing the highest growth rate. In 2002 about 40% of the total fish production came from the aquaculture sector, with 31% and 29% from the commercial and municipal sector, respectively (BFAR, 2003a).

Whilst total catches are increasing, catch per unit effort has declined dramatically from 1984 to the present, and that the total catch of small pelagic fish has remained much the same since 1975 despite a large increase in effort. Reasons cited include:

- Increases in commercial and municipal fishing effort due to population growth, migration to coastal areas, and use of more efficient gear.
- Generally slow economic development in coastal areas thus providing few viable other sources of income to municipal fisher families and communities
- Continued use of habitat – and fishery – destructive fishing practices
- Open access to fishery resources with few practical limits to entry in place
- Degradation of coastal habitats from various causes, including pollution

*Thailand*

- Fisheries data and information collection is the responsibility of the research and statistics group of the Information Centre of DOF. More detailed data collection on specific issues, is undertaken by a number of research projects.

- Production from all sectors have shown increases during the last decade, particularly from coastal aquaculture. Inland fish production contributes less than 10% to the total annual production, and less than both freshwater and coastal aquaculture, but provides an important source of protein for rural communities.

- Approximately 0.5m people are engaged in marine fisheries, operating about 18,000 registered vessels. Numbers for inland fisheries are uncertain. Most catches are destined for household consumption. Peak landings occur during the dry season. Inland waters cover approximately 4.5m ha. Floodplains are becoming less

important due to hydraulic engineering. Emphasis is now towards multi-purpose reservoirs, irrigation tanks and swamps.

Gear types
See reports

- CFs in Cambodia are increasingly using illegal gears because catch rates with legal gears are low.

Landing locations
*Thailand*

- Marine fisheries landing sites are divided into 5 zones for the purposes of monitoring and evaluation.
- Inland fisheries landing sites are more dispersed, although there are 24 major landing sites among 13 provinces.

***Management control measures***

*Cambodia*
See above

- Community fisheries may establish their own rules and regulations but these must not permit activities disallowed by the Fisheries Law.
- District and Provincial Fisheries Officers (D/PFOs) are responsible for enforcement activities, and the collection or estimation of fisheries statistical information, have close contact with the community. Their policing function can distort the statistics collected.
- Enforcement capacity is restricted by the limited numbers of poorly trained staff, lack of surveillance resources

*Philippines*

- Closed seasons may be established in municipal waters by an LGU in consultation with the FARMC.
- The FARMC may also recommend the establishment of closed seasons in municipal waters, fisheries management areas, and other areas reserved for the use of the municipal fisher.
- BFAR may also declare closed seasons outside municipal waters following consultation with the concerned LGU and FARMC.
- Effort outside municipal waters is controlled via vessel licences.
- Licensing in municipal waters is limited, and fees are often arbitary.
- Total Allowable Catch (TAC). However, the TAC and FMSY are uncertain due to limited data and information. The cost of implementing a comprehensive and accurate monitoring system to support management on the basis of these reference points is estimated to be higher than the funds available for fisheries management.
- Law enforcement is a major obstacle to effective management in the Philippines, where illegal fishing is recognised to be one of the biggest problems facing the fishery, including the intrusion of commercial fishers into municipal waters.

*Thailand*

- Strategies include restocking of fish and culture–based fisheries, control of aquatic vegetation, regulations on fishing gear, restrictions on fishing seasons

and areas, prohibition of destructive fishing methods, and rehabilitation of fish habitats.
- Fisheries regulation is used to optimize fish yield.
- Regulation of the fishery is decentralized, as regulations are defined by the provincial fisheries administrations (that is, provincial fisheries officers).

***Data and Information Currently Collected***.

*Cambodia*

- Catches by City, Province, fishery and gear type
- Numbers of fishers by 5 categories
- Numbers of fishing boats by engine size and GRT
- Fish Exports by City and Province
- Quantity of processed fish products.

*Tanzania*

- Effort data
  - Date
  - Vessel registration number
  - Vessel type
  - Gear type, number and size
  - Number of crew
  - Arrival time
  - Time spent fishing
- Catch data
  - Weight by species (groupings)
- · Number by species (groupings)
- Financial data
  - Value of catch (beach price) by species (groupings)

***Fish disposal***

*Cambodia*

- Marketing and distribution networks are well developed for the inland fisheries. Fishers normally sell their produce to small traders, who sell to medium traders, who distribute the fish through wholesalers (DoF, 2001g).
- Domestic consumption of marine fisheries products is low and most marine fisheries products are exported (DoF, 2001g). Little data is available on the amount and value of export of fisheries products.

*Philippines*
Largely uncertain

*Thailand*

- Marine fisheries: Fishers sell their fish to traders as fresh fish at local fish landings; some process both fish destined for sale as well as for household consumption. Commercial fishers sell most of their fish caught.
- Inland fisheries: Fishers sell their fish at the fish landings, or take it themselves to nearby markets or villages. A few sell fish to middlemen in cases of glut landings. The majority of small-scale fishers use fish primarily for household consumption.

*3.1.3 Identification of data and information requirements*

*Cambodia*

- Fisheries management is at a very early stage in Cambodia,
- Data requirements to support the contemporary management process are therefore virtually non-existent.
- Further, the current capacity of the DoF / CFDO to conduct the management process is very limited.
- The distinction between minimum and desirable information needs is therefore difficult to ascertain.
- The information needs presented below represent a 'wish list' of information which does not take into consideration the cost-effectiveness of methods of data collection or sharing.
- Current management activities appear enforcement driven (related to licence revenue generation?) rather than based upon explicit objectives and management performance criteria. The ecological basis of many regulations appear uncertain.

***Details of any management plans for each fishery***

*Cambodia*

- Currently no finalised management plans exist for any fishery in Cambodia. The current framework stipulates that one-year, five-year and ten-year fisheries management plans be prepared, but the capacity to do so is limited.
- The Fisheries master Plan is still under development.
- An ADB / FAO-funded project is currently developing a management plan for the Tonle Sap system.

*Philippines*

- Although no national management plan exists, the BFAR is obliged to produce a 'Comprehensive National Fisheries Industry Development Plan', but is finding it difficult to do so without external funding support.
- Individual management plans should exist for each MFARMC, and sometimes for BFARMCs, but in areas where the FARMCs are not well established the management plans are not used for implementation.

*Thailand*

- Currently no operational management plans exist for fisheries in Thailand. A Fisheries Development Plan, does however exist which sets out 4 outputs and 11 activities related to fisheries management and development.

*Vietnam*

- Currently no operational management plans appear to exist. A Fisheries Development Plan has been formulated aimed mainly at improving the economic performance of the aquaculture and offshore marine sectors and foreign trade in fish products.

*Tanzania*

- No specific operational management plans exist. However the Fisheries Master Plan sets out 15 programmes to achieve the policy objectives (see p 18 of the report).

*Laos PDR*

- Currently no operational management plans appear to exist.
- The fisheries management measures have been enforced by local authorities with many prejudices, conflicts and problems because of lack of scientific based information responding to the root causes of the situations.
- One of the major threats to sustaining capture fisheries is environmental degradation arising from the activities of other sectors.

***Management objectives for each fishery or as a whole***

*Cambodia*
As there are currently no management plans, the management objectives of individual fisheries have not been formulated. However, the Master Plan states three overall Gaols, each with a number of operational objectives:

- Goal 1: Harvesting within sustainable limits
- Goal 2: Supplies meeting demands
- Goal 3: Poverty reduction

See page 25-27 of the report for full details of the operational objectives.

*Philippines*
No specific national level management plans currently exists for any fishery in the Philippines. However, goals include:

- Contribute to national food security at all times
- Ensure the rational and sustainable development, management and conservation of fishery and aquatic resources in Philippine waters, including the EEZ and adjacent high seas
- Reduce poverty incidence in coastal areas
- Enhance people empowerment in the fisheries sector

*Thailand*

- The overall objectives of the Fisheries Management and Development Plan of the Department of Fisheries are to improve the conservation and fisheries management, aquaculture development, in order to achieve the sustainable fisheries development and maintain food security in the country consumption as well as fisheries processing development as the food safety in order to export. Most objectives relate to development targets.

*Vietnam*
The Government's (GoV) national objectives for the development in the fishery sector are stated in the Fisheries Master Plan Year 2010, which gives at its National Overall Objective "To effectively contribute to the improvement of the national economy and the social and socio-economic conditions of the people". Implied in this broad-based objective are a number of specific objectives, which are specified as:

- Improving the nutritional standards of the population by increasing the supply of aquatic products to domestic markets and improving people's access to aquatic products.
- Ensuring that all fisheries and fishery related activities are sustainable for this and future generations to continue benefiting from fisheries.

- Increasing export of aquatic products and net foreign exchange earnings that will derive from such exports.
- Accelerating modernisation and industrialisation of the fisheries sector and its associated industries to improve the economic and financial efficiency of the sector and to establish and maintain comparative advantages.

*Tanzania*

Policy focus is reflected in the Poverty Reduction Strategy. All policies stress the need for poverty alleviation.

The report identifies 18 strategic objectives, those reliant on routine data and information are:

- Increase fish production
- Improve utilisation of fisheries products.

Laos PDR

- "…to alleviate poverty, minimize gap in the socio-economic status between urban and rural areas, and increase the harmony and understanding among ethnic groups"

***Decision-making methods for each management objective***

*Cambodia*

- Because no management plans have been formulated, the decision-making methods for management objectives are not finalised yet. However, the draft Master Plan details strategies to achieve each operational objective, from which the report identifies some criteria and mechanisms for decision-making (see pages 27-28 of the report).

- Overall, the aim is to judge management performance against scientifically established best practice guidelines, and to use a series of revolving five- and one-year plans for more detailed planning. However, it should be emphasised that the Fisheries Master Plan clearly states that the capacity of the DoF to carry out its management duties currently is virtually non-existing, and will have to be developed through externally funded programmes, the cost of which is estimated at USD 226 million.

*Philippines*

- As no national level management plan has yet been formulated for any fishery, and no management objectives are currently finalised, the decision-making mechanisms for such objectives are unclear.

*Thailand*
Not adequately reported.

*Vietnam*

- As no national level management plan has yet been formulated for any fishery, and no management objectives are currently finalised, the decision-making mechanisms for such objectives are unclear.

Laos

"It is not clear to what extent decision-making is based on currently established information systems" (p38 of the report).

***Data and information requirements to control and regulate the fishery***

*Cambodia*

- Exact location of each fishery (marine, fishing lot and community fishery, on a map, with position co-ordinates)
- Details of license holders, including: contact details, vessel used, gear used, catch levels
- Community fishery rules and regulations, and how these are enforced
- Illegal fishing activities occurring in each fishery

*Philippines*

Data and information needs identified through workshops and interviews include:

- Extent of illegal fishing activities in area (from Fishers' Associations and fishers)
- Exact location of illegal activities in area
- Number of apprehensions for fishery law violations
- Nature of violations
- Number of cases filed in court, and the status of the case thereafter (convictions)
- Number of municipalities whose boundaries have islands / islets where the demarcation of the municipal fishing grounds may be in dispute
- Number of law enforcers (fish wardens) trained in latest law enforcement techniques, including procedural aspects of apprehension and prosecution
- Status of law enforcers' knowledge about how to recognise fish caught using explosives or cyanide, and skill level in fish identification
- Use of manuals (with procedural aspects, how to gather apprehension evidence and bring it to court) for law enforcement officers, where are they used, by whom

*Thailand*

The following requirements were identified:

- Information on offences and prosecutions on fisheries violations, including reason of violation, specific types of illegal behavior, number and types of warning, prosecution and convictions as well as the nature and scale of penalties;
- Summary on convictions (admission of guilt), license or fishing activity suspensions, fines, confiscations and imprisonments;
- Number of patrols, numbers of vessels examined and area searched;
- Information on infringements on minimum mesh-size controls.

*Tanzania*

Data and information are required in respect to the following:

- Vessel licences
- Fish taxes/levys (total catch landed)
- Fishing licences
- Vessel registration

*Laos*

Not adequately reported

***Data and information requirements for policy and development planning***

*Cambodia*

Data and information needs identified through workshops and interviews with DoF are listed on Page 29 of the report.

*Philippines*

See pages 27-28 of the report

*Thailand*

See pages 28-29. The information requirements listed appear to have been taken from the recommended reading with no explanation of its purpose or use.

*Vietnam*

- Improved understanding of fisheries biology and ecology including habitat requirements.
- Value of exports
- Socio-economic value of the fishery
- Total catches by habitat type to prioritise habitat conservation programmes.
- Management performance of traditional co-management fisheries.

*Tanzania*

Not clear from report, but in relation to objectives should include:

- Information to formulate and evaluate the Poverty Reduction Strategy
- Licence and export revenue
- Dis-aggregated catch and effort data.

*Laos*

- Stock distribution
- Fisheries ecology
- Economic value
- Socio-economic information on the functioning and resilience of traditional management systems.

***Data and information requirements for compliance with international management***

*Cambodia*

Data and information needs identified through workshops and interviews with DoF are listed on Page 30 of the report.

*Philippines*

See page 29 of the report

*Thailand*

See page 30 of the report. The purpose of much of this data is unclear.

*Tanzania*

CCRF, CITES, CDB, UNCLOS etc

*Laos*

CITES, CBD, FAO

***Data and information requirements for international reporting responsibilities***

*Cambodia*

Data and information needs identified through workshops and interviews with DoF are listed on Pages 30-31 of the report.

*Philippines*

*See pages 29-31 of the report*

*Thailand*

See pages 30-31 of the report

*Vietnam*

FAO reporting responsibilities; CITES, CBD.

*Tanzania*

FAO reporting responsibilities; CITES, CBD.

*Laos*

FAO, CITES, CBD

***Data and information requirements to support community-based fisheries***

*Cambodia*

The CFDO identified the following information and data needs in the study workshop:

- Location and area of community fisheries, as shown on a map, including clearly marked boundaries and position co-ordinates.
- Existing and potential livelihood strategies and occupations of community members, including incomes from each occupation / contribution of occupation or strategy to overall livelihood, food security, alternative livelihood strategies to fishing
- Natural and physical resources present in local area, including infrastructure, rivers, lakes, areas of permanent and seasonal flooding, forests, agriculture, aquatic organism species, etc., and resource use for each of these
- Information pertaining to local conflicts related to fishing or aquatic resources use, including who is involved, how conflict can be resolved, power issues
- People's needs within the community and within the community fishery, including existing projects / initiatives to meet these needs
- Problems encountered in the community fishery, including strategies to resolve them
- Inventory of fishing gear used, the species, sizes and values of organisms caught by different gear types (This should be described in the management plan, provided by a frame survey or SLA).
- Community fishery goals, rules, regulations and management plan, including inventory of resources (funds, patrol boats, petrol, means of protection against illegal fishers) data collected, local monitoring efforts, reporting requirements (This should all be described in the management plan).
- Details of illegal fishing, how much, by whom, gear used, species caught, actions taken against offenders.
- Traditional / local knowledge and understanding of resources, including flooding patterns, fish migration patterns, nursery areas, etc. (This can be obtained from a SLA)

- Status of understanding and knowledge of the Fisheries Law within the community fishery and the CFDU. (This can obtained from an SLA)
- Social framework, including religion, ethnicity, relationships, belief systems (This can obtained from a SLA)
- Level of co-operation and agreement within the community fishery, the CFDU, and the local authorities (This can be obtained from an SLA)
- Lessons learned by the community fishery, success and failure stories
- Power relations in the community (This can be obtained from an SLA)
- Details on existing and potential external collaborators such as NGOs, including their agenda, contact details
- Details on the CFDU, including CFDU capacity, human resources, needs, perception of community fisheries within CFDU (This can be obtained from an SLA)

This appears to be more of a "wish list". These should be accompanied by an explanation of what the information will be used for, how frequent the data are required, and to what degree of accuracy and precision.

*Philippines*
The BFAR identified the following requirements:

- Pertinent issues for coastal communities, possibly ranked in order of importance, indication of what the community would like to achieve
- Coastal resource assessment (including status of coral reefs; mangrove forests; seagrass beds; fish stock assessment; endangered species in area; index of existing projects and activities including artificial reefs, fish attraction devices etc.)
- Environmental data including water currents, recruitment areas, migration patterns of species (possibly from traditional / local knowledge)
- List of reserves / sanctuaries etc. in local area and rules pertaining to these
- Socio-economic information about coastal communities, including information on sources of income; alternative livelihoods; means of fishing (vessels and gear used, species caught, grounds fished); employment in fishing and ancillary industries by gender; current use of resources in local area
- Information on alternative livelihoods that are feasible for area
- Catch and effort data for municipal fisheries (species and weight by vessel and gear type and per fisher)
- List of projects and programmes in local area, information (from regional BFAR offices) about the success of individual projects
- Laws, rules and regulations pertaining to the management of municipal fishery

Aside from catch and effort data, the information listed above is currently only collected in areas where the FRMP or the CRMP operate.

*Thailand*
The following information was identified (and appears largely related to frame survey or baseline survey requirements) but the purpose of the information is largely uncertain:

- Existing ports and landing places, their locations, patterns of distribution and accessibilities;
- Numbers of fishing units and information on their composition such as fishing gears, fishers, fishing craft, and their geographical distributions in relation to home ports and landing place;

- Supply centres for capital goods, essential material and services (e.g. fishing gears and their components, fuel oil, engine parts, vessel repairs, navigation equipment);
- Fish distribution routes, fish utilization, fish processing and marketing practices, fish trade, local consumption, number of processors and marketing units;
- The relationship within community and between other community;
- The people's need within the community and within the fisheries community;
- The relationship or interaction among fishery stakeholders relating to fishing/fisheries management;
- The current community situation including socio-economic aspects, environmental aspects and resources available; utilization as well as resources management;
- Information on local conflict among users or between government and/or outsiders related to fishing or aquatic resources use;
- Attitudes of the people toward fisheries management/development as well as their understanding of the management or development plan (their roles, rights and how they can be involved and participate);
- What are the opinions to improve fisheries management/development to achieve overall development objectives and goals?
- Assessment of biological and economic effect of a change in fishery;
- An early warning of species decline;
- Baseline data for Environmental Impact Assessments (EIAs);
- Description of the existing system for large, middle-scale fisheries as based on stratified random sampling and a frame survey of fishing gears. All species captured, the catch by gear by month/season/district, as well as the prices/kg and total value are recorded.

*Vietnam*

Not adequately described in the report.

*Tanzania*
This was not explicit within the report but could be inferred as being:

- Description of each management plan to help coordinate activities
- Details of each Village Management unit including location.
- Resource status and trends associated with each management unit/district.
- Data and information to help generate management guidelines for and provide technical advice to villages/districts

*Laos*

- Definition/delineation of jurisdictional boundaries
- Clarification of respective roles and responsibilities
- government managers should participate in monitoring and evaluation, and, in particular, the communication of management information across organization levels and geographical scales. Not least because fisheries line agencies are the management partners established on all levels and geographical scales. They are the 'missing link' in a two-directional information flow between mainly locally derived user knowledge and fisheries policy on higher, i.e. district, province, national and even regional management. Information has not only to be 'transported' between management levels, but also 'translated'

***Data and information requirements to co-ordinate and evaluate community-based fishery***

***management activities***

*Cambodia*
The CFDO of the DoF in Cambodia identified the following information needs to support this role:

- Information about biological and ecological resources in community fisheries areas, including health of fish stocks, interactions between fishing and the environment (including impact of clearing), sustainable fishing levels and gear use, fish migration patterns, spawning areas, area of different habitats (rivers, lakes, flooded forest) and the aquatic resources found in each of these, industries, pollution, agriculture in area.

- Details of the working relationships and level of co-operation between the community fishery and other stakeholders (including the CFDU, local authorities and other organisations / institutions (including NGOs))
-
- Details of the working relationship between stakeholders, including the CFDU, local authorities and other organisations / institutions (including NGOs)

- Details of the development of the community fisheries, including exactly how the process was carried out, success and failure stories, sources of conflict related to management implementation

- Details of community fishery goals, rules, regulations and management plan, including status of by-laws, details of members of committees (age, gender, education, income), inventory of resources (funds, patrol boats, petrol, means of protection against illegal fishers), clearly defined conservation areas if present, fishing gear permitted in what areas, enforcement strategy and fines, data collected, local monitoring efforts, reporting requirements, details from any meetings and workshops held.

- Inventory of fishing gear used, the species, sizes and values of organisms caught by different gear types (why?)

- Human resources within the community fishery and within the CFDU, including training, education, gender, manpower, occupation, alternative livelihoods, level of understanding of the Fisheries Law

Again, this appears to be more of a wish list. These should be accompanied by an explanation of what the information will be used for, how frequent the data are required, and to what degree of accuracy and precision.

*Philippines*

- Reliable catch and effort data for municipal fisheries (BAS needs more funding than currently available to achieve this, or possibly to access information from other sources, including the municipal fisherfolk registry facilitated by the FARMCs in many areas).
- More accurate production figures from commercial fisheries, especially for migratory species (BAS needs more funding than currently available to achieve this, and better transparency from industry relating to production figures. Efforts already made on this front through the Convention for the Conservation and Management of Highly Migratory Species in the Western and Central Pacific

which provides for data collection on key species by the Oceanic fishery programme of the South Pacific Community).

- Municipality plan, including list of proposed activities, details of M&E system used and M&E results.
- Environmental data including area and status of fish stocks; coral reefs; mangrove forests; seagrass beds; existing artificial reefs; Fish Attraction Devices; marine reserves and sanctuaries; endangered species; weather patterns, industry, agriculture and pollution sources of the area; sea temperatures and water quality, etc.
- Details on existing livelihood or resource management oriented projects, including information (from regional BFAR office) on the success of these.
- Socio-economic data including food security; alternative livelihoods; participation in, and income from, fisheries and related activities for men, women and children; size of families; level of children's education; feasible alternative livelihood activities in area

The information above summarises that collected from about 100 municipalities within the FRMP for the PhilFIS.

*Thailand*
The data and information requirements to co-ordinate and evaluate community base fisheries management activities were identified as:

- Fishery stakeholder's involvement
- Community situation including socio-economic, (income/alternative occupation/living standard as well as the relationship within community and outsides) environment/resources aspect (fish population/catch/CPUE) before conduct the management activities and after finishing;
- Number of violation on fisheries regulation;
- Conflict conditions;
- Details of the working relationships and level of co-operation between the community fishery and other stakeholders (including fishery community, DOF, NGOs, local offices, TAO etc.);
- Objectives and goals of different stakeholders;
- The roles/rights/responsibilities of the community and planners to participate in fisheries management.

The purpose of these data is unclear.

*Vietnam*

- Yield and value of fish from the co-managed fishery.
- Frequency of fisheries violations.
- Indicators of living standards of fishing families
- Level of satisfaction with co-management by all stakeholders

The purpose of these data is unclear.

*Tanzania*
This was not explicit within the report but could be inferred as being:

- Description of each management plan to help coordinate activities
- Details of each Village Management unit including location.
- Resource status and trends associated with each management unit/district.

- Data and information to help generate management guidelines for and provide technical advice to villages/districts

*Laos*

*3.1.4 Description of existing, and identification of potentially appropriate, data collection tools, sources and methods*

***Existing data collection sources, tools and methods***

*Cambodia*
Non-Co-managed Resources:

- Catch data for different value categories of fish (no species information) for industrial (fishing lot) fisheries are compiled from logbook records kept by each lot holder. Logbook data are collected monthly by provincial fisheries officers or community based data collectors (5-6 per province). The data are passed on to the national level following a provincial fisheries office meeting where values are discussed.
- Middle-scale fishery catches are estimated from license information and reports (Vague). Monthly surveys are supposed to be conducted, but in reality rarely occur.
- Provincial Fishery Officers also estimate family-scale fishing efforts. Most estimates have very low accuracy, partly because the data collectors also belong to the enforcement unit.
- Provincial Fisheries Officers estimate marine fisheries statistics from licensing information and interaction with fishers. The data suffers from the same problems as that for the inland fisheries.

Where do export and processing data come from?

Co-managed resources: None

*Philippines*

- The Bureau of Agricultural Statistics (BAS) is responsible for the collection, compilation, analysis and dissemination of fisheries statistics.
- Survey coverage is limited by available funds from BFAR.
- Statistics are mainly gathered to satisfy national reporting requirements, which stipulates that quarterly summaries of the production of fish must be generated.
- Quarterly meetings are held to discuss regional data and explain and justify levels and changes in reported values. Fisheries statistics are published in quarterly performance reports and also in statistical handbooks published annually.

- Both the commercial and municipal fisheries are sampled for information on weight and value of catch by species, gears and vessel type.

- Landing centres provide the sampling frame, stratified into 3 levels: top-producing landing centres, major fish landing centres; and all others.

- Sampling follows a two-stage stratified random sampling design using province as the domain, fish landing centres as the first stage unit and the fishing boats as the second stage unit.

- All top-producing centres are sampled, but random sub-samples are taken at the major and other landing centres.

- Sampling is carried out every second day at each landing centre at peak times only, but the survey includes questions about activities at non-peak times. The duration of each survey varies with funding availability.

- The data is collected by contractual staff from the Barangay surveyed.

- Non-probability surveys are conducted when funding is insufficient or released too late to carry out probability surveys. These surveys involve quarterly visits to selected landing centres by statisticians, who carry out key informant interviews with fishing boat operators, fishers and traders.

- For Inland fisheries, households are used as the sampling frame. The frame for 34 provinces was updated in 2001, and 11 provinces were updated in 2002. Sample households are randomly selected by province, and surveyed half yearly or quarterly depending on funds available. Surveys last for 15 days (Coates, 2002). Contractual staff are paid 50 pesos per household interviewed to gather the information. When probability surveys are not possible because of lack of funding, quarterly Inland Municipal Fish Catch surveys are conducted. In these, sample fishing households report estimated percentage change in fish catch compared to the same quarter of the previous year.

The BFAR National Stock Assessment Program gathers data about fish catches, fishing effort and fish sizes caught to provide a basis for the formulation of policies for the management and conservation of marine resources. In 2002 the project continuously monitored 170 landing centres nationwide (BFAR, 2003a). The project is currently conducting fish landing site surveys for major and minor landing centres. A database system has been installed in BFAR regional offices. The database uses logbooks submitted by commercial fishing vessels to the national and regional offices. For minor landing centres, contractual staff or municipal enumerators conduct surveys. Data from the municipalities are transferred and consolidated at the BFAR regional offices, from where they are transmitted to the national level. How does this programme differ from the above?

FARMC maintains a registry of fisherfolk in some municipalities including details of:

· Personal details (name, address, next of kin, no. of children, etc.)
· Number of years in the municipality
· Main source of livelihood
· Number of years fishing
· Time of fishing (AM / PM)
· Number of hours spent fishing per year
· Name(s) of fishing ground(s)
· Type of fishing gear(s) used
· Types of fish caught (numbers of different species)
· Average weight of daily catch
· Peak season months
· Lean season months
· Type of fishing vessel (motorised / non-motorised / horse power if motorised)
· Other sources of livelihood / income

- Number of hours spent daily in other livelihoods
- Membership in fisherfolk organisation, position
- Community tax certificate details

Systems for the storage and analysis of the data collected are currently being developed in a number of municipalities, mainly through the use of Microsoft Excel spreadsheets. There are also plans to incorporate the information into the Philippine Fisheries Information System (PhilFIS) database of the Fisheries Resource Management Project (FRMP) of BFAR.

Under the Fisheries Resource Management Project, Contractual staff from universities collects ecological data using 'scientific methods'. Data collected and methods used include: Capture fisheries; Coastal habitat; Manta tow surveys; Water quality component:
Socio-economic data is also collected through household surveys carried out by contractual staff (commonly from NGOs). The data is collected using a single survey form.

Data collection also takes place under the Coastal Resource Management Project (CRMP), a seven-year project (initiated in 1996) funded by the US Agency for International Development (USAID). The project established Municipal Coastal Databases (MCDs) in each of the project locations. The information gathered for the database is shown in Table 9 of the report and covers the various attributes identified under project R7834.

*Thailand*

The DOF is also responsible for fish stock assessment, including that of straddling and highly migratory fish stocks. Data and information is obtained using fishery independent surveys/stock assessments and by catch sampling methods. Whilst the descriptions in the report are vague and lack detail, it appears that a port or market sampling programme is also undertaken to estimate catch weight, composition and fish size. Interviews and questions may be used, but he accuracy and precision of the data are questioned.

Fishery-independent surveys are undertaken in at least five study sites in four sampling months to estimate biomass, diversity, and population parameters. Sophisticated statistical techniques may be applied such as MDS and Cluster analysis.

The Fishery Economics Division is responsible for collecting data on demographic and socio-economic aspects of fisheries. The information is obtained by provincial and district at landing places by sampling, enumeration and interviewing. The data is published from time to time under such titles as *Fisheries Statistics of Thailand*, *The Marine Fisheries Statistics of Thailand*, *The Landing Places Survey* (latest edition 1994), *Statistical Survey of the Freshwater Landing Places, Freshwater Fisheries Products from Natural Reservoirs*. In cooperation with the National Statistical Office, Office of the Prime Minister, DOFs Fishery Economics Division and Marine Fisheries Division publish ten-yearly fisheries and fisheries-related censuses (the latest edition published data as per the year 1995, and was issued in 1997).

Recently, information provision on marketing and utilization of fish and aquatic products, including exports and imports, have become the responsibility of the private sector. However, no data from these sources is yet available. It is feared that such data may not be so reliable, as entrepreneurs fear that data may be used for tax purposes.

Data collection tools used in Thailand are reported to include: questionnaires, PRA approach, and the Rapid Appraisal of Fisheries Management Systems (RAFMS) approach.

Information is often assembled from district or provincial level via telephone, fax and emails. This was not adequately described in the report.

*Vietnam*

The systems employed to collect fishery statistics in Viet Nam is very unclear. One reason for this is that there is a large degree of delegation of the statistical system to provinces and it can be challenging to establish exactly what is happening at that level. In provinces where a Department of Fisheries exists it is responsible for collection and processing of information on fisheries production at the district and village/community levels. This information is heavily biased towards aquaculture statistics. Provinces are requested to report every 3 months and produce a yearly report on the total area and total production. Only a limited number of species are distinguished. All other production (culture or capture) is lumped together and reported simply as "freshwater fish". Since production figures are used as a basis for government revenue and tax it might be expected that this system results in a certain bias in reporting. The Ministry of Fisheries has no budget to collect their own data and rely entirely on the data supplied by provincial offices. An independent (parallel) system is in place through the General Statistics Office (GSO). Neither system has been designed to include all information fields necessary for the management of fisheries. Systems utilise the following methods:

- Registration books and license;
- Reports made by district officials;
- Reports based on the original data of the Sub-Department for Fisheries Resources Conservation, the Center for Fisheries Extension and the Market Management Board;
- Interviews and survey forms;
- Estimates of monthly, six-months and annual fisheries statistics, which the Department of Fisheries uses to make a report for MOFI's agency in charge of fisheries statistics.

*Tanzania (coastal)*

Catch, effort and value data collected by means of a CAS based upon a frame survey.
Catch and effort data is sampled in space and time. Samples are recorded for 16 days per month at 22 landing sites by field-based enumerators resident in the local community. The FEU is a single vessel/gear combination. Small-scale fishing activities including reef gleaning are not included. No socio-economic data are collected.

Field data are recorded into booklets and then transcribed onto forms for processing by DFOs.

Limitations:

- Incomplete coverage
- Poor data quality (under reporting by 25%) enumerators un-motivated/unsupported, unvalued etc.
- Rarely reported
- Many monitoring activities have ceased.
- (in effect there is no function system!)
- No national statistical reports have been produced since 1997!

A fish catch monitoring and Socio-economic and reef monitoring programmes have been set up by the TCZDP project. See p59 of the report. Confined to selected villages and based

upon national frame. Catch, effort and LFD collected. SEMP and reef programmes ad hoc and bi-annual.

*Laos*

Fishery related socio-economic data are few, and the official production figures, both for capture and culture fisheries, are mainly based estimates. However, the National Bureau of Statistics have been including fisheries data in their recent household survey in 1997, and has followed-up with adjustments since then.

Existing data collection system exists for livestock agriculture and fisheries which could potentially be adapted to include fisheries data. Data collection at village level is performed by means of the village headman, a "model farmer" or the relevant veterinarian worker. Usually at least one, but more often, all three of these are present in each village. Each is responsible for data reporting to the Ministry of Agriculture and Forestry. These people submit completed questionnaires through the district and provincial authorities to the national line departments in Vientiane. However, it is reported that relationships between villagers and government officers are less than ideal and there is widespread under-reporting. The main problem appears to be the usual fear that statistics will be used for taxation purposes. The level of formal training in data collection and statistics, in general, is weak at both provincial and district level.

The present system is a sub-component of the agricultural system. Data is compiled on the basis of previous ad hoc studies and data available from other government ministries including expenditure and consumption studies, CPUA estimates, agricultural census, foreign trade statistics etc (see p 41 of the report).

Some fisheries data collection programmes are described on p42, but it unclear if they are comprehensive and routine.

Problems

- IC, Finance
- Lack of feedback from users;
- Lack of objectives and incentives for enumerators and other staff to produce quality data
- Lack of awareness, especially by policymakers, of the importance of the sector in planning and development;
- The collected data is not always used which further contributes to the lack of motivation among enumerators;
- Low levels of capacity among personnel, especially at the local level, who are mandated to collect the raw data.

"Fisheries statistics are not used effectively in the determination of national fisheries policy, the formulation of national management frameworks and actions or even as a basis for understanding the status and condition of fisheries resources"

"In the case of inland fisheries operating within an international river basin such as the Mekong Basin, these methodologies need to be harmonized with adjacent countries, and the catchment approach promoted in this regard"

***Limitations of current methods***

*Philippines*

- Contractual workers employed for data gathering often have insufficient biological knowledge to discern different species.

- The inland fishing survey is mainly based upon respondent perception of changes in catch rates and therefore imprecise.

- Data reported by licensed fishers may be inaccurate because they fear taxation repercussions.

- The data collected as part of the FRMP is comprehensive and would form a great basis for management decision-making. The system is intended to form the basis for development of national data collection in the future, but it is likely to be very expensive, and may not be viable beyond the life of the project. The database is elaborate and requires both a high degree of capacity of local and national staff and appropriate (and expensive) hardware and software.

*Thailand*

- Significant delays exist between data collection and synthesis, analysis and the dissemination and publication;
- Compilation of the data from scattered sources is seen as an obstacle.
- The lack of basic knowledge and standardization of data collecting protocols
- Scientific surveys of fish population in large ecosystems are a problem in Thailand because of the limited budgets equipment and qualified people.
- Lack of socio-economic data/information for fisheries management planning, which it concentrated on mainly biological or technology information.

*Vietnam*
See above

***Required accuracy and precision of data***

*Cambodia*
This has yet to be assessed.

*Philippines*
This has yet to be assessed.

*Thailand*
This was not adequately addressed in the report.

*Vietnam*
This was not adequately addressed in the report.

*Laos*
This was not adequately addressed in the report.

***Potential improvements to existing systems***

*Cambodia*

Now relies upon research data generated by the MRC to replace the official statistics for the inland fishery. This is unlikely to be sustainable. A greater focus on livelihood-related information is likely to be even less sustainable given the cost of these approaches.

*Philippines*
The BAS plans to explore alternative methodologies for surveys, and through the collaboration with fishing boat operators and fishing establishments to ensure that data collected is accurate (Recide, 2003). No firm plans for a change of methodology have been made yet.

*Thailand*
The following suggestions were made:

- Training on statistical data and information handling techniques;
- Strengthening of communication and cooperation for statistics standardization between FAO and SEAFDEC requirements;
- Utilise cost effective methods to obtain data and information to full-fill priority requirements;
- Awareness building among fishers to cooperate in providing data and information;
- Set-up of information gathering networks including a coordination mechanism in designing and compilation of fisheries information.

Since data cannot be collected by individual species as indicated in the minimal statistical system, an alternative way would be to focus on economically important species groups to be substantiated by a species composition study to understand the overall information of production. The data collection methods largely depend on sampling, not on census or complete survey, due to cost and supporting resources implication.

*Vietnam*
Existing systems and resources should be rationalised after first carefully considering and prioritising requirements for effective management.

A minimum 'need-to-know' approach may help ensure that the most important information is collected with a sufficient degree of accuracy and at the lowest possible cost. This alone would be a huge step forward in available fisheries information at a macro-level. Once established, such a system could be expanded to include more detail on species, value, product, operator and other parameters. A third issue concerns enabling national statistical agencies to operate such a system in a sustainable manner on a basin-wide scale in cooperation with other national fisheries and non-fisheries systems and with the international organisations involved. The underlying assumption is that a suitable data sampling system, tailor-made for the administrative area under consideration, can be developed over a reasonably short period and can be expanded to cover the entire Lower Mekong Basin.

*Laos*

Souvannaphanh et al. (2003) make the following recommendations for improvements of fisheries statistics:

<u>National Level</u>
Strengthen national fisheries statistics systems as part of a national decision framework for policymaking, planning and monitoring to achieve sustainable fisheries by:

- Determining the objectives and minimum requirements of fishery statistics data and information with particular reference to national and local requirements;
- Coordinating collection and use of fisheries statistics data between the national fisheries authorities and other authorities including those responsible for trade, vessel registration, freshwater aquaculture and rural development;
- Building capacity at both national and local levels to collect, compile, analyze and disseminate quality statistical data and information in a timely manner as an empirical basis for formulating policies and decisions for fisheries management;
- Prioritizing statistical data and information needs with particular reference to practical indicators for fishery management and the specific requirements of the region's fisheries;
- Applying internationally or regionally standardized methodologies for statistical data to facilitate regional compilation and data exchange where appropriate; and
- Reviewing the national fishery statistics systems to identify areas needing improvement.

Regional Level

- Supporting, upgrading and expanding regional fisheries statistical systems by developing regionally compatible methodologies for national statistical data to facilitate regional fisheries assessment and data exchange; and
- Promoting technical cooperation between national agencies responsible for fisheries statistics to improve national systems, including development of guidelines and handbooks.

***Alternative sources, and data collection tools***

*Philippines*
This was not adequately addressed in the report.

*Thailand*
This was not adequately addressed in the report.

*Vietnam*
Consumption-based surveys are reported to be very resource intensive and can only provide estimates of total catch every 5-10 years.

*Laos*
Traditional knowledge has been used to identify migration routes and essential habitats in the Mekong River that can provide a solid foundation for basin-wide planning and decision-making.

***Attitudes towards participatory data collection systems, required incentives***

*Cambodia*
The CFDO uses a great deal of participatory methods, including PRAs and focus group discussions villagers are reluctant to participate unless they are compensated for lost time/earnings.

*Philippines*

- The Local Government Code advocates for integrated management and participatory processes through the provision for inter-LGU collaboration, partnerships with NGOs and establishment of multi-sectoral development councils.

- Participatory methods are currently not used by the Bureau of Agricultural Statistics (BAS), the agency responsible for national data collection on the fishery (what about HH survey?).

- The ADB funded Fisheries Resource Management Project (FRMP) uses a variety of participatory methods to collect socio-economic data about fishers and costal communities, and have trained local collaborators from the LGUs in these techniques. Methods used include Rapid Resource Appraisal, semi-structured key informant interviews with fishers, resource mapping, community walk-throughs, focus group discussions and workshops.

*Thailand*
This was not adequately addressed in the report.

*Vietnam*
Fishers need not be compensated for logging their own individual catches, but many do not keep good records. Identifying reliable data-collectors seems preferable. However, the opportunity cost of collecting such information needs to be covered if it is to be practicable.

***Use and potential of traditional knowledge***
*Cambodia*
Traditional and local knowledge may provide the cheapest and most feasible way to collect information on the migration patterns of fish species, standard of living of local people, the health of the fishery etc. Traditional knowledge has been used to identify suitable locations for fish sanctuaries.

*Philippines*
Under the FRMP specific activities were planned aiming to increase the awareness about indigenous knowledge, and to include traditional knowledge in fisheries resource management planning.

*Thailand*
This was not adequately addressed in the report.

Vietnam
Local Knowledge has been used to improve understanding of the ecology of Mekong river fish, particularly their migration behaviour.

Although local knowledge on its own cannot provide all the answers about the functioning of a large and complex ecological system such as the Mekong, it can provide a solid foundation for basin-wide planning and decision-making. Furthermore, information obtained through local knowledge can help focus future research, management and monitoring activities.

Future development and resource management in the Mekong River basin will be successful only if local communities are involved in the planning and management process. As part of this process, the knowledge that exists within these communities must be taken into account.

*3.1.5 Data storage and processing methods*

***Existing and proposed including software, hardware, data processing capacity***

*Cambodia*

- Non-co-managed Resources*:* The DoF has a database containing their statistical data, including the number of boats operating. Currently, the data is used mainly for the purposes of collecting fees from the fisheries, and not as a tool for management.

- Co-managed Resources: The CFDO developed an English-language Microsoft Access database (later converted to Excel for ease of operation for staff) for community fisheries status overview. The cost of scaling up the current pilot database to nationwide coverage is $0.5m.

*Philippines*

- The Bureau of Agricultural Statistics (BAS) operates the official national statistical system database.
- The Philippine Fisheries Information System (PhilFIS) is a centralised system to store and process data collected under the FRMP. PhilFIS will be able to generate about 100 reports once fully operational. The system comprises several databases, (listed in the report). The databases are initially intended for BFAR internal use, but an extension of the FRMP intends to base them on the World Wide Web. Details of the databases are provided in Table 10 of the report.
- PhilFIS is designed to incorporate nearshore monitoring, control and surveillance (MCS) as a three-tiered system of data collection (monitoring), legislation (control) and enforcement (surveillance). The MCS investment plan includes the setting up of one national and eight regional MCS co-ordination centres.
- Due to the complexity of the system, it remains to be seen how sustainable the system is following the current handover to BFAR staff.

- The DENR's Municipal Coastal Database (MCD) was created under the Coastal Resource Management Project (CRMP), funded by USAID. The database comprises a number of fields dealing with budgets, resource management plans, the operational status of marine sanctuaries and mangrove reforestation, and training activities. Project activities are currently being implemented in 40 municipalities in three regions, and aims to:
    - o Provide a framework for monitoring and evaluation of coastal resources projects for use by the local government unit and other organisations
    - o Identify current status of, and information gaps within, coastal resources management activities
    - o Facilitate the collection of information by local government units

The MCD was designed to store and collate data and generate reports to facilitate planning, implementation and monitoring and evaluation of coastal resource management plans and programmes. The MCD is managed and used at four levels: municipal / city, provincial, regional and national. Each level has a distinct MCD installation CD, reports, and management and maintenance requirements. Data is transferred between different databases using CDs, floppy disks or USB portable memory devices. The MCD uses Microsoft Access and is designed to run on Pentium 1 PCs (CMMO, 2000).

*Thailand*

- Data are stored on both paper and in electronic format. Combining the information from these two formats is difficult and requires a great deal of manpower.
- Computerised links are required allowing data to be entered directly from provincial and district officers.
- Reports from the database could be shortened and made available more quickly.

*Vietnam*
Not reported

*Laos*
Not reported

Although a book system has been developed in one province to harmonise data collection among district fisheries officers.

Strengths:
- The books are useful for the DLF, the district and the province.
- The books are convenient for summarizing data, writing reports and for planning.
- Data is located in one place and it can be stored for a long time.
- People at the district and provincial level can easily see and understand the data.
- The books can be used to easily compare data from different years. 6. The books are convenient for when people change their positions because responsibility for the data input can easily be transferred to another person.

Weaknesses:
- There has not been a workshop on how to use the Book System for the people who enter data into the books.
- There are no standard input forms for each book.
- There is no appropriate place to store the books in the district off ices.
- The handbook is not detailed enough and it should include standard input forms for each book.
- Some districts want to collect data that is not included in the original 12 books but the current system does not take this into account.

Potential exist to expand this system to other provinces.

***Potential Improvements to existing systems***

*Cambodia*
- The DoF plan a substantial restructuring of the database to meet their management information requirements including the functions to estimate fishing effort. It also recognises the lack of fisheries related socio-economic data collection by government agencies to date, and plans to include this information in management plan formulation in the future. This will require substantial investment.

- Kimchhea et al. (2003) stated that the English-language requirement using the Access version of the database was considered a limitation in its usage, and that alternative software which could accommodate Khmer script could be sourced.

*Vietnam*
Not reported

*3.1.6 Identification of potentially appropriate data sharing and provision mechanisms*

***Channels of communication between and within fisheries institutions***
*Cambodia*
See above.

*Philippines*
This was not adequately addressed in the report

*Thailand*
This was not adequately addressed in the report

*Vietnam*
Not reported

***Opportunities for facilitating sharing or the provision of data***
*Cambodia*

- The CFDO forms part of STREAM, the regional communications and learning initiative of NACA from which it is able to regularly share knowledge about co-management as well as a wide range of issues related to aquatic resource management and poverty alleviation.

- The DoF currently receives information from communities through provincial sources and from national level government staff working on projects run by international projects. The CFDO receive information from the CFDUs and provincial offices.

- In the workshop which formed part of the consultation process for this report, the CFDO expressed a great need for success and failure stories of community fisheries establishment and management, and for guidelines on how to go about the process of facilitating the establishment of community fisheries as well as how to co-ordinate the management of community fisheries on a nation-wide basis.

- Some of the fisheries resources being co-managed within Cambodia include migratory species which cross provincial and national boundaries. In this regard the Fisheries Department has recently signed a Memorandum of Understanding with the Department of Livestock and Fisheries of the Government of Lao PDR especially about sharing knowledge between Lao PDR research institutions especially LARReC in Vientiane and IFReDI in Phnom Penh. In addition the Deputy Fisheries Director will next month join a Ministerial mission to Vietnam to address similar knowledge sharing issues (Nao Thouk pers. comm.)

*Philippines*

- BFAR staff expressed a need for information and guidance on how to formulate fisheries and natural resources management plans, as well as comprehensive guidelines on how, and from whom, to apply for funding from different funding agencies.
- BFAR is also the key collaborative agency for STREAM, through which it receives and shares information pertaining to livelihoods, institutions, policy development and communications and poverty alleviation.

*Thailand*
This was not adequately addressed in the report

*Vietnam*
Not reported

***What information would the DoF be willing to share/provide or is currently sharing or providing?***

*Cambodia*

- The CFDO suggest that the pilot community fisheries database developed by the CFDO with STREAM support should be made available to all stakeholders involved in community fisheries, through a central database system (at village level also?).
- The CFDO envisages that reports generated from the database are shared amongst communities and other stakeholders throughout Cambodia, and that a list of partner organisations involved in community fisheries management are registered in the database, enabling the CFDO to build a contact network.

*Thailand*
The DOF publishes fisheries related data the via www.fisheries.go.th.; reports, handbooks, media, AV aids (e.g. video cassette tapes), posters, Television/Radio Programs, printed publications, technical papers. All information/data are also stored in the DOF library. This material is disseminated to relevant governmental agencies, universities and the private sector.

DOF is interested to receive from lower, i.e. local and regional, the following information:

- Fisheries characteristics and resources condition;
- Types of fishery and fleet and gear characteristics for each fleet;
- Number of fishing units for each fleet, at present;
- Key fishing grounds and their characteristic;
- Impact of fishing gears and practices on the environment and ecosystems;
- Catch, CPUE, catch by fishing gears and seasons;
- Fish population abundance and species;
- Environmental conditions.

*Vietnam*
Not reported

***Existing and proposed information provision to, or exchange among, fisher communities***
*Cambodia*

- The Community Fisheries Self-Review (Degen et al., 2002) established a method for communities to share information about the process of establishing community fisheries with each other.
- District Fisheries Officers are not trusted in rural communities because of the policing role and 'rent-seeking' behaviour undertaken by some officers.
- Information may be shared with communities by trusted, regular and recognisable sources, and be delivered in an interactive manner, but lengthy field visits are expensive.
- A better way to reach communities may be through the establishing of a network for sharing information where communities and other stakeholders interact directly with each other through a series of scheduled meetings (Mee et al., 2003). Mass media such as TV, which is becoming increasingly common in rural areas may also facilitate information sharing.

*Vietnam*
Not reported

***Identification of requirements for sharing or providing information***
*Cambodia*

- Trust among stakeholders is paramount.
- Systems must be developed in consultation with all stakeholders, hence respective roles and responsibilities must be made explicit and understandable to the community.

*Philippines*

- FARMC is the most important vehicle for information sharing in the fisheries sector. It is therefore important to strengthen the FARMCs. This is recognised by BFAR, who have made FARMC strengthening part of their agenda.

*Thailand*

*Format:* The information system development should be established to facilitate the exchange of information and experience on fisheries management and development.

*Standardization*: the initial set-up of system standards and classifications has to take into account not only immediate data collection needs, but also the evolution of data collection system and data needs over time

*Cost*: including surveillance costs; enforcement costs, administration costs, scientific research cost and costs to industry (administration costs).

*Reliability/integrity:* Information has to be accepted both by DOF and all stakeholders, and the methodology used to produce this information has to be understood by all.

*Trust and cooperation among institutions/stakeholders*: Clearly, the strong participation of community/all stakeholders in sharing the information is essential.

*Vietnam*
Not reported

### *3.1.7 Existing or previous activities to develop data collection and sharing systems*

*Cambodia*
See above

*Thailand*
DOF is strengthening human resources to improve knowledge of scientific data collection by cooperation with inter-government organizations like FAO, NACA, SEAFDEC, AIT and MRC. DOF has revised the Fisheries Act to cover fisheries activities that provide or encourage the people/community to involve on reporting the data to the government.

*Vietnam*
Danida is funding a Fisheries Sector Programme Support (SPS) project to develop a fisheries management information system (FMIS) for MOFI.

This description of the project activities and purpose was difficult to understand from the report. The focus appears to be the development of a central MS Access database to store and process data collected from the 33 provinces. There are significant infrastructure and

capacity building components, but little evidence of components dealing with the design of the data collection systems.

*3.1.8 Details of involvement in related research, studies, programmes*

*Cambodia*

- The STREAM Communications Hub in the Community Fisheries Development Office of the Department of Fisheries provides a conduit for information flow between a network of aquatic resource management stakeholders in Cambodia and similar communities and service providers in nine other Asia Pacific countries.
- Counterparts in nine other Asia Pacific countries to share information about technologies, practices, ways of working, research, development, legislation and policy via the STREAM journal and website.
- An Information Access Survey (IAS) was undertaken to identify and recommend means of communication that are appropriate to aquatic resources management stakeholders, focusing in particular on poor rural communities. The Cambodian report is available in pdf format from the STREAM Initiative website.
- Cambodia is currently participating in a programme by SEAFDEC aiming to increase the quality of fishery statistics in Laos, Cambodia and Myanmar.

## 3.2 Summary and Conclusions

The community fisheries in Cambodia are at a very early stage of development, and the exact management responsibilities are still poorly understood by many stakeholders. Because the DoF and the CFDO are still traversing a steep learning curve with respect to the management of community fisheries, the formulation of exact cost-effective data collection and sharing strategies was not feasible at the time of the survey

Overall appears to be a fundamental lack of understanding of the basic management process ie for specific fisheries: identifying objectives, selecting and applying rules and regulations or interventions to meet these objectives, deciding how performance in respect to these objectives should best evaluated (deciding what to monitor), implementing the MP (enforcing, monitoring and evaluation process), enforcing the MP (which will have its own set of info req associated with it) and refining the MP on the basis of the monitoring and evaluation results.

Overall management objectives must be translated into operational management plans for each fishery or subsector as appropriate.

**Defining explicit management plans, particularly in respect to management plan performance evaluation, must therefore be a prerequisite to designing and implementing effective data collection and sharing systems.**

All information requirements must be justified! The manual needs to guide the readers through a process to ***justify*** any requirements and give full details of how the data will be used to make or inform decision-making including details of frequency, format, storage processing, accuracy, precision. Justification must be in terms of relevance to objectives, goals or tasks, cost-effectiveness, coherence/palatability/acceptability/timeliness to users, and required accuracy and precision.

**Annex 1**

# *Guidance Notes for Compiling System Requirements Reports*

***Purpose of Reports***

For a range of geographic areas, environmental regimes, and fisheries types, the content of these reports should provide, at different management levels, a broad picture of the (i) range of data and information requirements that exists, (ii) typically available manpower, resources and institutional capacity, (iii) structure and operations of co-managed fisheries, (iv) existing and potentially appropriate data collection tools, sources and methods, (v) existing data storage and processing methods (if any), (vi) requirements and opportunities for data and information sharing and (vii) lessons and experiences of previous or existing attempts to develop data collection and sharing mechanisms.

This information will be reviewed, discussed and synthesised during the Guidelines Development Workshop as the basis for developing a manual, in the form of an FAO Technical Paper, for designing and implementing data collection and sharing systems to support the co-management of aquatic resources.

**Notes on Stakeholder Involvement**

The information included in the System Requirements Reports should be collected/generated in a participatory workshop with the management institutions that are the focus of the reports. The content should reflect the outcome of careful thought and discussion between the management institutions and the project staff responsible for submitting the report. Focus management institutions should be encouraged to justify wherever possible the system requirements or opportunities they identify, or opinions they express, particularly in the context of their *management roles and responsibilities and available institutional capacity*. For example, does a DoF really need precise total catch and effort data to make recommendations on optimal effort levels to achieve MSY when it doesn't have the capacity or resources to effectively monitor and control fishing effort or if they've devolved responsibility for this to local fishers? Are these models and reference points relevant to climatically dominated ecosystems?

**Preparation**

Before attempting to compile these reports, it is strongly recommended that you invest time in reading the following material:

R7042 – *Information Systems for the Co-Management of Artisanal Fisheries*. (Section 3 & 4 provide very relevant background including co-management arrangements, design considerations, opportunities for sharing information, and identifies generic information requirements to support national level management roles and responsibilities. Chapter 5 which provides useful information on data collection approaches draws heavily from FAO (1999 –see below)). **The report can be downloaded from** http://www.fmsp.org.uk/FTRs.htm

R7834 – *Interdisciplinary Multivariate Analysis for Adaptive Co-Management* (contains useful information on co-management roles and responsibilities, and a range of simple indicators for monitoring and evaluating the performance of local management institutions and initiatives, and for coordinating their activities. **The report can be downloaded from** http://www.fmsp.org.uk/FTRs.htm

FAO (1999) - *Guidelines for the routine collection of capture fishery data*. FAO Fish. Tech. Pap. 382. Provides guidelines for routine collection of data at national level.
FAO (2003) New Approaches for the improvement of inland capture fishery statistics in the Mekong Basin. Contains relevant country reviews, thematic papers and new approaches for collecting fisheries data.

Coates (2002). Inland capture fishery statistics of Southeast Asia: current status and information needs. Contains country relevant reviews, recommendations for improvements, and raises questions regarding data for monitoring sustainable livelihoods.

FAO (2002) Sample-based fishery surveys – a technical handbook. Clearly written sections covering issues such as accuracy, precision, bias, sample size requirements…etc.

These documents will help you and your partners to complete each section of the report by:

- Providing explanations of the relevance of the information,
- Providing a source of relevant information.
- Raising awareness of the issues surrounding data collection and sharing systems.
- Raising awareness of, and helping to identify, potentially appropriate data and information requirements, data collection sources and tools, and information sharing systems in support of different management objectives, decision-making approaches, institutional capacity.

References to these reports particularly R7042 are made in the ToCs of the System Requirements Reports below.

***Process Documentation**
Process notes should accompany each section of the report describing important issues that arose when compiling the information with project partners that would be relevant to include in the final Guidelines. These may including problems encountered by partners attempting to identify/provide the required information and successful approaches that were adopted to resolve them, including useful tips for conceptualising and addressing problems or issues.

**Structure and Content of the Reports**
The design of appropriate data collection systems is dictated by a number of interacting factors summarised in Figure 1 below.

The System Requirements Reports (at least for levels 1 & 2) are structured to provide information on each of these factors for a range of different fisheries, institutional arrangements and management perspectives (levels). This information will be used to identify the range of typically appropriate options as well as important issues for consideration when designing and implementing data collection systems.

Typical information requirements including required accuracy and precision will be identified on the basis of information provided on the management roles and responsibilities of each institution, their objectives, the way decisions are made and control measures applied, taking into consideration available institutional resources and capacity. Appropriate data collection sources and tools to provide this information can then be identified on the basis of information regarding the structure, operations and characteristics of the fishery taking account of the required or affordable accuracy and precision of the data (Figure 1).

The reports also provide information necessary to help identify options and important considerations for developing data sharing and provision systems.

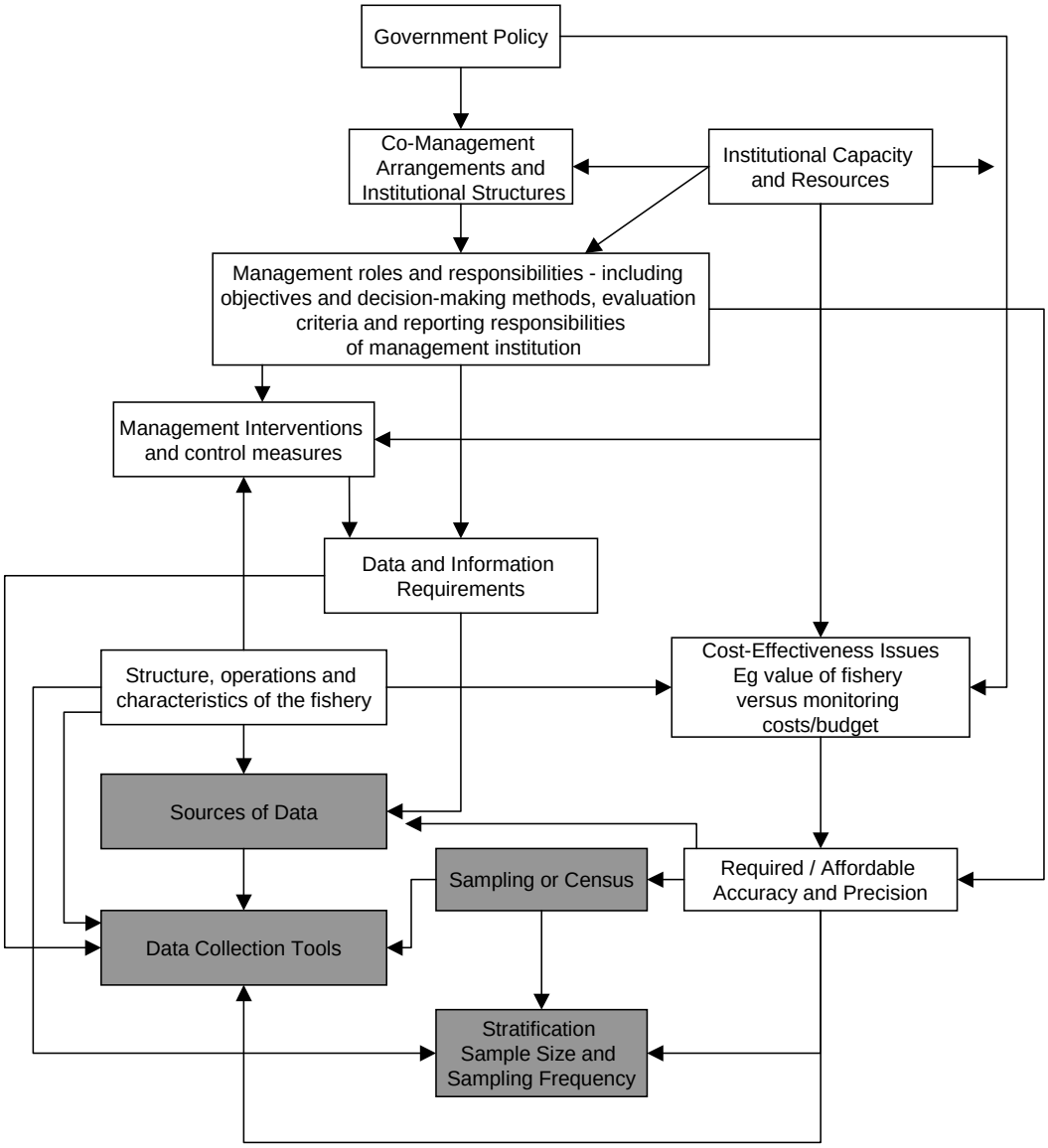


Figure 1 Factors affecting the design of the main elements (shaded grey) of data collection systems.

# *Identification of System Requirements*

## *Report in Preparation for the Guidelines Development Workshop*

## Level 1- Local management Institutions (Fisher Communities)

**Draft Table of Contents**

**Section A- Introduction**

**Background**

1.1. Purpose

[Describe the purpose of the study ie to generate information to develop guidelines for…]

**1.2.** Report Focus

[Eg this study describes existing or potentially appropriate data collection and sharing systems to meet the information requirements of local communities engaged in the co-management of aquatic resources of the XX reservoir in Laos PDR….]

**Section B - Methodologies**

[Eg Stakeholder workshops, PRAs, consultation exercises, location, participants, institutions involved, venues, dates…etc]

**Section C - Results**

2. **The Fisher Communities (the local management institution(s)) and Management Structures**.

[This information will help to understand the roles and responsibilities of the local management institution and thereby its data and information requirements. It will also identify important requirements and potential pathways for information sharing].

- 2.1. Location.
- 2.2. Geographic jurisdiction of management institution.
- 2.3. Numbers of fishers and socio-economic profiles including age and gender profile by main livelihood category.
- 2.4. The importance of fishing to community livelihoods including food security, income..etc.
- 2.5. Other attributes (eg health, education, access to services etc).
- 2.6. Institutional structure and management roles and responsibilities [see Chapter 3 and table 2 in R7042].
- 2.7. Institutional capacity and resources.
- 2.8. Links and relationships with other institutions and stakeholders including DoF, local government, NGOs, regional bodies etc (management structure).
- 2.9. Description of co-management arrangements and activities, if any [see Chapter 3 R7042].

3. **The Fisheries**.

[This information will help build a picture of the structure, operations and characteristics of the fishery which will influence the choice of appropriate sources of data and data collection methods in relation to required/affordable accuracy and precision (see Figure 1 above). It will also help to identify typically important environmental variables for inclusion in monitoring programmes]

- 3.1. Resource and Environment [see section 4.2.1 of R7042].
  - 3.1.1. Stocks/fisheries and area of operation.

3.1.2. Information on the environment.
3.1.3. Environmental influences/threats to the resource (anthropogenic, climatic, other)

3.2. The Fishery [see section 4.2.2 of R7042].
3.2.1. Status and trends
3.2.2. Numbers of fishers.
3.2.3. Gear types.
3.2.4. Seasonality.
3.2.5. Fishing locations.
3.2.6. Landing locations.
3.2.7. Socio-economic categories of fishers.
3.2.8. Socio-economic value of fisheries

3.3. The fishers and other stakeholders [see section 4.2.3. of R7042]

3.4. Management control measures and existing monitoring and control systems implemented by the local management institution [eg effort/access restrictions, closed seasons, areas etc and details of enforcement activities. These will also impact on data requirements – see Figure 1 above and section 3.5 in R7042.]

3.5. Fish disposal (Fish disposal pathway diagram). [This will help identify appropriate data collection sources tools see MAHON, R. and ROSENBERG, A.A. 1988.]

4. **Description of the data and information requirements of the local management institution**. [These along with the information on the structure, operations and characteristics of the fishery, and cost-effectiveness issues will determine appropriate data collection sources and tools – note however that formal data collection systems may not be required by local management institutions see sections 3.5, 4.8 and 4.9.2 of R7042].

4.1. Details of any management plans (activities) including enhancement activities [see section 4.2 of R7042].

4.2. Management objectives [see section 4.3 and 4.9.2 of R7042].

4.3. Decision-making methods for each management objective [informal, formal, status monitoring, adaptive management, book keeping etc and associated data and information requirements – see sections 4.3.2, 4.3.3, 4.8 and 4.9.2 in R7042 [minimum requirements, existing and desirable]]

4.4. Data and information requirements to control and regulate the fishery, if any. See sections 4.4, 4.8 and 4.9 in R7042 [minimum requirements, existing and desirable]

4.5. Any other data needs and constraints.

5. **Description of existing, and identification of potentially appropriate, data collection tools, sources and methods** [Section 5 in R7042 but note that the text relates mainly to data collection approaches from a national DoF, rather than a local management institution, perspective. It may be that formal systems, other than perhaps bookkeeping is inappropriate and fishers may simply rely on informal monitoring see Section 4.8, and 4.9.2 of R7042].

5.1. Existing data collection sources, tools and methods, if any (including strengths and weaknesses) – particularly their relevance to the management undertaken.

5.2. Required accuracy and precision of data to support 4.3.- 4.5 [see FAO 2002]

5.3. Potential improvements to existing system particularly in relation to use and dissemination.

5.4. Attitudes towards participatory data collection systems, required incentives etc.

5.5. Attitudes of communities towards formal data collection methods.

6. **Data storage and processing methods (if any).** [See chapter 7 FAO 1999 but unlikely to be relevant at the local management institution level.].

6.1. Existing and proposed

7. **Identification of potentially appropriate data sharing mechanisms**

7.1. Opportunities and pathways for sharing [consider the institutional links among stakeholders and compare data and information requirements among the main co-

management stakeholders see 2.6-2.9 and 4 & 5 above. Also see Section 3.6.2, 4.1, 4.8, 4.9 of R7042 and chapters 2-4 of R7834].

7.1.1. What ”external data and information” would the local management community be interested to receive or is currently receiving?

7.1.2. What information would the community be willing to share or is currently sharing?

7.2. Identification of requirements for sharing (giving and receiving) for 7. [Consideration should be given to the following:

- Format and required presentation
- Standardisation
- Cost
- Timeliness
- Accuracy and precision
- Reliability/integrity
- Trust and cooperation among institutions/stakeholders
- Presentation and dissemination to foster improved access and value to managers].

8. **Existing or previous activities** to develop data collection and sharing systems. [Include descriptions of any problems, successes, solutions, required modifications, perceived solutions, uptake, cost, sustainability etc].

9. **Details of involvement in related research**, studies, programmes including references.

## *Identification of System Requirements*

## *Report in Preparation for the Guidelines Development Workshop*

## Level 2- National Management Institutions - Fisheries Departments

Draft Table of Contents

Section A- Introduction

**1. Background**

1.1. Purpose

[Describe the purpose of the study ie to generate information to develop guidelines for…]

**1.2.** Report Focus

[Eg this study describes existing or potentially appropriate data collection and sharing systems to meet the information requirements of the Department of Fisheries for Laos PDR….]

**Section B - Methodologies**

[Eg Consultation exercises, location, participants, institutions involved, venues, dates…etc]

**Section C - Results**

2. **Description of DoF and associated stakeholders** (Management institution and structure) [This information will help to understand the roles and responsibilities of the national level management institution (DoF or equivalent) and thereby its data and information requirements. It will also identify important requirements and potential pathways for information sharing].
   - 2.1. National and sectoral policy environment
   - 2.2. Roles and responsibilities [see chapter 3 and 4.1 in R7042].
   - 2.3. Institutional capacity and resources including manpower, finances etc.
   - 2.4. Links and relationships with other departments, organisations and institutions including local community-based or co-management stakeholders/institutions.
   - 2.5. Description of co-management arrangements and activities (if any) [see chapter 3 of R7042].

**3. The Fisheries.**

[This information will help build a picture of the structure, operations and characteristics of the fishery which will influence the choice of appropriate sources of data and data collection methods in relation to required/affordable accuracy and precision (see Figure 1 above). It will also help to identify typically important environmental variables {section 4.3.5, 5.1 of R7042} for inclusion in monitoring programmes. Several fisheries are likely to exist characterised or identified on the basis of stocks, gears, management measures, value etc.].

- 3.1. Resource and Environment [see section 4.2.1 of R7042].
  - 3.1.1. Stocks/fisheries and area of operation.
  - 3.1.2. Information on the environment.
- 3.2. The Fishery [for each main fishery…see Section 4.2.2 of R7042]
  - 3.2.1. Status and trends
  - 3.2.2. Numbers of fishers.
  - 3.2.3. Gear types.

3.2.4. Seasonality.
3.2.5. Fishing locations.
3.2.6. Landing locations.
3.2.7. Socio-economic categories of fisherman.
3.2.8. Socio-economic value of fisheries

3.3. The Fishers and other stakeholders. [see Section 4.2.3 of R7042]

3.4. Management control measures and existing monitoring (data collection) and control (regulatory) systems implemented at the national level for each fishery described above eg gear controls, closed seasons, areas, access restrictions licensing etc and details of enforcement activities including effectiveness, manpower /infrastructure requirements etc. [see section 3.5, 4.4, 4.5.3 of R7042].

3.5. Fish disposal (Fish disposition pathway diagram). ). [This will help identify appropriate data collection sources tools see MAHON, R. and ROSENBERG, A.A. 1988.]

4. **Identification of data and information requirements**. [These requirements along with information on the structure, operations and characteristics of the fishery, and cost-effectiveness issues will determine appropriate data collection sources and tools]. For EACH Main fishery:

4.1. Details of any management plans for each fishery [see Section 4.2 of R7042]

4.2. Management objectives for each fishery or as a whole [see Section 4.3 of R7042].

4.3. Decision-making methods for each management objective [informal, formal, status monitoring, formal models etc and associated data and information requirements – see Sections 4.3.2, 4.3.3, 4.3.6 of R7042] [minimum requirements, existing, and desirable].

4.4. Data and information requirements to control and regulate the fishery. [See Section 4.4 of R7042] [minimum requirements, existing and desirable]

4.5. Data and information requirements for policy and development planning. [see Section 4.5 of R7042]. [minimum requirements, existing and desirable]

4.5.1. Resource and fishery related
4.5.2. Socio-economic information
4.5.3. For MCS

4.6. Data and information requirements for compliance with international management responsibilities [see Section 4.6 of R7042].

4.7. Data and information requirements for international reporting responsibilities [see Section 4.7 of R7042].

4.7.1. FAO Regional Fishery Commission Requirements
4.7.2. CITES
4.7.3. Convention on Biological Diversity

4.8. Data and information requirements to support community-based fisheries [see Section 4.8 in R7042 and chapters 2-3 in R7834]. [minimum requirements, existing and desirable]

4.9. Data and information requirements to coordinate and evaluate community-based fishery management activities.[ see Section 4.9 in R7042 and chapters 2-3 in R7834]. [minimum requirements, existing and desirable]

4.10. Any other data needs and constraints

5. **Description of existing, and identification of potentially appropriate, data collection tools, sources and methods**. [see Section 5 in R7042]

5.1. Existing data collection sources, tools and methods (including strengths and weaknesses)

5.2. Required accuracy and precision of data to support4.3.- 4.10 [see FAO 2002]

5.3. Potential improvements to existing systems [see Coates 2002, FAO 2003].

5.4. Alternative sources, and data collection tools [see Tables 9&10 in R7042 FTR or FAO 1999, and Coates 2002, FAO 2003]

5.5. Attitudes towards participatory data collection systems, required incentives etc.

5.6. Use and potential of traditional knowledge.

6. **Data storage and processing methods.** [see chapter 7 of FAO 1999 and chapter 7 of R7042].
   6.1. Existing and proposed including software, hardware, data processing capacity.
7. **Identification of potentially appropriate data sharing and provision mechanisms.**
   7.1. Channels of communication between and within fisheries institutions and stakeholders at different levels. [consider the institutional links among stakeholders and compare data and information requirements among the main co-management stakeholders see sections 2, 4 & 5 above]
   7.2. Opportunities for facilitating sharing or the provision of data? [see Section 3.6.2, 4.1, 4.8, 4.9 of R7042 and chapters 2-4 of R7834].
      7.2.1. What ”external data and information” would the DoF be interested to receive or is currently receiving eg from local communities, regional bodies etc.? What are the sources?
      7.2.2. What information would the DoF be willing to share/provide or is currently sharing or providing? Eg with local fishers, regional bodies, international programmes eg FIGIS etc.
   7.3. Existing and proposed information provision to, or exchange among, fisher communities.
   7.4. Identification of requirements for sharing or providing information (for 7.2 and 7.3 consideration should be given to the following):
      - Format and required presentation
      - Standardisation
      - Cost
      - Timeliness
      - Accuracy and precision
      - Reliability/integrity
      - Trust and cooperation among institutions/stakeholders

8. **Existing or previous activities to develop data collection and sharing systems**. Include descriptions of any problems, successes, solutions, required modifications, perceived solutions, uptake, cost, sustainability etc.

9. **Details of involvement in related research**, studies, programmes including references.

## *Identification of System Requirements*

## *Report in Preparation for the Guidelines Development Workshop*

## Level 3- Regional Level Management Bodies (SADC, MRC)

Draft Table of Contents

1. **Background**
   1.1. Purpose
   [Describe the purpose of the study ie to generate information to develop guidelines for…]
   1.2. Report focus/subject
2. **Description of Regional Management Body** [This information will help to understand the roles and responsibilities of the regional level management institution and thereby its data and information requirements. It will also identify important requirements and potential pathways for information sharing].
   2.1. Roles and responsibilities
   2.2. Institutional capacity and resources.
   2.3. Links and relationships with other departments, organisations and institutions.
   2.4. Description of co-management arrangements and activities in member countries.
3. **Data and information requirements to meet roles and responsibilities / mandates**. [minimum requirements, existing and desirable] Issues for consideration:
   - Format and required presentation
   - Standardisation
   - Cost
   - Timeliness
   - Accuracy and precision
   - Reliability/integrity
4. **Data and Information Sharing/Provision Systems.** [see section 3.6.1 of R7042]
   4.1. Existing information sharing/provision systems among member countries or subregions. [Including details of the data and information shared or provided (without reciprocation), benefits, problems, shortfalls, opportunities for improvements etc].
   4.2. Potential systems
      4.2.1. Opportunities for sharing/provision of data and information.
      - Common information requirements among members/stakeholders
      - Channels of communication between and within fisheries institutions and stakeholders at different levels – Existing and potential.

   4.3. Identification of system requirements for sharing data and information among stakeholders. [Consideration should be given to the following:
      - Format and required presentation
      - Standardisation
      - Cost
      - Timeliness
      - Accuracy and precision
      - Reliability/integrity
      - Trust and cooperation among institutions/stakeholders]

5. Details of involvement in related research, studies, and programmes including references.

# Identification of System Requirements

## *Report in Preparation for the Guidelines Development Workshop*

## Level 4- International Management Advisory Bodies (FAO)

Draft Table of Contents (for change and elaboration)

1. Description of FAO
   1.1. Roles and responsibilities
   1.2. Institutional capacity and resources.
   1.3. Links and relationships with other departments, organisations and institutions and regional bodies.
2. Data and information requirements to meet roles and responsibilities or mandates.
3. Data and Information Sharing and Exchange Facilitation programmes and activities.
4. Technical advice on sampling strategies and data collection methodology.
   4.1. Resource Requirements

Can we undertake a number of exercises, preferably with real data from each participating DoF, to determine what data collection approaches are likely to be realistic and useful given available (and future?) manpower?

For example, how much manpower would be required to estimate say total inland catches within a country using standard catch assessment survey techniques with sufficient precision to be of value for active management purposes?

For example, what would be the required sample size to detect 5, 10, 15, 20% changes in say monthly CPUE (a proxy of abundance) given different assumptions about population (CPUE) variance? (CPUE data available by gear type, month and habitat exists for Bangladesh from FAP17 study).

   4.2. Review of studies on the relative accuracy, precision, reliability and resource requirements of different data collection strategies/tools (eg CAS – [gear-based or FEU] vs fish consumption surveys).

5. Results and recommendations of relevant studies and programmes eg Udon Workshop.

# *Identification of System Requirements*

## *Report in Preparation for the Guidelines Development Workshop*

### MRAG Reviews

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1. Review of participatory methods for data collection.
2. Review of methods, systems and opportunities for fisheries information provision and exchange (sharing).
3. Review simple indictors for monitoring outcomes and explanatory factors affecting management performance at the local level (including SLs).

Contributions where possible to above reviews drawing upon, R7042, R7834, FAO guides and FMSP livelihood reviews.