MANAGEMENT OF RIVER AND RESERVOIR FISHERIES IN THE MEKONG BASIN

Data Collection and Sharing Mechanisms for Co-management

Report on Systems Requirements for Local Management Institutions ("Level 1") in the Lower Mekong Basin

Vientiane, December 2003

Management of River and Reservoir Fisheries in the Mekong Basin (MRRF)

The aim of this Component of the MRC Fisheries Programme is to contribute to sustainable management and use of aquatic resources by strengthening reservoir fisheries co-management in the Mekong Basin. This will be achieved by developing improved river and reservoir management strategies, joint preparation of river and reservoir fisheries management plans by users and government agencies concerned and their implementation, and the strengthening of management capacity of all participating stakeholders. Major activities comprise the review of national fisheries management strategies, assessment of present and future river and reservoir fisheries potential, special studies on technical and institutional improvements in rive and reservoir fisheries, participatory aquatic resource planning and management implementation, the training of resource users and Government staff in river and reservoir co-management and user community organization.

The Component maintains offices in all four riparian countries. Presently, its head office is at the Living Aquatic Resources Research Center (LARReC), Vientiane, Lao PDR. E-mail: fip@laopdr.com

Title Illustration:

MRRF staff share management information with users of Nam Houm Reservoir, Naxaythong District, Vientiane Municipality, Lao PDR.

Level 2 – System Requirement Report – Information needs of local management institutions in the Lower Mekong Basin (Cambodia, Lao PDR, Thailand and Viet Nam) for the co-management of fisheries

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ACRONYMS

CC	Chhroy Chhek (Cambodia)
CCD	Community Capacities for Development
CCF	Cambodian Capture Fisheries (MRC)
CF	Community Fisheries (Cambodia)
CFDO	Community Fisheries Development Office (Cambodia)
COBY	Constitution and By-laws
CPUE	Catch per Unit of Effort
BCL	Boeung Chun Len (Cambodia)
BT	Buon Tria (Viet Nam)
DAFO	District Agriculture Office/Officer (Lao PDR)
DARD	Department of Agriculture and Rural Development (Viet Nam)
DOF	Department of Fisheries
ES	Ea Soup (Viet Nam)
FIP	Fisheries Programme (MRC)
FL	Fishing Lot (Cambodia)
LARReC	Living Aquatic Resource Research Centre (Lao PDR)
DLF	Department of Livestock and Fisheries (Lao PDR)
HL	Huai Luang (Thailand)
HS	Huei Siet (Lao PDR)
IFRDC	Inland Fisheries Research and Development Center (Thailand)
IFReDI	Inland Fisheries research and Development Institute (Cambodia)
IFG	Illegal Fishing Gear (Cambodia)
JMC	Joint Management Committee
JUGO	Joint User/Government
KH	Krong Buk Ha (Viet Nam)
KL	Kaeng Lawa (Thailand)
LL	Lak Lake (Viet Nam)
LMB	Lower Mekong Basin
MAF	Ministry of Agriculture and Forestry (Lao PDR)
MRAG	Marine Resources Assessment Group
MRC	Mekong River Commission
MRRF	Management of River and Reservoir Fisheries in the Mekong Basin (MRC)
NH	Nam Houm (Lao PDR)
NO	Nam Oon (Thailand)
NS	Nam Souang (Lao PDR)
OBT	Or-Bor-Tor (Thailand)
PAFO	Provincial Agriculture Office/Officer (Lao PDR)
PDR	People's Democratic Republic (Lao PDR)
PB	Pak Beung (Lao PDR)
PRA	Participatory Rural Appraisal

PRASAC	Cambodia
RFMC	Reservoir Fisheries Management Committee (Lao PDR)
RIA	Research Institute of Aquaculture (Viet Nam)
SRR	Systems requirements Report
TC/TD	Tmor Dar/Teuk Chhar (Cambodia)
THB	Thai Baht
VND	Vietnamese Dong
YR	Yang Re (Viet Nam)

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Section A – Introduction

Preface

This report presents the findings from numerous meetings, user self-assessment exercises, consultations with users at different levels and workshops, group and individual interviews conducted by counterparts and collaborators of MRRF in the four riparian countries of the Lower Mekong Basin (LMB), that is, Cambodia, Lao PDR, Thailand and Viet Nam, in the period June – November 2003.

The information was collected by and from staff of fisheries line agencies at various levels, as well as members and representatives of formal and informal user groups and/or organizations and unorganized fishers, both women and men. Main contributors from line agencies, who either prepared a country-specific report, provided other information or participated in or facilitated meetings are listed on the front page of the report. About 250 members of fisher organizations, who expressed their opinions and provided information, are too numerous to be listed individually.

Annex 4 of the report of Project Planning Workshop (Rome, April 2003), prescribes in detail the format of this Systems Requirement Report (SRR). Many of the line agency personnel, who provided the country-specific information, encountered problems with the requested contents of the reports, because it either overlapped considerably or indicated the need for information which was not readily available.

The compilers refrained from filling in information from literature or other secondary resources in order to make up for any gaps. Instead, the material contained in this report means to reflect the breadth and depth of information easily available with fisheries "co-managers", this is, government staff and users, at local level.

People involved in fisheries in all four countries of the LMB consider co-management an innovation. They see management responsibilities and resulting information requirements in a variety of different ways, if at all. Furthermore, at any given time, there may be a host of different management forms under implementation, formally and informally. This includes the established, bureaucratic forms of management by the state, community-based management as well as initiatives towards co-management and user involvement in management functions such as data collection and others, which, project-driven, are often short-lived or geographically limited. Therefore, while this report aims to relate the information practices and needs of both line agency staff and users operating at local level, the compilers acknowledge that this is done mainly with the situation at water bodies targeted by MRRF in mind. Thus, the information provided does not represent the totality of existing views, opinions and practices on and in data collection and sharing mechanisms for local-level fisheries co-management.

1. Background

1.1 Purpose

Major pertinent documents prescribe the purpose of the project "Data collection and sharing mechanisms for (co-) management", and, more specifically, the activity of writing up this report, as follows:

- To provide managers and advisors at all levels, but particularly local fisher communities and institutions, with appropriate cost-effective systems and mechanisms for the collection and sharing of data and information necessary to improve the sustainable co-management of their resources. [From the *RD1*];

- To develop guidelines for such data collection and sharing systems, based on a description, for local, national and regional levels, of (i) management institutions (ii) fisheries, (iii) data and information requirements for managers to meet their respective roles, responsibilities and mandates, (i) details of existing and planned data and information sharing and facilitation programmes, in the MRC's area of operations (that is, the countries of the Lower Mekong Basin) [*Annex 2 of the Letter of Agreement between MRAG and MRC*];
- To write up this information in SRRs, which, subsequently, participants at the Guidelines Development Workshop will review, discuss and synthesize 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.

1.2 Report Focus

It was agreed that the content of the SRRs should provide 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 should be provided for a range of geographic areas in the countries of the LMB, environmental regimes, and fisheries at different management levels. [From *Guidance Notes for Compiling System Requirements Reports*].

Section B – Methodologies

This document reports the information needs for co-management as felt and expressed by people concerned with local management institutions, and who are directly involved in the day-to-day management at the local level of the fisheries in the countries of the LMB. These are usually members of user organizations, which formally or informally collaborate with staff in units of national fisheries line agencies at the local level (sub-districts, districts, communes etc.).

The compilers of this report collected pertinent information

- during workshops and other events with line agency staff presently involved in collaborating with users in practical fisheries management;
- during consultations with members and representatives of users organizations, held specifically for this purpose or as part of regular meetings within the cycle of management planning and implementation.

The schedule (including date, venue and persons met) is shown below.

Table 1: Main events for collection of information for SRRs

Date	Event
Regional	
June 2003	MRC/FIP Annual Meeting, Udon Thani
August 2003	Joint Management Committee (JMC) Meeting, Udon Thani
September 2003	3rd Regional Training Course on Co-management in Inland Fisheries
November 2003	MRC/FIP Technical Symposium, Pakse

Date	Event
January 2003	JMC Meeting, Vientiane
In Cambodia	
September 2003	Village consultations, Kampong Thom
June-October 2003	Management Plan Meetings, Kampong Chhnang
November 2003	Plan Review Meetings, Kampong Thom, Kandal
In Lao PDR	
November 2003	Plan Review Meetings, Naxaythong and Paksan districts
January 2004	National Co-management Planning Meeting, Vientiane
In Thailand	
August 2003	Plan review preparation meeting, Sakhorn Nakhorn
October 2003	Plan reviews, Udon Thani, Khon Kaen, Sakhorn Nakhorn provinces.
In Viet Nam	
November 2003	Plan review meetings at Ea Soup and Lak

Section C - Results

1. Fisher Communities and Management Structures

1.1 Locations

The water bodies targeted by MRRF and their locations are presented in Figure 1 (p. 10). They are:

- In *Cambodia*, Chhruy Chek Reservoir (CC) in Kampong Siem District, Kampong Cham Province, about 7-10 km away from the Mekong River; Teuk Chhar and Tmor Da (TC/TD), two reservoirs adjacent to each other in Prey Cho District, Kampong Cham Province; Boeung Choen Len reservoir (BCL) in Kandal Province, situated between the Tonle Sap and the Mekong, about 20 km north of Phnom Penh; former Fishing Lot (FL) No. 18, in Lovea Em District, in Kandal Province, about 2 km east of the district office; and former FLs Nos. 13-15 in Kompong Chhnang Province.
- In *Lao PDR*, Nam Houm (NH) and Nam Souang (NS), two irrigation reservoirs in Naxaythong District of Vientiane Municipality, about 35 km, respectively 45 km northwest of Vientiane; and Huay Siet (HS) and Pak Beung (PB), two irrigation reservoirs in Paksane District of Bolikhamxay Province, about 140 km east-southeast of Vientiane.
- In *Thailand*, Huai Luang reservoir (HL) in Udonthani Province, covering parts of three districts, i.e. Muang, Nong Wuasor, and Nikhom districts; Nam Oon reservoir (NO) in Sakon Nakhorn Province, covering parts of three districts, i.e. Pang Khon, Waritchaphoom, and Nikhom Nam Oon; and Kaeng Lawa reservoir (KL) in Khon Kaen Province, covering parts of three districts, i.e. Ban Phai, Chonnabot, and Ban Had. Activities at a fourth reservoir, Huai Muk in Mukdaharn Province have since discontinued.
- In *Viet Nam*, Lak lake (LL) and Buon Tria (BT) irrigation reservoir in Lak District; and Lower Ea Soup (ES) irrigation reservoir in Ea Soup District. Activities at Yang Re (YR) and Krong Buk Ha (KH) reservoirs have since been scaled down.

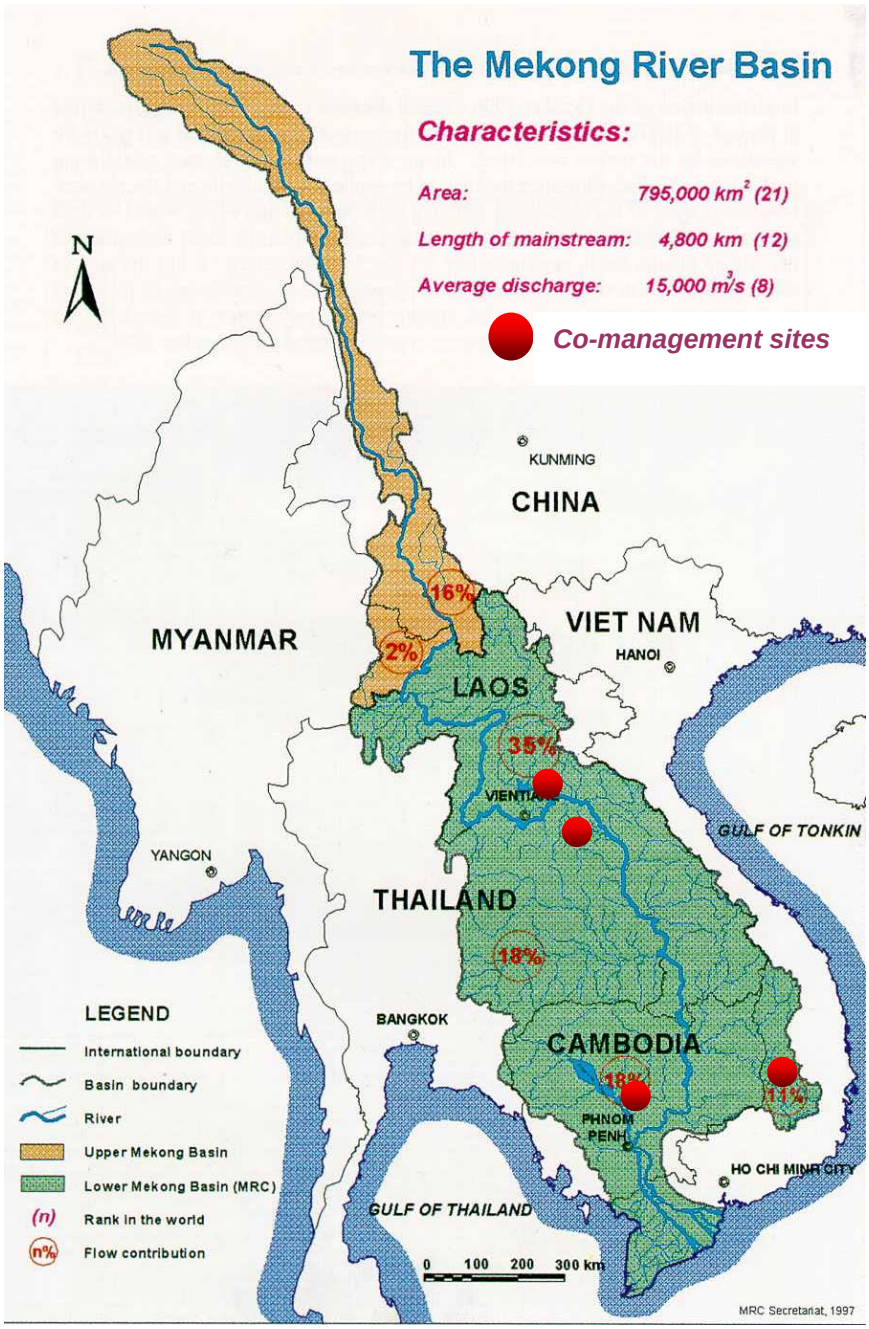
1.2 Geographic jurisdiction of management institutions

In our understanding, *management institution* does not only refer to the *management organization*, but also to such institutions as *rules* and *norms* contained in management plans and fishing rules and sanctions.

In *Cambodia*, on the user side, the management institution is a new user organization called “Community Fishery (CF)”, the formation of which is under way since 2001. The jurisdiction of a Community Fishery is the village. Each CF elaborates a management plan, as well as develops its own fishing rules within the overall framework of the country’s fisheries legislation.

CFs sharing the same water body have, in some instances, formed a CF Federation, such as in Fishing Lots No. 13-15, with a CF Federation in each former lot. In the case of CF’s at water bodies targeted by MRRF, waterbody-wide management plans as well as fishing rules have been developed.

Figure 1: Location of MRRF co-management sites



On the government's side, the management institutions are the provincial and district fisheries offices, which implement activities according to a national sector development plan and fisheries legislation.

In *Lao PDR*, at each of the water bodies targeted by MRRF, the management institution is a newly formed organization called Reservoir Fisheries Management Committee (RFMC), which has been established in 2000, 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.

On the government's side, the management institutions are the provincial and district fisheries offices (DAFO/PAFO). In addition to this, but only in Naxaythong District, there is a District Reservoir Management Committee, comprising of representatives of practically all line ministries; however, this district committee is defunct.

In *Thailand*, the management institution is the Sub-District Administration, or Or-Bor-Tor (OBT). Usually, a reservoir is shared by more than one OBT. A group of fishers 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*, on the user side, the management institution is the Fisher Union, 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.

Box 1: Is there Co-management at Bung Wa Tai, Lao PDR?

Role/Management function	Community	Government
Who makes regulations	X	X
Enforcement/patrolling	X	(X)
Stocking	X?	X
Fish marketing	(X)	-
Capacity-building	-	X
Pond construction/maintenance	X	X
Facility/equipment provision	-	X
Decision-making on pond use	X	(X)

Box 2: Organizations and Institutions for Co-management P&I

Cambodia	"Community Fisheries"; WUA
Lao PDR	Reservoir Fisheries Management Committee
Thailand	Or-Bor-Tor (Sub-district Administration)
Viet Nam	Fisher Union; Management Board; Contractor-Fisher Group
All	"The Plan"; fishing rules & regulations

1.3 Numbers of fishers and socio-economic profiles

Sizes of water bodies, numbers of fishing villages and fishers

Table 2 presents information on numbers of fishing villages, fishers and the size of water bodies targeted by MRRF.

Table 2: 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 2,920	Full-time Part-time
Kaeng Lawa	1,700	3 (13)	458 1,011	Full-time 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

1.3.2 Socio-economic profiles

Almost without exception, reservoir users consider themselves “farmers”, and not fishers. In communities linked to former FLs in *Cambodia* however, people may consider themselves first and foremost as “fishers”. This is in particular the case of ethnic minorities, such as the *Muslim Cham* and sizeable communities of *Vietnamese* origin (about 20%, of the population in some FLs).

Around *Cambodian reservoirs*, households are generally poor. For example, according to wealth ranking done on occasion of PRAs, 10% of families consider themselves rich (enough rice to eat for one year; assets such as motorcycles, TV and

jewelry; etc.), 50% of medium wealth (enough rice to eat for 10 months; bicycle; etc.), and 40% of families as poor (earn living day-to-day; no assets; etc.). At former FLs, the situation of people is better, with 20% considering themselves rich, 70% of medium wealth and only 10% as poor.

1.4 Importance of fishing to community livelihoods

In *Cambodia*, in villages around reservoirs fishing plays a crucial role in maintaining household livelihoods and food security throughout the year, as, different from rice farming which is seasonal, fishing is a year-round activity. The majority of families use the fish they catch for their own consumption. As such, it is the most important source of animal protein for rural families. Only very valuable species they happen to catch are sold at local markets, and are an important source of cash income. Overall however, in terms of total family income, agriculture, and in particular rice farming, is more important than fishing for most households, with fishing providing supplementary income.

Fishing lots (FLs) targeted by MRRF are natural water bodies formerly auctioned off to entrepreneurs, which have been opened up for use by local communities, as a result of Cambodia's fisheries management reform since 2001. Here, people largely consider rice production as their priority and fishing as their secondary source of income. However, since the release of FLs to local communities, fishing has become an important, if not major source of income.

Table 3: Cropping Calendar:

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Rice				x	x	x			x	x	x	x
Other crop					x							
Fishing	x	x	x	x	x	x	x	x	x	x	x	x

Table 4: Seasonality Calendar

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Fishing	xxx	xxx	xxx	x	x	x	x	x	x	x	x	xx
Dry rice cultivation	x	x	x	x								
Bean and corn		x	x	x								
Fish Culture	x	x	x	x	xxx	xxx	x	x	x	x	x	x
Wage work		x	x	x	x							
Cut fire wood									x	x		
Rainy season												
Dry season												

In *Lao PDR*, the importance of fisheries varies substantially between families and across seasons. Most families are involved in both paddy farming and fishing activities. Nutrition wise, fish is very important, as it is consumes by all households surrounding the reservoir. For people involved in cage-culture, the raising of fish may be the largest income provider for the family. This may also be the case for some full time fishermen, especially, in seasons of high catches. In other cases fish is only for

subsistence, or serves as temporary supplementary revenue. *(No absolute figures available).*

In *Thailand*, fishing is important both as a commercial activity as well as for household food security. At HL for example, about 60% of fish caught is sold and 40% retained for family consumption. Fermented fish particularly important as a means to increase family income through work done by women. Most fishing families have more than one activity, and family members work seasonally as agricultural laborers or migrate to Bangkok and the south of Thailand in the same season in search of work.

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. At Buon Tria reservoir, fishing is a secondary source of income for the union members, all of whom are farmers. However, it represents a very important source of both protein and supplemental income. Regarding the value of the fisheries the following can be said: At Lak Lake, the eestimated value of fish yields peaked at over 1 billion VND in 1999/2000, and dropped by about 30% in the following year. The fishery is an important source of protein for the fishing community. In 1996, a MRF study found that fish was the main protein source for the fishing community, making up about 15% of the total diet. Fresh water fish made up 70% of this. At Ea Soup, the estimated value of fish yields peaked at about 570 million VND in 1999/2000, and dropped by about 20% in the following year. Buon Tria: Estimated value of fish yields was over VND 44 million in 2001.

1.5 Other attributes

In *Cambodia*, the rural infrastructure is generally inadequate for meeting the people's needs. This is especially the case with respect to access to safe drinking water. Many people use ponds and open water holes as their main access to water. In the Community Fisheries (CF) villages, there are so far only very few wells available.

School facilities in terms of number of school buildings and classrooms are found to be still insufficient. The villagers did not mention poor school quality and lack of qualified teaching staff but these are general problems in the Cambodian education sector that can also be assumed to be prevailing there.

Poor road conditions are the main reason for difficult access to public health services, which in themselves are insufficient. They also make the purchase of production inputs as well as the sale of the production difficult.

In *Lao PDR*, approximately 30-50% of the population have completed primary school which is 5 years (MRC, 2003). All reservoirs have access to basic medical care and all reservoirs are located close to main roads, and therefore have potential access to main markets. HS and PP reservoir are located relatively far away form Vientiane (the capital), and farmers sometimes speak of lack of services such as the provision of fingerlings for stocking and aquaculture.

In *Thailand*, Every village has primary school. There is public health office in every sub-district.

In *Viet Nam*, Lak: there is a small health care center in each commune and a larger one in the district. Indigenous people are provided health services from the government for free. Normally formal education of the Kinh (mainstream Vietnamese) is higher than the indigenous people. All families have easy access to elementary schools. Many indigenous families are too poor to afford to send their children to high school.

1.6 Institutional structure and management roles and responsibilities

Cambodia

At Chhroy Chhek, MRRF cooperated with PRASAC in integrating fisheries management into a wider water management regime. Subsequently, the Chhroy Chek Water User Association was renamed into Water User and Fisheries Community, which was officially launched in October 2001. At FL 18, CF development has been facilitated by MRRF since 2000.

In FLs 13-15, communities living in and near these lots had begun organizing while the fishing lots were still place, and by the time the lots were cancelled the rudiments of CFs already existed in the areas of ex-lots 13 and 14. There, CF development had been facilitated by Cambodian Capture Fisheries (CCF) component of MRC/FIP, and by an NGO, the Community Capacities for Development (CCD), since 2001. MRRF, which succeeded the earlier CCF, has continued to follow up those earlier activities and facilitate the continued development and strengthening of community fisheries. This has included the facilitation of community fisheries management planning and implementation.

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. The CF objectives, management roles and responsibilities of CF are stated clearly in their constitution and by-laws (see Annex 1 for an example). These roles are:

Lao PDR

The following organisations are involved in reservoir management related activities:

- Reservoir Fisheries Management Committee (RFMC) *(user group);*
- District/Provincial Agriculture and Forestry Office (DAFO/PAFO) (*government)*;
- Irrigation Office (*government);*
- Central Department of Livestock and Fisheries (DLF) *(government);*
- Living Aquatic Resource Research Centre (LARReC) *(government);*
- Fish trader (private business);
- Mekong River Commission (MRC) (*government);*

Formally, reservoirs in Lao PDR belong to the government and are therefore under the management authority and responsibility of the government. In Lao PDR the government is present (organisationally) at all levels from central to village level. According to government regulations the central and provincial authorities are the policy makers and planners, while district and, to a certain extent, village authorities are responsible for management implementation. Under the Management of River and Reservoir Fisheries component, this has changed slightly as decentralised government units and local users (villages) jointly plan, implement and evaluate.

Thailand

Here, stakeholders formulated reservoir management plans; however, each village conducts its activities separately. The sub-district administration, the OBT, plays the role of local institution which decides on the budget for implementing activities, and implements, supported by the respective technical line agency. Every village has

OBT members who can propose activities related to reservoir management, which may be subsequently included in the OBT plan.

Thus, the structure of the co-management arrangement is based on the existing administrative structure. For illustration, leaders, fishers, women group members, OBT members of each village who are involved in the reservoir management propose the management plan to be included in the OBT plan and request for funding to support its implementation, as far as possible. So, plan acceptance and implementation depends on the availability of funds. The Or-Bor Tor, as an institutional representative of local people, is the main interface between local communities and outside supporters such as provincial administrative organization and politicians.

At HL, the Huai Luang Irrigation Project is the reservoir owner, and thus responsible for maintaining water level and for the upkeep and repair of dams and bunds of the reservoir. The irrigation project is implementing a reservoir management plan based on the agricultural sector. It is also responsible for getting rid of weeds and to deepen shallow area (dredging?). The water in HL reservoir is provided for domestic consumption in Udonthani city, too.

Aquatic resources management in the reservoir is under the Udonthani Fishery Office. Among other tasks, these offices conduct stocking of fingerlings and juveniles of a number of fish species and freshwater shrimps. MRRF support activities for building up managers' capacity.

The reservoir management plan set up by villagers under facilitation by MRRF is an inter-sectoral plan, aiming at the solution of a number of problems, connected to such issues as water pollution, fish production, fish prices during the surplus catches, etc.

The institutional and organizational set-ups at the other reservoirs are similar: At Nam Oon, the Irrigation Project is the owner of Nam Oon dam and Nam Oon reservoir area. So, every project that is being implemented in Nam Oon has to be authorized by them. As for the aquatic resources management, this is the responsibility of Sakon Nakhorn Fishery Office and Sakon Nakhorn IFRDC. Villagers' reservoir management plans aim at the solving of such problems as decreasing fish production, maintaining fish prices, ecotourism, and set up conservation zones. At Kaeng Lawa, the Khon Kaen Irrigation Office is the owner of KL area. So, every project that implemented in KL has to ask for permission. However, the water resource utilization is managed by the water supply office, too. As for the aquatic resources management, this is directly managed by the Khon Kaen Fishery Office. Villagers' reservoir management plans aim at solving problems of water pollution, increase fish production, increase water storage capacity of the reservoir, and to set up a reservoir conservation group to implement respective activities.

Viet Nam

At Lak Lake, a fisher union was established by the Daklak People's Committee. Currently, there are 216 members registered in the union. They have a board with 5 fishers representing three communes. Main duties and activities of the Lak fisher union are to manage all fishing activities, to collect tax from non-members and members of the union, to conduct savings and credit activities for members, to communicate with government at different levels, and to organize and participate in the enforcement of fishing regulations. They plan to open a fishing gear shop, too. The Union also assists MRRF in organizing training courses for fishers.

The union was divided into two sub–unions based on commune border and ethnic groups. A board of five fishers represents all members. The union members set up monthly meetings in order to solve any problem and to make plan for the following months. Each sub-union meets first, then the board for the entire union.

At Ea Soup, a fishers' union was established by the Ea Soup farmers' union. Currently, there are 52 members registered in the union. Its mode of operation is similar to that of the Lak union. Main duties and activities of Ea Soup fisher union are the same as at Lak Lake. In addition, the Ea Soup union also stocks stock the reservoir. The union was divided into five sub–groups based on geographic location. A board of seven fishers represents the members.

At Buon Tria a fisher group was established by the Buon Tria Commune People's Committee. Currently, there are 11 members registered to the union. They have a board with 3 fishers. Main duties of Buon Tria fishers' union are to manage all fishing activities, stocking, patrolling, conducting savings and credit activities for members, communicating with government at different levels, and participation in enforcement

1.7 Institutional capacity and resources

In *Cambodia*, the capacity of CFs is generally poor in term of human resources (knowledge in CF management and development) and finical resources. However, some of CFs received supports from a number of external projects/programs. Their capacity has been improving gradually through the provision of formal and informal training and capacity-building.

In *Lao PDR*, the institutional capacity in terms of human resources of RFMCs, and DAFO/PAFO of DLF, is limited. The financial capacities of these organisations are very low.

In *Viet Nam*, most of the finances of the fisher unions come from membership dues and taxes. The Australian Embassy has provided supplementary funding for some activities (stocking; credit and savings inputs, purchase of gear to replace electro fishing, a boat for the Lak Fisher Union, support for enforcement, 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.

At Lak Lake, the fisher union was approved by the farmers' union. It cooperates with the commune in order to prevent destructive gears use in the lake (patrolling activity). It maintains contact with the Vietnam Fisheries Association in order to get membership cards and to collect information when needed. The district and commune provided advice in developing the regulations of the union. The commune helps the union to communicate with higher government levels, especially with regard to receiving help with enforcement and taxation. The union has exchanged information and experiences with other fishers unions, fisher groups, as well as the managers of Ea Kao reservoir.

1.8 Links and relationships with other institutions and stakeholders

In *Cambodia*, CF is based at the village level, where it works closely and links with local authorities (village, commune and district chiefs) through existing units of administrative and technical line agencies on all levels, that is, from village to provincial levels. At the national level, there is a Community Fisheries Development Office (CFDO) at DOF, which is mainly responsible for promoting and facilitating the CF establishment, management and development. The main mission of CFDO is to facilitate the establishment of Community Fisheries throughout Cambodia and support their functioning as management partners with DOF in the strive for efficient, sustainable and equitable use of the living aquatic resources. There are three sections of CFDO: 1) Research and Development section; 2) Legal and Accreditation; and 3) Monitoring and Evaluation section. The CFDO aims to maintain close collaboration with the DOF's Inland Fisheries Research and Development Institute (IFReDI). The collaboration will take the form of joint research projects

involving CFDO staff in data collection, analysis and reporting, requests from CFDO for studies to be undertaken by IFReDI and exchange of information through regular meetings between CFDO and IFReDI staff. The CFDO maintains close collaboration with the DOF Planning and International Cooperation Officer on CFDO strategy development and priority setting. The Planning Office will further be actively involved in the setting up and maintenance of the Community Fisheries monitoring system and the processing and analysis of data and other information.

In *Thailand*, MRRF supports technical activities for building managers' capacity. The irrigation project provides water for agriculture (and fishing). The OBT, as the institutional representative of local people, provides some budget and coordination with support from outsides such as provincial administrative organization and politicians. At Nam Oon, the Sakon Nakhorn Fishing Club organized fishing competition for promoting tourism and offered some of he proceeds to the conservation zone operation at that reservoir. At Kaeng Lawa, schools in 3 target villages participated in environmental awareness campaigns. The local irrigation office participated in clearing weeds and deepening the reservoir which had become shallow.

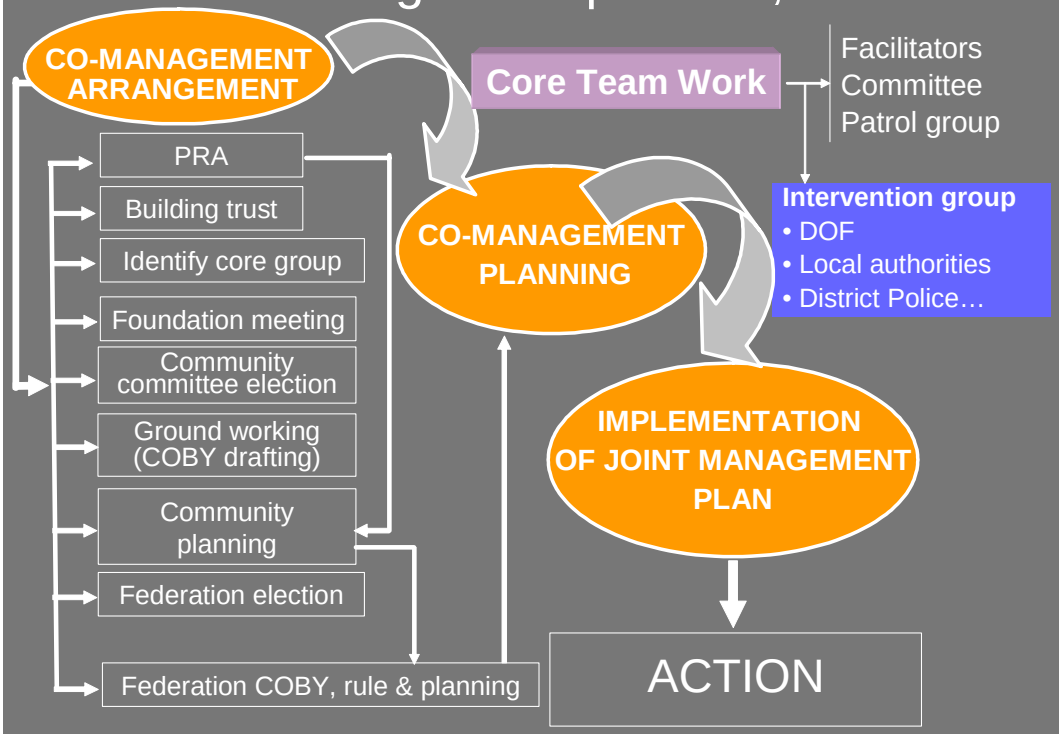
In *Viet Nam*, the very user organizations, fisher unions and groups, depended on the approval of authorities at higher (mainly provincial) administrative levels. The union works closely with local government in order to prevent destructive gears use in the lake (patrolling activity). The Union pays a tax of VND 8 million per year to the District. In case of conflict with other stakeholders, local governments intervene. For example, when the Lak Fisher Union requested the Commune to ban harvesting of aquatic weeds from the lake, the Commune, instead, limited the area in which the weeds could be harvested.

1.9 Description of co-management arrangements and activities

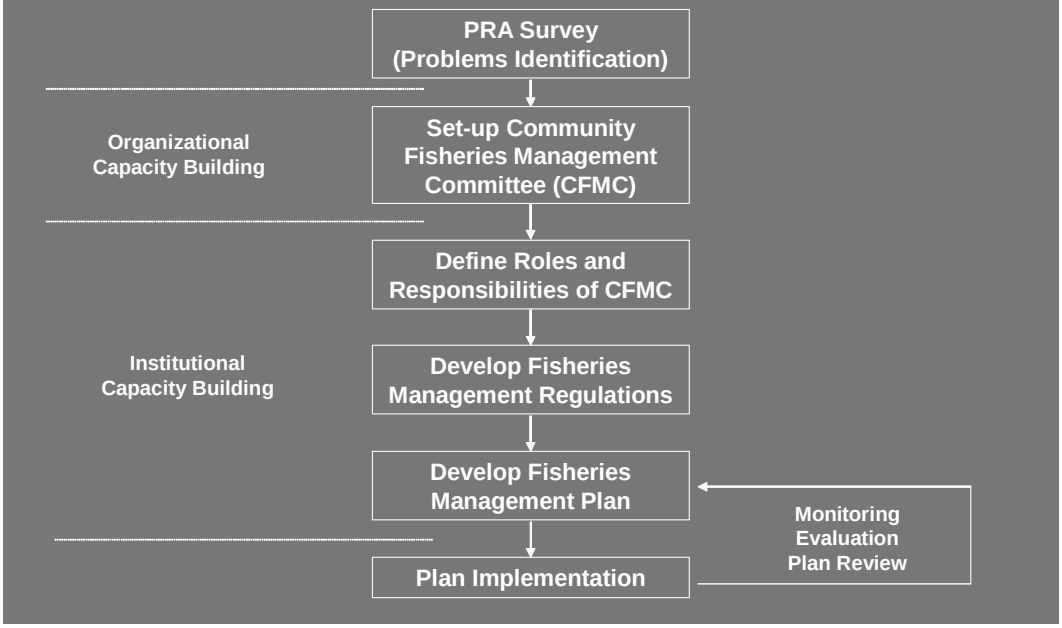
In *Cambodia*, the process to set-up co-management comprises the following steps: 1) Participatory Rural Appraisal (PRA) to identify major problems and objectives of reservoir management; 2) Identification of Core Group of community fisheries managers; 3) Mobilization of resource users and their families; 4) Drafting of CF Constitution and By-laws (COBY); 5) Founding Meeting of CF association; 6) CF Elections; 7) Management planning; 8) Networking and plan implementation; 9) Capacity-building/training.

For the purpose of illustration, we present below Boxes 4 and 5 on the processes of setting-up co-management organizations and their respective institutions (plans, etc.), in Cambodia and Lao PDR.

Box 4: Co-management process, Cambodia



Box 5: Co-management Process, Lao PDR



In *Lao PDR*, co-management of reservoirs occurs between three main stakeholders, that is, the RFMCs, the DAFO/PAFO of DLF and LARReC. The RFMC is primarily made up of village headmen, who are all members of the Lao Peoples' Party'. To say that the RFMC is purely a user group (in the sense that it is non-governmental), may not be entirely correct.

These actors are all involved in the planning, implementation and evaluation of management plan activities.

There are several co-management activities which are carried out, facilitated by MRRF:

- Joint management plan formulation;
- Joint management plan evaluation and adaptation (yearly);
- Joint management plan activity planning. On occasion of Joint User/government Officer (JUGO) workshops.

In *Thailand*, co-management is being implemented based on the reservoir management plans generated by local people. Co-managers usually implement three main areas of activities (out of a portfolio of about five areas), such as conservation zone establishment, fish processing, stocking, aquatic resource conservation (conservation zone establishment, training volunteers, and stocking), maintaining the fish price (fish processing), tourism, and waste water solution.

In *Viet Nam*, activities include patrolling, enforcement, taxation, credit and savings, arranging training courses, and operating a fishing gear shop.

2. The Fisheries

2.1 Resource and Environment

With the majority of the families having no land for cultivation in *Cambodia*, fishing plays a crucial role in people's livelihood. When the fisheries policy reform was initiated, the Royal Government cut 56% of fishing lots for conversion to public fishing to be exploited by CFs in a participatory management approach, that is, community-based aquatic resource management or co-management. When the fisheries management reform was initiated, among the problems faced were such as lack of staff; lack of local community capacity; use of illegal fishing gear. These difficulties are said to have contributed to the declining of catch, both in terms of production as well as size of fish, and creation of environmental problems.

In *Lao PDR*, the four reservoirs targeted by MRRF are all relatively small and shallow, build for the purpose of irrigation (NH: 500 ha; NS 1100 ha; HS: 150 ha PP 300 ha). The maximal depth is about 12 meters at NH and NS reservoir.

In *Thailand*, the size of NO reservoir is 53,800 rai. It has a water holding capacity for 520 million m^3.

In *Viet Nam*, Lak Lake covers about 658 ha; production is mainly based natural fish species (over 100 tons/year). Formerly, the lake had an extensive cover of aquatic plants, but many of these have been harvested for pig feed. The surface area of Lower Ea Soup Reservoir covers about 240 ha; production is mainly based on natural fish species (over 100 tons/year). Stocking began in 2001, and stocked species now make up an important proportion of the yield from the reservoir. The reservoir has an extensive cover of aquatic plants around the edge. Its extent varies seasonally. The surface area of Buon Tria reservoir is about 141 ha; production is mainly based natural fish species (over 6 tons/year). Stocking began in 2001, but no data are available on its effect on yields.

Stocks/fisheries and area of operation

In *Cambodia*, fish species caught in reservoirs and FLs comprise the following:

Table 5: Common Fish Species in Reservoirs, Cambodia

Local Name	Scientific Name	Local Name	Scientific Name
Trey riel	Henicorhynchus siamensis	Trey Phtuok	Chnnidae striata
Trey Khnawng Veng	Dang la lineata	Trey Damrey	Oxeyeleotris marmorata
Trey Kros	Osteochilus Hassetti	Trey Pra	Pangasius dyambal
Trey Kranh	Anabantes, Tudineus	Trey Chhdaur	Channidae micropettes
Trey andaing	Clarias	Trey Kanchos	Mystus rhegma
Trey Slat	Notopterus notopterus	Trey Chhlang	Leiocassis stenomus
Trey Chhpin	Hypsibarbus lagleri	Trey Khmann	Hampala dispat
Trey Damrey	Oxeyeleotris marmorata	Trey Kanchanh chras	Pseuda mbassis notatus
Trey Raws	Channidae melasoma	Trey Kan trawb	Pristolepis Fasciata
Trey Kanchos	Mystus rhegma	Antong	Monopterus albus
Trey Chhlong	Macrognathus siamensis	Trey slak russey	Paralaubuca barroni
Trey Linh	Thynnichthys thynnoides	Trey prorlung	Leptobarba hoeveni
Trey Raws	Channidae melasoma		

In accordance with the CF management plan, fish stocking has been taken place in Tmodar and Boeung Chum Len reservoirs in late 2002 with local/indigenous fish species, such as Silver and Tinfoil Barb and River Catfish.

In *Lao PDR*, the following are statements about the reservoir fisheries as expressed by fishers:

Table 6: Fisher opinions on situation of fisheries, Lao PDR

Question	Nam Houm Reservoir	Nam Souang Reservoir
Have fisheries improved or gotten worse?	"Fisheries have gone done a lot". "5-6 years ago people could catch more than double of today". "However, the taste of the fish was not very good, because of the water hyacinths". "There are fewer fish today but the quality is better".	"Two years after the dam was build, the fisheries were good (up to ten kilo per net) "Today ten fishing nets catch only 4-5 kilos of fish". "In different seasons we catch different species. Most of the species are going down".
What species have increased or decreased?	"Before we used to catch many Big-head". "Today we catch a lot of Pa-tong and Pa-nin. There is more Tilapia because they escape from ponds/cages".	"All of the species are going down". "Most of the fish caught are native (not many Tilapia because of little stocking)".
Why has there been a change in fisheries	"In the rainy season there is too much water in the reservoir. Fish escape when it overflows". "People use small mesh-size gillnets". "No water hyacinths where fish can hide". "Too many fishers at the reservoir. People come from outside to fish".	"Increased no. of fishers, both from outside and inside the villages". "Fishers use destructive fishing methods and gear" (this is done by both villager and outsiders, although some said that outsiders are worse). "People who used to work with timber are now fishing".

Question	Nam Houm Reservoir	Nam Souang Reservoir
Question	**Huay Siet Reservoir**	**Nam Souang Reservoir**
Have fisheries improved or gotten worse?	"A few years after finishing Dam construction there were many fishes in reservoir". "At some time the dam was damaged and fish escaped".	"There are many fishes in the reservoir if we compare with the days before the dam construction." "After dam construction some species disappeared from the reservoir."
What species have increased or decreased?	"Increasing species are: Pa Dtong (notopterus notopterus), Pa Gah (Pristolepis fasciata), Pa Khor (Channa striata)". "Decreasing species are exotic species, which do not well grow".	"Increasing species are: Pa I Tai (osteochilus hesseltii), Pa Sayeng (mystus singaringan)." "Decreasing species are: Pa Dto (Channa micropeltes), Common carp, Pa Phia (morulius chrysophekadion), Pa Khaao (wallago attu)."
Why has there been a change in fisheries	"After dam was built there are many places where fish can hide, when they get trouble from fishing activity. Also in the conservation zones. Good for the fish!" "When dam was damaged many fishes from the reservoir escaped."	"Fish got disease." "Fish from Mekong river cannot come to the reservoir." "Fishermen fish in spawning season." "Too many fishermen." "Destructive fishing methods and gears".

In *Thailand*, at HL, the main fish species is Nile Tilapia (stocked by the Udon Thani IFRDC) and Carps, which reproduce in the reservoir. Total catch in 2001 was 780 t. At NO, stocking was done near the dam and in deep areas, Ban Dong Khampoo, for example. Most of fishers fish in the middle of reservoir and in front of their village. At KL, this year (2003) 1 million fingerlings were stocked by the Khon Kaen IFRDC on the occasion of establishing the conservation zones.

In *Viet Nam*, Lak Lake is unstocked. Its production is mainly based on indigenous species. Shrimp are the most important single species, by weight and value. At Ea Soup, fish production is based on both indigenous and stocked species. And finally, in Buon Tria reservoir, indigenous species were the main source of fish until 2002, when stocking was initiated. Fishers are quite satisfied with the results of stocking.

2.1.2 Information on the environment

In *Cambodia*, the CC reservoir was rehabilitated by the EU-funded PRASAC programme, resulting in an irrigable area of almost 1,200 ha, in 1998. The length of the dam is 2 km. The maximum depth reaches 3 meters, and the minimum is 2 meters. At BCL, the reservoir covers about 300 ha. The maximum depth ranges from 3.5 meter at high water to 2 meter at low water levels. The reservoir is located just 7-10 km away from the Mekong River, which floods it once a year, from June to September. Teuk Chhar and Tmor Da are two reservoirs adjacent to each other in Prey Cho District, Kampong Cham Province, close to the provincial boundary with Kampong Thom. Teuk Char is the upper of the two, flowing into Tmor Da. In fact, the two are just separated by a road which functions also as a dam. Boeung Choen Len reservoir in Kandal Province is situated between the Tonle Sap and the Mekong, about 20 km north of Phnom Penh. It is one of three lakes that form the Tasen lake structure in Mukh Kampul District. It is the only one of these lakes whose boundaries have been outlined as a reservoir, with inlet and outlet structures. It lies between the other two whose elevations are more or less the same. Apart from fishing in the lake, they occasionally also catch fish in the nearby Mekong River.

In *Lao PDR*, all four reservoirs are located in rural areas away from major cities. According to villagers the reservoirs are not affected by pollution. There are no 'scientific' data available to verify this.

In *Thailand*, at NO, there is a national forest and fisheries area. Large parts of the reservoir dry up in several years. At KL, pollution of reservoir water from surrounding settlements, industries and in particular pig farms has been a problem common for fishers, farmers and domestic water consumers.

In *Viet Nam*, reports from studies carried out in Phase I of MRRF are available. Many parameters (including temperature, oxygen, and pH) in reservoirs fluctuate widely.

2.1.3 Environmental influences/threats to the resource

In *Cambodia*, the main problem seen in fisheries on the local level is that the fish production in general is low. Users also mentioned to have observed a decrease in the number of fish species caught (decrease of aquatic biodiversity). The villagers also noted that the size of the fish in their catches is decreasing. They blame this as a main cause for the declining production. It became apparent that people do not comply with fishing regulations. Therefore, illegal fishing gears are still widely used in all the areas. Last but not least, a lack of fisheries-specific regulations for reservoirs and reservoir management is deplored. As a consequence of fisheries decline, many families increasingly encroach on other natural resources and utilize them in an unsustainable way, e.g. clearing of flooded forests and wetlands, leading to great damages to the environment and loss of natural resources in general. Since CF development and management has been initiated, above mentioned problems are said to be decreasing gradually. Now most people are willing to stop illegal fishing activities because they understand the important role fisheries resources play in their daily livelihoods. In FL 18 a catches have decreased in comparison to previous years. This was attributed to the use of illegal fishing gears and the fishing lot increasingly getting shallow.

In *Lao PDR*, in some years, when rainfall during monsoon has been low, people report of low water levels in the reservoir during the following dry season. This is said to often lead to disease of fish in the reservoir. NH and NS reservoirs are located in the plains surrounding Vientiane, which are exposed to increased population pressure. In NH there are widespread activities of cage-culture of exotic species.

In *Thailand*, at HL there is an important stream that affects fish production in the reservoir. The water level in this stream is being controlled by the HL irrigation project for irrigation purposes, which negatively impacts on fish catches. Similarly, NO was created mainly for providing water for irrigated agriculture, the water level being controlled by NO Irrigation Project, which negatively effects fishing every year. However, there are 2 important streams flowing into the reservoir, which further receives additional water from rainfall. There are 3 spawning grounds in front of 5 villages in the reservoir. At KL, fish production and water quality depend on the yearly flooding of the Chee River.

In *Viet Nam*, at Lak lake siltation is serious; and the lake is becoming shallower. Electro-fishing and seining have been reduced, but fence and lift nets may be having serious effects on the stocks. There has been at least one case of poisoning at Ea Soup. Oxygen levels are sometimes low. Electro-fishing has been reduced significantly. The effects of Upper Ea Soup Dam, which closed in March 2003, are so far uncertain. The effects of stocking on wild stocks are high. Fish grow very fast. Upper Ea Soup reservoir was stocked this year, and harvests have begun. The yields from this large, new reservoir have greatly depressed the prices of stocked fish, especially Silver and Bighead Carp from Lower Ea Soup, presenting the fishers and the fisher union with a new problem.

2.2 The Fishery

2.2.1 Status and trends

In *Lao PDR*, all four reservoirs are shallow tropical reservoirs and therefore have a relatively large production of fish. Following are estimated total catches from the reservoirs.

Table 7: Estimated Reservoir Fish Catches, Lao PDR

Waterbody	Fishers	Catch/Day	Days/Month	Catch	
				Month	Year
Nam Houm	82	2.25	11.85	2,186	26,232
Nam Souang	88	1.875	10.55	1,740	20,880
Pak Peung	91	3.62	12.82	4,223	50,676
Huai Siet	40	3.275	8.95	1,172	14,064
Total					111,852

With an average price of 7,000 Kip per kg of fish, the total value of fish catches at four reservoirs is 782,964,000 Kip, or about 78,000 US $.

The figures mentioned above are most likely underestimated as they are based on catch reports by registered fulltime fishermen, and do not include catches by subsistence fishers, which may account for an equally large amount of fish.

In *Thailand*, at NO, in comparison to earlier years, CPUE and total catches declined in year 2002. Weeds also increased in the reservoir. Markets for reservoir fish are limited because this reservoir is close to Song Khram River and river species are favored. Some fishers migrated to fish in other reservoirs such as Pasak Chonlasit reservoir in Lopburi province. Contrarily to this, due to heavy flooding in 2002, total catches have increased in KL (200 tons more than 2001).

In *Viet Nam*, yields at Lak Lake appeared to peak in 1999/2000. Ever since, catches of some high value species have declined rapidly. Fishers say that catches have dropped further for most species in 2003. At Ea Soup, reported yields peaked in 1999/2000, but because of gaps in data collection it is difficult to compare yields since mid-2001 with earlier reports. In any case, fishers report that catches of high value species have dropped in comparison to earlier years. The fishery at Buon Tria reservoir has not been intensive. Total yield for 2001 was estimated at a little over 6 t, or about 40 kg/ha.

Gear types

In *Cambodia*, the following fishing gear is used in reservoirs and fishing lots:

Table 8: Common Fishing Gears in Reservoirs, Cambodia

Local Name	English Name
Morng	Gill-net
Santuch Ronorng	Hooked long line
Santuch Bangkey	Cast single hooked
Sam Nagn	Cast-net
Uorn Hum	Seine-net

Local Name	English Name
Lop	Small cylindrical drum trap
Tru	Oblong trap
Chhneang Day	Handled scooping basket
	Cages

At present, most of the people use modern gears, such as gill-nets, which is different from 10 years ago when major gears were traps and scooping baskets, hook and line and large-mesh cast net.

In *Lao PDR*, The following gear types are use at all reservoirs: 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).

In *Thailand*, at HL gill-net is the main gear type (57%), followed by lift net (13.70%), and traps (6%). At NO, there are 15 gear types used in the reservoir, which gill-net is the most important (74.5%). At KL, there are 9 gear types used in the reservoir; again, the gill-net is the most important (60.71%).

In *Viet Nam*, at Lak: fishers use gill-nets, traps, lift nets, long lines, rod and lines, cast nets, fence nets; at Ea Soup, gill nets, , lift nets, long lines, rod and lines, fence net; and at Buon Tria gill-nets, long lines, rod and lines.

2.2.4 Seasonality

Fishing in the LMB is an occupation carried throughout the year. Peak seasons seem to be December-May (in Cambodian reservoirs); June-July in Lao PDR; and January-July in Thailand and Viet Nam.

2.2.5 Fishing locations

People usually fish in a number of water bodies, such as the Mekong River, rice fields, natural lakes and streams, as well as reservoirs. Reservoirs are fished everywhere, except conservation zones established seasonally or permanently by communities for management or religious purposes (e.g. in Thailand), or no-go areas near dam walls and spillways for purposes of protecting the infrastructure.

2.2.6 Landing locations

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.

2.2.7 Socio-economic categories of fishers

In *Cambodia*, fishing in and around reservoir is characterized by family fish catching activities that are usually a part-time occupation and secondary source of family income. Both men and women are involved in fishing and rice farming, with women adding fish selling to their roles and responsibilities. With regard to habitats exploited, fishing by women is mainly done in rice fields, while men fish all aquatic habitats. These fisheries also pertain to the category of “family fishing”.

Similarly, in *Lao PDR*, both men and women are involved in fisheries with women primarily involved in fish marketing and fish processing and men primarily involved in capture fisheries and aquaculture.

In *Thailand*, at HL, there are almost 3,000 fishing households, whose fishing intensity however fluctuates during the year. Average number of fishing days is about 4 days/week. The income from fishery is in the range of THB 170.00. Average age of fishers is 39 years. Women are involved in fishing activities in everyday harvest for family consumption. Many full time fishers are landless, especially those in Ban Nong Ornoy and Ban Nampon. Most of the villages have problems with land ownership, because both the reservoir water bodies proper as well as the surrounding lands belong to the Royal Irrigation Department. At NO, there are 1,200 households of fulltime fishers and almost 3,000 households of part time fishers. At KL, there are a total of 3,100 households, out of which about 500 are full time fishers and about 1,000 part time fishers. Main activities are cultivation of rice, sugarcane, cassava, agricultural labor, rising of cattle, fishing, carpentry, silk weaving, etc. Women are rarely involved in the fishery.

In *Viet Nam*, at Lak lake 216 fishers belong to the Lak fisher union. Fishers are both Kinh and indigenous (mainly M'nong). Main activities of members are: fishing; some fishers do agriculture and aquaculture; about 95% of the fishers are male; but many women are involved in fish sales; about 30% of the fishers are under 30, and most of the rest are between 30 and 60. At Ea Soup, 52 fishers are in Ea Soup fisher union. Most fishers are immigrants, although a few indigenous Jarai and Ede participate. Main activities are: fishing; some fishers do agriculture and aquaculture; about 70% of the fishers are male; about 60% of the fishers are under 30. At Buon Tria reservoir, 11 fishers belong to the Buon Tria fisher group. Main activities: farming. Most of full time fishers are poor because they are landless or small landowners who migrated from other areas after they had been allotted land.

2.3 Fishers and other stakeholders

In *Thailand*, at HL, there is some conflict between fishers and cassava starch factory since the factory drains waste water into the reservoir. There are some conflicts between fishers who are "insiders" and "outsiders" (the latter characterized by using illegal gear and violating conservation zone regulations). At NO, there are several conflicts between the irrigation project and fishers since the Nam Oon dam was created without public hearing (36 years ago). As a result, there is still a problem about allotment of land as compensation. Fishers violate rules especially during the spawning season, so that the patrolling unit and many fishers have not a good relationship. Some fishers don't respect the rules of the conservation zone that was demarcated in front of Ban Dong Khampo and Ban Kud Takab. At KL, the relationship between fishers and other stakeholders is not bad. However there is some competition for use of irrigation water between owners of rice fields in different locations.

In *Viet Nam*, at all sites other crucial stakeholders include commune and district and provincial governments (at a formal level). These stakeholders are represented through local government.

2.4 Management control and existing monitoring systems

In *Cambodia*, by now many CFs have their rules/regulations, which were set up by the CF members and how to implement these rules/regulation makes up part of the CF management plan. Activities contained in the CF management plan are regularly monitored and followed up by component counterparts. There is a regular monthly meeting by CF committee members. The purpose of the CF monthly meeting is to report on the implementation of CF activities done according to the CF management plan, discuss problems encountered facing and subsequently solving them.

In *Lao PDR*, in principle there is open access to reservoir fisheries by all members of the public. However, in practice, some reservoir areas have been privatized by operators of fish cages and fish pens. These cage and pen operators are private entrepreneurs and the military. Fishing is prohibited in conservation zones which have been established at reservoirs either permanently or seasonally. The 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. At NH and HS reservoir it is considered illegal to do actively drive fish into gill-nets (this is not yet formulated in the fishing regulations).

In *Thailand*, HL reservoir is under an enforcement of Ubolratana Patrolling Unit and Udonthani Fishery Office. At NO, there is a closed season from 16 May–15 September. In the closed season only small gear is allowed. There are other gear regulations which are being enforced. Conservation zones have been established at Ban Dong Khampo and Ban Kud Takab. At KL, although there is a patrolling unit in Khon Kaen, there are no enforcement activities in this reservoir.

In *Viet Nam*, after establishing unions and fisher groups at the Daklak reservoirs, many meetings were held among members to discuss how to manage the fishing activities. Finally the union set up fishing regulations. The regulations focused on fishing area, access restriction, gear use (kind of gear, size of gear). Electro-fishing and seining are banned, and have been largely eliminated by now. Gill-nets and lift-nets operate in different parts of the lake. No fishers from outside communes are allowed to fish, with the exception of Buon Tria, where fishers from outside communes are allowed to fish. At Ea Soup, the he Fishers' union also stocks the reservoir, and funds it through taxes collected from fishers and other sources of money.

2.5 Fish disposal/marketing

In *Lao PDR*, fish marketing is monopolised at the reservoirs. Yearly, the provincial authorities auction off the rights to trade fish from the reservoirs. A one-time yearly fee is paid for this right. Connected to this system at some reservoirs, e.g. NH and NS, a regulation exists that limits fish that can be kept for family consumption to 2 kg/day, while the rest has to be sold to the fish trader.

In *Thailand*, main fish markets at HL are in Nong Wuasor and Muang districts. An important product here is fermented fish, which is highly sough after. At NO, fish markets cater mainly for family consumption around the reservoir. Traders from Pangkon district and Waritchaphum come to buy fish from the landing sites. At KL, main markets are in Ban Phai and Chonnabot districts, which both are in Khon Kaen province. Fishers informed that, as the fish in KL is mainly from the Chee River, the price is higher than for fish from nearby fish farms.

In *Viet Nam*, at Lak 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.

3. Identification of data and information requirements

3.1 Details of management plans and activities

At most water bodies fisheries management plans are being setup, negotiated and adapted on a yearly basis, in a number of meetings with aquatic resource users and local government staff (except in *Viet Nam*). Initially, that is, prior to the first round of management planning, major management problems were identified in a

Participatory Rural Appraisal (PRA [see Box X]). Based on problems perceived, management concerns and objectives are formulated, and activities identified, the implementation of which is expected to contribute to the improvement of said concerns (see Table 9). See Boxes 6-9 for a summary of four management plans.

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

- 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. Long-term goals can be set, but whether or not they can be reached and how they can be reached depends on various things, many of which are not predictable. For this reason, fishers' groups do not commit to activities until they are sure they can complete them. The emphasis in planning, then, is on flexibility and responsiveness.

The management plans from 18 water bodies in the LMB are summarized in Boxes X-X. In Annex 1 and 2 detailed management plans from Cambodia and Lao PDR are presented.

3.2 Management objectives

The formulation of problems and objectives were originally based on PRAs, which were carried out at all reservoirs (either village- or reservoir specific) in 2001 (see Box X for an example from Cambodia). Table 4 summarizes management concerns (problems), management objectives to solve problems faced, and activities that would contribute to reaching objectives, as they resulted from PRAs carried out in the four countries.

Box 6: Management Plans, Cambodia

Issues	BCL	TC/TD	CC	L18
Setting up/strengthen user organization	V	V	V	V
Manage conflicts	V	V	V	-
Establish conservation zones	V	V	-	-
Develop alternative sources of income	V	V	-	-
Provide fisheries infrastructure	V	V	-	-
Enhance fish habitats and stocks	-	V	V	-

Box 7: Management Plans, Lao PDR

Issues	NH	NS	HS	PB
Organize reservoir fisheries management committee	V	V	V	V
Monitor plan implementation and fisheries	V	V	V	V
Review/adapt fishing regulations	V	V	V	V
Establish conservation zones	V	V	V	V
Support Cage culture	V	V	V	V
Stocking	V	V	V	V
Organize fisher groups	V	V	-	-

Box 8: Management Plans, Thailand

Issues	HL	NO	KL	HM
Monitor fisheries	V	V	V	V
Create conservation zones	V	V	V	V
Support fish processing	V	V	-	-
Support fish marketing	V	V	-	-
Stocking	V	-	-	V

Box 9: Management Plans, Viet Nam

Issues	LL	ES	BT	NN	YR	KH
Organize fisher groups/union	V	V	V	V	V	V
Strengthen credit/savings mechanisms	V	V	-	V	V	V
Modify tax system	-	-	-	-	V	-
Stocking	-	V	V	V	V	V
Diversify livelihoods	V	V	V	V	V	-
Enforce regulations/patrolling	V	V	-	-	-	-
Data collection on fisheries	V	V	V	V	V	V

In general, management objectives mentioned are:

- to manage, conserve, protect and develop fisheries resources in a sustainable way; assure sustained yields from the fishery of residents;
- to 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;
- to enhance the capacity of reservoir managers to establish and implement their reservoir management plan;
- to assure sustained or increased income for fishers members;
- to encourage mutual support and welfare;
- to improve communication and collaboration with local officials;
- to gain support for co-management from policy makers, and to find out more about the co-management model.

In Cambodia, at some of the CFs (e.g. CC), the existing water user group was joined by a CF. Therefore, it has the additional objective of overall water management in the command area, including for agricultural purposes.

Box 7: Results of PRA (Cambodia)

Problems	Emphasis/Activities
Lack of cooperation/ coordination (among community members)	Organizational development • Leadership training • Committee strengthening • Training in CF concepts
Illegal fishing	Institutional development • By-laws, rules and regulations, • Establishing partnerships with authorities • Strengthening channels of communication
Increase in fishing effort	Technical/institutional development • Training in management skills • Livelihoods development • Limiting number of gear/household

Table 9: Management Concerns, Objectives and Activities

Country	Management Concerns	Management Objectives	Management Activities
Cambodia	Effort increase Illegal fishing Habitat destruction Inefficient management	Income diversification Combat illegal fishing Habitat protection Efficient management	Training Organizing management Revise/enforce rules Credit provision
Lao PDR	Low/decreased yields Illegal fishing Habitat destruction Lack of management Fish disease	Income diversification Combat illegal fishing Habitat protection Efficient management	Training Organizing management Revise/enforce rules Improve marketing Fund raising
Thailand	Low/decreased yields Habitat destruction Inefficient management Fish disease	Income diversification Habitat protection Efficient management	Training Organizing management Revise/enforce rules Improve marketing
Vietnam	Low/decreased yields Inefficient management	Income diversification Efficient management	Training Organizing management Credit provision

3.3. Decision-making methods for each management objective

At most sites (all except *Vietnam*), management plans are formulated on a yearly basis, implemented according to plan, and monitored, reviewed and adapted at the end of the planning-implementation cycle.

In *Cambodia*, decision-making regarding each management objective is informal/ formal, and based on status monitoring, adaptive management, book keeping etc and associated minimum data and information requirements, existing and desirable (see Annex 8). Decisions are taken through focus group discussion/consultations with CF members and related stakeholders in the local areas. There are several consultation meetings or focus group discussions in making a final decision for what the CF is going to do.

In *Lao PDR*, Management decisions are initially made by 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).

In *Thailand*, Most management decisions are based on 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.

In *Viet Nam*, management decisions are taken based on the following principles: Monthly reviewing 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.

3.4 Data and information requirements to control and regulate the fishery

In *Cambodia*, data and information required for CF management and development as follows (see also Annex 8):

- appropriate gear types and mesh sizes for sustainable fishing, especially in CF areas;
- effective methods for enforcement of fishery law and CF rules and regulations;
- effectiveness of compliance with the CF constitution and by-laws;
- effectiveness of CF management or fisheries co-management;

In *Lao PDR*, The following is the information requirements as expressed by users and district officers:

Fish trends and species composition: Participants in meetings expressed interest in getting 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 reach by stocking the species that are decreasing.

No. of fishers: RFMCs already monitor the no. of fishers using 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 reservoir (except HS) RFMCs monitor the amount of law breakers. This is currently recorded, however, RFMC members would like to record this more systematically (no. 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.

In *Thailand*, data and information requirements include total catches and trends for key species; type of fishing gear used; number of fishermen; reason why fish populations go up or down; perception of success of management plan activity (by users and government).

In *Viet Nam*, main data requirements are on 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.

3.5 Any other data needs and constraints

In *Thailand*, other identified needs and requirements are: Methods of collecting and analyzing ecological data; systematic collection of ecological data from fishermen; lack of skill by local fishermen to organize and present local knowledge to outsiders.

In *Viet Nam*, constraints identified included financial support needed for union activities, including data collecting, especially in the beginning. Fishers cannot afford the time needed to do what they need to do. Now that the Union is collecting taxes, the situation is better, but this depends on the amount of taxes collected. Data-collecting is not a priority activity for the Unions, but members see the value of the information.

4. Identification of appropriate data collection tools, sources and methods

4.1 Existing systems

In *Cambodia*, existing data collection sources, tools, methods and some results are presented in Annex 8 and 9.

In *Lao PDR*, currently, only limited information is collected by the DAFO and RFMC. DAFO records the following data: No. of cage-culture operations, and amount of fish

(in kg.) traded from the landing site. The RFMC records the following data: No. of fulltime fishermen, no of people who violate 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.

In *Thailand*, the Inland Fisheries Centers (MRRF counterpart organizations) collect 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 braking. Annex 6 lists monitoring activities and methodology used at Thai reservoirs. Annex 9 informs on a system of Participatory Impact Monitoring (PIM), which was developed in collaboration with users and local government officers. The system is presently being applied by village headmen and leaders of women groups in the monitoring of conservation zones and fish processing activities.

In *Viet Nam*, recently implemented "Quick Surveys" take less time, but the results are not credible. More structured surveys, which we conducted before, give more believable results, which can be used in making management decisions. 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 trouble, species selectivity of various gear, and in particular, the non-selective nature of fence nets.

Presently, fishers collect data on stocked fish in two reservoirs (ES; BT). In ES, a group of five fishers are volunteers for collecting data. They will record their own daily catches and those of another three fixed 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 (five species, that is, Grass Carp, Bighead Carp, Rohu, and two indigenous species). In BT, due to a limited number of fishers (approx. 10) at that reservoir, all fishers will record their own daily catches.

4.2 Required accuracy and precision

While in *Thailand* users and government staff feel that data has to be so precise that people trust the data, opinions from *Viet Nam* are that this is difficult to say. There the experience has been that analyzing every second month instead of every month (previously) greatly changed the implications of the results. Therefore monthly surveys were continued as long as possible, but became too costly.

4.3 Improvements to existing system, focus on use and dissemination

In *Cambodia*, major improvements have to be made with regard to the appropriate methods of information dissemination, on how the information reach and is effectively used by the local people.

In *Lao PDR*, on several occasions it has been discussed to develop a monitoring system, where RFMC members record simple data into log-books (data that monitor the management plan's impact on the resource). 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.

In *Thailand*, feed back of government data to fishermen should be improved. Evaluation of government data by fishermen should be improved. Managers (users and government) and data collectors should be the same people.

In *Viet Nam*, Reinstate monthly surveys. Results should be report to and discussed with the unions at workshops every year or when needed.

4.4 Attitudes of communities towards different data collection systems

In *Cambodia*, the participatory data collection approach means that villagers or CF members have to spend time on it. This affects to their daily jobs. Most of the community members are poor, and need to spend their time on income earning activities. If the participatory data collection system does not foresee payment of incentives or similar, income is lost. As a result, participation will be low and not effective, and lead to insufficient and inaccurate information and data. Furthermore, 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.

In *Lao PDR*, DAFO/PAFO have expressed interest in the 'log-book' system – that is villagers (RFMC members) collecting data for management purposes.

In *Thailand*, both government and local managers have a positive attitude to participatory data collection systems. An important incentive for data collectors is that they feel that this data is relevant to their own life. Cost of equipment necessary for data collection should be covered by government.

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.

4.5 Attitudes of communities towards formal data collection methods

In *Lao PDR*, RFMC members have expressed interest in recording data that can be used for evaluating and improving the reservoir management plans. In *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.

5. Data storage and processing methods

Data storage in log-books have been recommended, and storage at the place of collection (at an appropriate location at the water body in question). Processing methods should be simple, and provide an opportunity for community members to understand the process of analysis.

6. Identification of potentially appropriate data sharing mechanisms

6.1 Opportunities and pathways for sharing

In *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.

In *Thailand*, the 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. 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.

In *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.

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

In *Lao PDR*, The local management communities are interested in getting information about their reservoirs which require technical skills to collect/or obtain. The RFMC committee members have expressed interest in specific services provided by the LARReC and MRC. The information/or small-scale studies that they have asked for are as follows:

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.

In *Thailand*, information is desired on possibilities of fish processing and marketing; aspects of fisheries law (particularly citizens' rights). Also, information from government agencies and their actions (inside and outside the fishery sector) that affect reservoir ecology.

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

6.1.2 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. Villager currently share data on catches and gear use. In *Viet Nam*, fishing and management experiences

6.2 Identification of requirements for data sharing

In *Lao PDR*, the experiences so far is that monitoring systems should be kept: Relevant to the people who collect/record data; data should stay with the people who collect them; when used at higher administrative levels, such information should be then copied; 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 own evaluation may not be the same format required it RFMC management has to be communicated to other actors, such as the central government.

In *Thailand*, the following points were raised: The format should be simple and easy to understand: posters, statistics in simple graphs, to be explained to and disseminated through village meetings; only a need for standardization 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.

In *Viet Nam*, transportation and travel costs.

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

In *Thailand*, Catch assessment survey (log book): lack of skill and motivation to fill in catch data. Catch assessment survey (interview fishers by fishery officers): only officers analyze the data. This method cost 30,000 THB per reservoir.). Catch assessment survey (standing crop and CPUE): only officers collect and analyze data. No participation of the local people. Modification: better methods and systems for feeding back information (for example: posters, regular meetings, easy readable 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.

In *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.

8. Details of involvement in related research

In *Thailand*, at HL, there is an Agricultural Sector Program Loan (ASPL). It is a joint project between DOF and Huai Luang Irrigation Project that plans to relate to fisheries management in two activities, that is, stocking and conservation zone establishment. The target for stocking this year is 1 million fingerlings and juveniles; expanding the existing three conservation zones and set up one more. The Udonthani Fishery Office and Udonthani Inland Fisheries Research and Development Centre are responsible for providing fingerlings and organize trainings for villagers. The villagers and the fishery office and the fisheries centre are also interested in participatory monitoring on catches that MRRF introduced in the plan review meeting at Huai Luang reservoir. At KL, teachers at Ban Chee Kok Khor have carried out a research and development project on fishing communities in the Chee River Basin, which includes activities relating to fisheries management. This research has been supported by the Thailand Research Fund, as well as by local politicians, too (making available a raft for the location of the fishery information centre at Ban Chee Kok Khor).

Annexes

Annex 1: CF Constitution and By-Laws

The Constitution and By-laws is a set of ideas that defines an organization. These ideas are formulated and agreed upon by members of the organization in order to provide direction to its activities and other decisions. By-laws can be as specific or as general as the members want them to be, depending on what they feel is necessary. Here are some basic questions that may be considered to define a community-based organization.

Purpose and name

- What is the purpose for the establishment of this organization?
- How do you want your organization to be called?

Activities - What activities do you want to do in order to achieve your organizational purpose?

Base of Operations - Where is the base of the organization? Where does it operate?

Organizational Membership

- Who can become members (e.g., men, women; is there any age limit; persons who fish part time or full time; limitations in terms of place of residence; other criteria.)
- Is membership as individuals, as families, etc.?
- After the founding, how can others become a member?
- What are provisions and process for expulsion?

Organizational Structure

- Who makes and decides on the policies and plans of the organization?
- Who implements these policies and plans (is it individuals, small groups, etc.?)
- What are their specific duties and accountabilities?

Choosing your Leaders

- Who can become the leaders, and how will they be chosen?
- What are their positions and their specific functions? How long can they be leaders and on what terms?

Meetings

- When and how often do you want to meet?
- What will be taken up in these meetings?

Rights and Responsibilities of Members - What are the specific tasks expected of each member?

Examples

- Participate in the policy and plan formulation and implementation of the organization;
- Pay dues or fees (if dues are decided upon), such as membership dues, annual dues, etc.
- Participate in all activities for the membership, e.g., meetings, trainings, etc.;
- Become a leader if chosen;
- Cast his/her vote for choosing the organization's leaders;
- Choose an activity in the organization's plan s/he wants to be active in.

Decision-making

- How will decisions be made by the organization (e.g., by consultation, by the leaders alone, etc.)?
- How is a decision carried (by consensus, majority, what definition of majority, etc)?

Finance - Where and how will the organization get money to support its activities?

Annex 2: RFMC roles and responsibilities, Lao PDR

Article: 1. **On the Name -** The organization's name is "Reservoir Fisheries Management Committee".

Article: 2. On the participants - Participating in the Reservoir Fisheries Management Committee are representatives of village authorities and fishermen from the villages surrounding the reservoir, project coordinators at district and provincial levels. The Committee's technical supervisors are DAFO and PAFO.

Article: 3. On the roles of RFMC - The important roles of the committee are:

Management of reservoir related to fishing activities such as planning, implementing and monitoring; more specifically:

- Identify and set up conservation zones of reservoir, its possible use areas and environmental protection;
- Coordinate with technical departments DAFO, PAFO in order to promote fisheries development for the reservoir;
- Cooperate with the surrounding villages and various government agencies.

Article: 4. On the main duties of the Committee -

- 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).

Article: 5. On the Committee's right

- 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.

Article: 6. On the structure of the organization – The Reservoir Fisheries Management Committee is composed of one chief, two deputies and the others committees who are representatives of village authorities.

Article: 7. On the Committee working principles - The Principle of working of the committee will follow such as:

- Divide tasks among committee members regarding management and fishing activities in individual village.
- Regular committee's meeting will be organized one time for every three months or more times depend on the needs in order to summarized and discussed past activities and consider future plans.

Article 8. On follow-up - After the district governor has approved the above, the activities will be handed over to the committee for their responsibility and implementation.

This Agreement was assigned by district governor on 26/09/2001.

Annex 3: Reservoir Management Plan, Boeung Chun Len, 2002, Cambodia

PROBLEM	CAUSES	PROPOSED SOLUTIONS	SPECIFIC TASKS	RESOURCES NEEDED		PERSON IN CHARGE	TARGET DATE
				Internal	External		
Disappearing Species and Decreasing fish catch	Use of illegal / destructive gears such as EFG, seine nets	Fishers' organization help to enforce the law	Formulate fishing regulations Meeting with stakeholders Establish the patrol group Make sign boards Patrolling Fish stocking	CF Labour	Notice boards Stationary Budget for Transportation During patrolling	Phoung Sopheap	17th June 2002
Fish Kills	Water pollution, Duck raising, weeds, lotus cultivation, pesticides use	Reservoir Ecology Training Research on fish kills.	Identify participants Identify resource person Prepare and conduct training Cooperate with expert to do research on fish kills	Labour Place and accommodation	Materials for training, food & transportation Resource person Papers, pen	Tive Ky Hong Los Lee	23/12/02 11/11/02
Fish migrate out the reservoir	No net or barrage	Build barrage	Site visit Writing project proposal Meet with Technical Department and experts Implement Activity	Labour Place	-Food -Technical staff. -Paper, pen -Budget for support activity	Pha Chok	22/04/02
No fish habitat	Cutting of flooded forest & over fishing	Build permanent fish sanctuary	Identify Location Meet with DOF Work plan Put up sign boards Info. Dissemination Patrolling	Labour Local comm. contribution	-Technical department -Stationary -Sign boards -Budget for support activity	-Phoung Sopheap	17th 02/02

PROBLEM	CAUSES	PROPOSED SOLUTIONS	SPECIFIC TASKS	RESOURCES NEEDED		PERSON IN CHARGE	TARGET DATE
				Internal	External		
Gear Theft	Some poor villages have no job	Help enforce the law against theft Alternative livelihoods.	Cooperate with Police Identify the poor Prioritize activities Activity feasibility study Write proposal Implement the activity	Labour	Police support Food Stationary Technical staff	Phan Sok	1/5/02 10/10/02
Low price of fish	Sell in the village (no capital to transport)	Provide capital inputs/ Credit for trader members	Activity feasibility study Meeting with women Writing proposal Implement activity	Labour	Stationary Technical staff Budget support (capital input)	Mrs Tang Meng	2/08/02

Annex 4: Management Plan 2004, Pak Peung Reservoir, Lao PDR

Management benefits	Indicator
RFMC members increase skills Increase rule compliance Increase in fish production and species composition Increase income for reservoir families	*1) 60% of management plan activities implemented and an increase in Reservoir Development Fund's account balance.* *2) Occurrence of violations decrease by 50%.* *3) CPUE show increase in species composition and total catch.* *4) Increase in income of fishing families.*

Activity (prioritized)	Indicator	Coordination	Responsible person	Budget
1. Reorganization and strengthening of RFMC: 1.1 Re-organize the tasks and roles of REFM members and select new members. 1.2 Conduct RFMC monthly meetings (on every 25th of month). 1.3 Conduct study tour to other reservoirs to learn from other co-management experiences.	New RFMC members selected, February, 2004. All RFMC members can express their tasks and roles, February, 2004. RFMC have meet and reported activities every 25th of the month. Study tour conducted, July, 2004.	5 village chiefs / DAFO/ District Governor.	Mr Visay MrBounkuam MrSuvan MrChantha	500.000 k.
2. Improve the conservation zone 2.1 Improve demarcation of Conservation zones and set-up 2 signs board at Laksi and Napho village. 2.2 Establish new CZ which purpose of selling licenses once a year for fishing inside the CZ.	CZ demarcation improved and two new signboards set up, March 2004. New Conservation zone established, April, 2004.	RFMC and DAFO	Mr Visay Mr Bounkuam Mr Souvanh	2.500.000
3. Improve fishing regulations: 3.1 Review fishing regulations and formulate improved fishing regulations. 3.2 Submit the regulations to Dist. governor for authorization.	Fishing regulations improved and authorized, March, 2004.	RFMC, DAFO and District governor	Mr Visay MrSouvanh Mr Keo	500.000 k
4. Increase awareness of fishing regulations 4.1 Produce small folder containing revised fishing regulations. 4.2 Circulate fishing regulations to 59 villages surrounding reservoir. 4.3 Disseminate regulations in local radio, TV, loud speaker into the villages.	Small folder with fishing regulations developed, March, 2004. Radio announcement sent, April-December, 2004. People know about the CZ and fishing regulations, in 59 villages, May, 2004.	RFMC, Propaganda district officer	Mr Phet Mr Souvanh Mr Keo	1.000.000
5. Stocking:	Fish stocking carried out by July,	RFMC, DAFO	Mr Sommano	1.000.000

Activity (prioritized)	Indicator	Coordination	Responsible person	Budget
5.1 Training in fish breeding and the use of a mobile hatchery 5.2 Produce fingerlings with the use of the mobile hatchery. 5.3 Stock reservoir with fingerlings produced by the mobile hatchery (organized by RFMC).	2004, using fingerlings produced in mobile hatchery.	and LARReC	Mr Saleum Mr Visay Mr Bounkuam Mr Souvanh Mr Keo	
6. Patrolling and Enforcement 6.1 Conduct patrolling twice a week	Patrolling carried out twice a week, starting from February, 2004.	RFMC and DAFO	Mr Visay Mr Bounkuam	500.000 k
7. Monitoring and Data collection. 7.1 Develop monitoring system 7.2 Monitor management plan implementation. 7.3 Collect data on catches (CAS) 7.3.1 Clarify the CAS form, (number of fisher, boats, number of gear and select fisher who fill the CPUE form. 7.4 Disseminate information.	Monitoring system developed, June, 2004. CAS carried out and analyzed information feed back to fishermen, Martz and September, 2004.	RFMC, DAFO, MRRF staff	RFMC each village	500.000 k
8. Cage culture 8.1 Disseminate information from cage culture research at Nam Houm to cage culturists at Pak Peung.	Cage culture research information disseminated, April, 2004.	MRRF	Mr Keo	
9. Strengthen fish processing: 9.1 Study tour and/or training on fish processing (financial management and marketing). 9.2 Set-up fish processing group. 9.3 Develop new fish products.	Study tour conducted, March, 2004. Fish processing group established, April, 2004. New fish products developed, December, 2004.	RFMC women group	Mrs. Phet MrsPhoutha Mr Keo	1.000.000
10. Organize fisher group : 10.1 Sharing experience with fisher groups at NH. 10.2 Establish fisher groups	Fisher groups established, June, 2004.	RFMC PP, and NH, DAFO,	Mr Bounkuam Mr Souvanh Mr Visay	500.000 k
11. Develop tourism as income earning activity. 11.1 Investigate possibilities through study tours. 11.2 Implement research project on tourism	Small study on tourism conducted, December 2004.	RFMC, DAFO,	Mr Souvanh Mr Phet	

Annex 5: Basic Contents of a CF's Regulations and By-Laws (Cambodia)

FISHING REGULATIONS FOR COMMUNITY FISHERIES

BOUENG CHOEN LEN, KANDAL PROVINCE

August 2001

The fishing communities of the villages of Boeung Choen Len, Russey Chhruy, Chuteal, Chhruy Metreyleu and Kaom are the authorized managers of Boeung Choen Len.

Boeung Choen Len is open to everybody in the villages who wants engage in family fishing and use fishing gears that are allowed by the DOF and the fishing communities.

For now, no management fees will be collected by the fishing communities from the people who want to fish in the reservoir.

The following fishing gear is prohibited in the reservoir:

- IFG (Illegal Fishing Gears);
- All kinds of Seine/Drag Nets (*uon*);
- Fish Aggregating Device (brush parks, locally known as *samras*);
- Bag Net (*dai*);
- Mosquito Net.

The use of the above illegal gear will be subject to fines and immediate confiscation by the officers of the fisheries communities.

The following are the fines that will be charged for each illegal gear:

o IFG	500,000 Riel
o Seine and seine nets (uon)	500,000 Riel
o Bag Net (dai)	100,000 Riel
o Fish Aggregating Device	300,000 Riel
o Mosquito Net	500,000 Riel

Catching of fish fry of all species is prohibited. Catching of snakehead fry is subject to a fine of 200,000 riel.

The officers of the fishing communities will issue a receipt to the illegal fisher caught and will provide a regular (monthly) report of its law enforcement and fine collection activities to all the members of the fishing communities.

The money collected will be used to fund the planned activities that have been approved and agreed upon by the majority of the members of each fishing community.

Activities that destroy the water quality and fisheries of the lake are also prohibited, as provided for in the country's environmental laws, e.g., dumping of domestic, commercial and industrial waste into the lake; use of pesticides in and around the lake, lotus growing, cutting of trees in and around the lake, etc.

Violators of the above regulation will be duly punished according to the environmental laws and whatever penalties the fisheries communities will deem appropriate (indirectly through the fisheries community).

Signatures:

Annex 6: Current monitoring/data collection, Thailand

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

Annex 7: Participatory Impact Monitoring, Thailand

Management Plan activities.	What information is needed?	PIM methods used.	Who is responsible for collecting data?	Who are the respondents?	Frequency of monitoring	Follow up: Analysis and Dissemination
Conservation zones Fish processing Fish Marketing Fish stocking	- Have regulations on CZ been formulated? - Have CZ regulations been announced? (village and district level) - Are CZ regulations implemented? (not broken) - Are CZ demarcated? - Are people satisfied with CZ? - Does the CZ increase (amount, size and diversity) of fish? - Have FP. Groups been established? - What new products are produced? - Do people have increased knowledge about fish processing? - Have new landing sites been established? - Is there any local /government support? - How many fish landed? -Are there any stocking activities (how many?, which species?, where were they stocked, who stocked?)	Questionnaire: ↓ Log book Questionnaire: ↓ Log book Log book	Questionnaire: MRF II/ DOF Log book: Resource Users. (This should be divided according to profession. People who have an interest, design and implement the system)	Questionnaire: The following groups of people are interviewed separately: Leaders Fishers (Men) Women Traders Government staff.	Questionnaire: Once yearly. Two weeks before the Management Plan review. Log book: Continuously.	Who analyses: Questionnaire: Gov. Staff at each reservoir. Log book: Users and Gov. staff. Dissemination: Will happen at the management plan review meeting (at reservoir level). How: Reports Meetings (Presentations and discussion) Report: Summarise: (success stories and obstacles) ⇓ Review of Management Plan

Annex 8: Monitoring system - Cambodia

1. CF Activities Monitoring

Regular events

Information/data on CF situation and activities are reported through regular monthly meeting by, users/CF committee members and village chiefs and written up in CF notice book in all MRRF sites, except CF in fishing lots 13-15, Kg Chhnang province, through regular bi-monthly meeting. The monthly report is sent to Provincial Fisheries Office and CFDO/DOF through MRRF counterparts.

Irregular events

Matters/issues/events (such as illegal fishing activities) which happen un-regularly are written/recorded as minutes of these events by CF committee members/patrol group. Sometime the minute should be accepted by local government/village or commune chief, if they are available at the time of the event. The events have to be immediately reported to local authorities and Provincial Fisheries Office or related government agencies through the help by MRRF counterparts and CF facilitators.

Parameters/indicators used

- The activity done and situation of CF management plan implementation;
- The situation of CF management;
- Number of conflicts and illegal fishers;
- The situation of patrol activities;
- Number of interventions in stopping illegal fishing activities;
- The situation of CF livelihood activities, such as cow/rice bank; women handicraft activities; small-scale business of selling fishing gears etc. (expenditure and income recording).

Why monitor?

To strengthen and follow u CF management and take the actions in the next CF monthly planning or immediate action/solution (depend on the issues/problems/events) by the CF committee members, local authorities and related agencies (Provincial DOF).

2. Recording of general information of interest for CF

- Impression/expression/statement written during hosted study tours in CF areas;
- Donation/contribution to CF by visitors during hosted study tours or from other events/activities of CF.

3. Monitoring of Management Impact on Fisheries

Catch assessment

Catch assessment is conducted one time per year, in the middle of the year, through focus group discussions with key informants (who do fishing regularly in the reservoirs) by using questionnaires in all reservoir sites (Boeung Chun Len, Chhroy Check and Tmordar/Teukchhar reservoirs).

Parameters/indicators

- High and low season per gear (to see the variation of fish catch per gear);
- Main gears use and mesh size;
- Mean catch per gear and species by 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.

Why monitor?

- Feedback/result of fisheries co-management/CF management in the area;
- Information/data of fish catch, species and gear uses in high and low season are used for monitoring_activities and comparing in the following year to see how the situation of fish catch has changed in the area. This is important information for the users/CF members to see the results of their efforts and encourage them to participate in fisheries co-management.

4. CF management plan review/evaluation

CF management plan review is conducted one time per year, in the end of the year, through focus group discussion 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 see 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.

Parameters/indicators

- 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.

Why monitor?

Results of CF management plan implementation are reported to Provincial DOF and CFDO/DOF; and it is important for setting up CF management plan in the following year.

5. Monitoring and data needs

The monitoring and data needs that have been addressed by CF committee members, CF members and local authorities during the CF management plan review are as the follows:

Monitoring need

- Monitoring of fish catch should conduct in river sites (CF in former fishing lots) too;
- Activities Monitoring of CF plan implementation is still need the facilitation/help from the outsiders/related agencies through bi-weekly visit;
- Monitoring method and timing should be standardized in all areas (by technical agencies/provincial DOF/CFDO).

Information/Data need

- The effectiveness of CF management with regarding sustainability;
- The effectiveness of CF regarding compliance with regulations;
- Methods of patrolling and how to arrest and stop illegal fishing in an effective and sufficient way;

- Information and knowledge on community fisheries development to be self-reliant and financed;
- Number of fish traders and fish price in the area;
- The appropriate gear uses;
- Ecological information in the area;

Annex 8: Catch and Effort Survey, Cambodia

BCL Reservoir is located in Recey Chruy Commune; Mok Kampol District Kandal Province. There are 5 villages such as Boeung Chun Len, Chhek Teal, Russey Chhroy, Chhroy Metrey Leu, Koarm villages border with this Reservoir.

BCL Reservoir is 45 kilometers away from Phnom Penh and can be reached by car in 40 minutes.

In 5 villages above, the main economic activities is rice cultivate. Fishing ranks two, Of 1,343 people, 13% people engage in fishing for food and income. On the average, people spend 120 days fishing during the high season and 28 days during the low season. During the months of August to December, fishing is intensifies, after the rice crop has planting season crop has been planted. The months of from January to July are considers lean months, since people are busy with rice planted and harvested.

Table 1: Graph Showing Seasonal Gear Use

Gear	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gillnet												
Loglines												
Planted hook rod												
Lop trap												
Tru trap												
Cast net												
Handled Scooping basket												

Fishers in BCL engage in fish capture. The main gears used in BCL are gillnet, Mesh size from (3 to 5), hook N.14 and 16, cast net, seine net, drum trap, drum-oblong trap and handle scooping basket.

In 2004, the total catch from all gears in this village was 37,325.14 kg/year. This can be broken down to following specific gears used in the area.

Table 2: Gear Used, Catches and Species

Gear	Catch (kg/year)	Specific Species Caught
Gillnet	66,059.43	Riel (Henicor hynchus siamensus), Linh (Thynnichthys thynnoides), Kros (Osteochilus Hassetti), Slat (Notopterus notopterus), Chpin (Hypsibarbus lagleri), Kranh (Anabantes), Kantrawb (Pristolepis fasciata), Khmann (Hampela dispat), Kahe (Barbodes altus).
Hook-long-line	10,884.34	Ros (Channa striata), Slat (Notopterus notopterus), Andaing (Clarias), Kromom (Ompok krattensis), Kranh (Anabantes), Chhlang (Leiocassic stenomus). Kanchos(Mystus mysticetus), Domrey (Oxyeleotris marmorata)
Bobak	1,147.5	Chhtor or Deab (Channa micropeltes), Ros (Channa striata)
Lop trap	1340.57	Riel (Henicor hynchus siamensus), Kros (Osteochilus Hassetti),Krolong (Cirrhinusmrigala), Domrey (Oxyeleotris marmorata)Ka Ek (Tor Tambroides), Chunchuk Day

Gear	Catch (kg/year)	Specific Species Caught
		(gyrinocheilus pennocki Klang Hai (Belodontichthys dinema). Chpin (Hypsibarbus lagleri), Ros (Channa striata),Chpin (Hypsibarbus lagleri),Krapat (Wallago attu).
Tru Trap	1,992.85	Riel (Henicor hynchus siamensus), Linh (Thynnichthys thynnoides), Kros (Osteochilus Hassetti), Arch kok (Dangila siamensis), KanchosTmor(Leiocassis siamensis),Andiang(Clarias) Komplean(Trichogaster microlepis),kranh(anabantes)
Handle Scooping Basket	278.78	Riel (Henicor hynchus siamensus), Linh (Thynnichthys thynnoides), Kros (Osteochilus Hassetti), Arch kok (Dangila siamensis), Slat (Notopterus notopterus), Chpin (Hypsibarbus lagleri), Kranh (Anabantes), Kantrawb (Pristolepis fasciata), Khmann (Hampela dispat), Kahe (Barbodes altus), Kro Long (Cirrhinusmrigala), Klang Hai (Belodontichthys dinema).
Cast Net	2,1740	Slat (Notopterus notopterus), Kros (Osteochilus Hassetti), Kantrawb (Pristolepis fasciata), Ros (Channa striata), Chhlang (Leiocassic stenomus), Chpin (Hypsibarbus lagleri), Andaing (Clarias), Kranh (Anabantes).
Total	103,443.5	

1. Gillnets

Table 3: Seasonal Use of Gill-nets

Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High												
Low												

Table 4: Fishing days

Item	High Season:			Low Season		
Number of fishers fishing (days/week)	≤ 1	2-4	5-7	≤ 1	2-4	5-7
Number of fishers	1	28	83	8	11	16

Table 5: Total number of gillnets (piece) <u>in use</u> (days per week)

Mesh (stretched, cm)	High season			Low season		
	≤ 1	2-4	5-7	≤ 1	2-4	5-7
~<3	2	26	91	12	13	16
3-5		39	125	5	11	31
~>5		14	95	5	18	26

Table 6: Species and Catch Composition

Species name	%
Riel (Henicor hynchus siamensus)	20
Arch kok (Dangila siamensis),	20
Kros (Osteochilus Hassetti)	20
Linh (Thynnichthys thynnoide)	12
Slat (Notopterus notopterus), Chpin (Hypsibarbuslagleri),), Khmann (Hampela dispat), Kahe (Barbodes altus). Kranh (Anabantes) Kantrawb (Pristolepis fasciata) Kanchos (Mystus mysticetus)	18

Table 7: Fishing Effort (Gear actually <u>used</u>)

High season:			Low season		
Mean CPUE (kg/piece/day)	Mean number of fishers per day	Mean number of piece in use per fisher	Mean CPUE (kg/piece/day)	Mean number of fishers per day	Mean number of piece in use per fisher
0.7	74	3	0.2	25	4

2. Longlines

Table 8: Seasonal Use of Longlines

Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
High												
Low												

Table 9: Fishing Days

Item	High Season:			Low Season		
Number of fishers fishing(days/week)	≤ 1	2-4	5-7	≤ 1	2-4	5-7
Number of fishers	12	23	20	6	7	4

Table 10: Total number of hooks (set) (Gear actually <u>used</u>)

Item	High season			Low season		
	Days per week			Days per week		
Hook size	≤ 1	2-4	5-7	≤ 1	2-4	5-7
14	4	6	10			
15		10	20	1	2	2
16	15	35	30	3	3	1
17	15	25	15	2	2	1

1 set =100hooks

Table 11: Species and Catch Composition

Species name	%(weight) of total catch
Ros (Channa striata)	35
Slat (Notopterus notopterus)	35
Andaing (Clarias)	9
Kromom (Ompok krattensis)	11
Kanchos(Mystus mysticetus), Chhlang (Leiocassic stenomus). Domrey (Oxyeleotris marmorata)	10

Table 12: Fishing Effort (Gear actually used)

High season:			Low season		
Mean CPUE (kg/set/day)	Mean number of fishers per day	Mean number of set in use per fisher	Mean CPUE (kg/set/day)	Mean number of fishers per day	Mean number of set in use per fisher
0.5	30	3	0.2	5	1

3. Cast Nets

Table 13: Seasonal Use of Cast Nets

Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High												
Low												

Table 14: Fishing Effort

Item	High Season			High Season		
Days/week	<1	2-4	5-7	<1	2-4	5-7
Number of fishers	1	9	39	1	0	5
Number of cast net in village	1	9	39	1		5
Mean catch (kg/gear/day)	1kg			0.5kg		

Table 15: Species and Catch Composition

Species name	%
Riel (Henicor hynchus siamensus)	27
Kro Long (Cirrhinusmrigala)	15

Species name	%
Arch kok (Dangila siamensis)	15
Kros (Osteochilus Hassetti)	10
Linh (Thynnichthys thynnoides)	10
Slat (Notopterus notopterus), Chpin (Hypsibarbus lagleri), Kranh (Anabantes), Kantrawb (Pristolepis fasciata) Khmann (Hampela dispat) , Kahe (Barbodes altus).	23

Table 16: Fishing Effort (Gear actually used)

High season:			Low season		
Mean CPUE (kg/cast net/ day)	Mean number of fishers per day	Mean number of hooks in use per fisher	Mean CPUE (kg/100hooks/ day)	Mean number of fishers per day	Mean number of hooks in use per fisher
1	19	1	0.5	6	1

4. Planted Hook Rods

Table 17: Seasonal Use of Planted Hook Rods

Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High												
Low												

Table 18: Fishing Effort (Gear actually used)

Item	High Season			Low Season		
Days/week	<1	2-4	5-7	<1	2-4	5-7
Number of fishers	7		14			
Number of hook rod in village	7		14			
Mean catch (kg/hook/day)	0.5					

Table 19: Species and Catch Composition

Species name	%
Ros (Channa striata)	80
Chhtor or Deab (Channa micropeltes)	20

Table 20: Fishing Effort (Gear actually used)

High season:			Low season		
Mean CPUE (kg/1 h/day)	Mean number of fishers per day	Mean number of hooks in use per fisher	Mean CPUE (kg/100h/day)	Mean number of fishers per day	Mean number of hooks in use per fisher
0.5	8	1			

5. Lob Traps

Table 21: Seasonal Use of Traps

Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High												
Low												

Table 22: Fishing Effort

Item	High Season			Low Season		
Days/week	<1	2-4	5-7	<1	2-4	5-7
Number of fishers			17			
Number of trap in village			44			
Mean catch (kg/gear/day)	0.50					

Table 23: Species and Catch Composition

Species name	%
Riel (*Henicor hynchus siamensus*)	11
Kros (*Osteochilus Hassetti*)	20
Kro Long *(Cirrhinusmrigala)*	30
Domrey *(Oxyeleotris marmarata).*	10
Ka Ek (*Tor Tambroides*), Chunchuk Day (*gyrinocheilus pennocki*) Klang Hai *(Belodontichthys dinema).* Chpin (*Hypsibarbus lagleri*), Ros (*Channa striata),*Chpin (*Hypsibarbus lagleri*),Krapat *(Wallago attu).*	29

Table 24: Fishing Effort (Gear actually <u>used</u>)

High season:			Low season		
Mean CPUE (kg/gear/day)	Mean number of fishers per day	Mean number of gear in use per fisher	Mean CPUE (kg/gear/day)	Mean number of fishers per day	Mean number of gear in use per fisher
0.50	17	2			

6. Tru Traps

Table 25: Seasonal Use of Tru Trap

Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High												
Low												

Table 26: Fishing Effort

Item	High Season			Low Season		
Days/week	<1	2-4	5-7	<1	2-4	5-7
Number of fishers		15				
Number of trap in village		30				
Mean catch (kg/gear/day)	5kg					

Table 27: Species and catch Composition

Species name	%
Riel (Henicor hynchus siamensus)	20
Kros (Osteochilus Hassetti)	20
Arch kok (Dangila siamensis)	19
Linh (Thynnichthys thynnoides)	10
Kanh Chos Thmor (leiocassis siamensis).	10
Komphlean (Trichogaster microlepis), Kranh (Anabantes) Andaing (Clarias), Kranh (Anabantes).Antong (Monopterus albus)	21

Table 28: Fishing Effort

High season:			Low season		
Mean CPUE (kg/gear/day)	Mean number of fishers per day	Mean number of gear in use per fisher	Mean CPUE (kg/gear/day)	Mean number of fishers per day	Mean number of gear in use per fisher
5	15	2			

7. Handled Scooping Basket

Table 29: Seasonal Use of Handled-Scooping Basket

Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High												
Low												

Table 30: Fishing Effort (Gear actually used)

Item	High Season			Low Season		
Days/week	<1	2-4	5-7	<1	2-4	5-7
Number of fishers		30	10	10		
Number of basket in village		30	10	10		
Mean catch (kg/net/trip)	0.1			0.05		

Table 31: Species and Catch Composition

Species name	%
Kom Peuse (Macrobrachium lanchesteri),	10 %
Kdam (crabs)	80 %
Other: Krem Tion Sai (Trichopsis pumila). Chhlong (Macrognathus siamensis). Kompleanh (trichogaster trichopterus).Snail.	20 %

Table 32: Fishing Effort (Gear actually used)

High season:			Low season		
Mean CPUE (kg/seine net/ day)	Mean number of fishers per day	Mean number of hooks in use per fisher	Mean CPUE (kg/100hooks/ day)	Mean number of fishers per day	Mean number of hooks in use per fisher
0.1	25	1	0.05	1	1

8. Number of fishers and boats (any gear category)

Table 33: Fishing Effort

Item	High Season			Low Season (days/week)		
Days/week	<1	2-4	5-7	<1	2-4	5-7
Number of fishers	14	112	183	25	18	25
Number of motorised boats*						
Number of non-motorised boats*	33 boat made of palm trees and 89 Wooden boats.			33 boat made of palm trees		

*Only boats used for fishing.