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MINISTRY OF AGRICULTURE, FORESTRY AND FISHERIES

FISHERIES ADMINISTRATION



Mekong Integrated Water Resources Management Project Phase III – Component 1

TECHNICAL REPORTS

Community Fisheries self-monitoring: local priorities, local means



2021

Inland Fisheries Research and Development Institute

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TECHNICAL REPORT

Community Fisheries self-monitoring: local priorities, local means

Prepared by the Inland Fisheries Research and Development Institute for the Fisheries Administration

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EXECUTIVE SUMMARY

We propose in this report ten monitoring techniques designed for Community Fisheries, using local means only. This initiative is part of the Mekong Integrated Water Resources Management project Phase III, Component 1. The objective is to offer Community Fisheries tools and methods to implement on their own a solid, relevant and independent monitoring that can guide their management initiatives and assess management outcomes at the CFi scale.

We first introduce the concept of self-monitoring (a monitoring process fully handled by communities, to guide their own decision making), and distinguish it from scientific monitoring for co-management (data gathering by communities, analysis by institutional or NGO scientists, recommendations to communities). A literature review show that this approach is innovative, and its pros and cons are reviewed.

Ten monitoring techniques are proposed. They are designed to meet a diversity of objectives, and to be fully implementable by Community Fisheries, using low technology and calculation requirements compatible with village resources. Thus, the information analysis proposed does not require more than a basic calculator, nor any numerical analysis more complex than averaging.

Monitoring techniques cover fishing (number of fishers, identification of offenders), fishery management results (benefits from patrolling, best interventions), fish yield (catch by fisher), fishery socioeconomics (fish prices, fishers' income) and environment (water levels, women's participation, co-management interactions).

These techniques aim at providing Community Fisheries with tangible information ("data") to objectively describe trends over years, assess outputs of management interventions or document issues in view of addressing them in collaboration with authorities or NGOs. The overall initiative is aimed at strengthening Community Fisheries, enabling them to drive their own management, and increasing the effectiveness of that management.

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1. INTRODUCTION

The present report is a contribution to the Mekong Integrated Water Resources Management project Phase III (M-IWRM III). The objective of the latter is to enhance Cambodia's institutional capacity and infrastructure to sustainably manage its water and fishery resources in northeast Cambodia. Within this project, Component 1 managed by IFReDI/FiA is tasked with supporting Fisheries and Aquatic Resources Management in Kratie and Stung Treng Provinces. One of its objective in particular is to strengthen public sector fishery management.

The project requires working with all Community Fisheries involved to ensure capacity building. More specifically, the Project Appraisal Document (PAD) dated 28 April 2016 indicates that "Provincial Implementation Teams (PIT) will provide support to the key management stakeholders (PFiA, CC and CFi) for the design of monitoring and reporting programmes" and that "IFReDI/FiA will design and support CFis to implement monitoring systems for fisheries and evaluation of Management Plan. Standard indicators and methodology to monitor fishery and management performance will be developed" (Results Framework and Monitoring, indicator #7)

The review of the project dated 25 September 2017 by the World Bank also states that "It would be better if members of the community could participate in the monitoring if possible so that they can see for themselves the outcomes of their management efforts".

As flagged in the companion report "Scientific monitoring of the fish resource with community fishers" (Fisheries Administration 2019), combining the involvement of *each* community and a rigorous science-based monitoring revealed significant challenges:

- each of the 70 CFi should have been represented by several fishers to reflect individual variability in fish catches; this would have resulted in the involvement of hundreds of fishers, which would have represented a major logistical challenge;
- the collection, computer entry and analysis of thousands of monthly data sheets then the preparation of individual summaries for each CFi would have been the task of IFReDI or provincial FIA offices, but these are neither equipped, staffed nor funded for such task.

Aside from these implementation constraints, several other objections were raised to the involvement of *all* Community Fisheries in *FiA-driven fish monitoring* to inform and underpin management in each CFI:

- CFi have to deal with multiple management challenges and management performance is not necessarily limited to fish; it may have to include other resources or environmental parameters, with needs that vary from place to place;
- a monitoring process in which each CFi relies on data analysis by the Fishery Administration is not in line with the ambition of enabling communities to manage their local resources in an autonomous way. Furthermore, its cost does not make it a sustainable option beyond project life in Kratie and Stung Treng, and even less so as a national strategy for all CFi countrywide;
- a monitoring relying on computer-based data entry and numerical data analysis is not compatible with the technological level of the villages concerned (several of them do not have electricity, and computers are unknown in most) nor with the capacity of villagers (a majority of them acknowledging that they are not familiar with complex arithmetic calculations).

These constraints and observations led to devising two distinct and complementary protocols:

- a protocol to monitor the fish resource in the project provinces and assess their trends, using a scientific approach and fishery science tools;
- a CFi-based protocol adapted to local implementation and local analysis means, that would also reflect CFi-specific concerns, activities or priorities.

The latter option corresponds to adaptive management at the CFi level, independently from Fisheries Administration inputs.

The present report proposes protocols for CFi resource management performance self-monitoring (in short "CFi self-monitoring").

SELF-MONITORING IN A NUTSHELL

What is self-monitoring?

Self-monitoring is a monitoring program for Community Fisheries to record information:

- relevant and useful to them;
- gathered by themselves, in each CFi;
- that can be analysed and summarized by themselves;
- used to guide and adapt their management.

Why self-monitoring in each CFi?

- to observe local trends in the resource (down, up, changing, etc.);
- to observe consequences of local Management Plan and adjust actions;
- to communicate with FiA, authorities, NGOs, donors or other CFi.

Monitoring what?

- A flexible approach, tailored by each CFi, to monitor:
 - fish, fishing or poaching;
 - management and results of management;
 - income from fishing or post-harvest;
 - fish habitats, water;
 - etc.

1.1. Differences between fish resource monitoring and self-monitoring

Before developing the conceptual background of the approach, we summarize below the difference between a) fish resource monitoring developed for the project and b) the present CFi self-monitoring (Table 1). Fish resource monitoring and self-monitoring are different in terms of:

- **scale**: the fish resource monitoring aims at assessing the status of the fish resource in the whole project area, i.e. Kratie and Stung Treng provinces, whereas the self-monitoring only considers resources at the level of individual CFi;
- focus: the focus of the fish resource monitoring is on fish only (all species, all gears, various habitats), that of CFI self-monitoring is on fish (CFi-specific species, gears and habitats), but also on other variables of relevance to the CFi and its management plan (e.g. fish processing, water quality, etc.);
- purpose: the purpose of the fish resource monitoring is to assess, using fishery science methods, the benefits of the project in terms of improved or sustained sustainability of the fish resource in that region of Cambodia; self-monitoring, on the contrary, aims at assessing the benefits of each CFi Management Plan activities (including on the fish resource);
- target: The results of the fish monitoring are produced for the Fishery Administration (as overall resource manager) and national or provincial decision makers –while also informing CFi about regional findings-, whereas the results of the self-monitoring target individual CFi while also keeping FiA informed about CFi-level findings;
- **operators**: information about fish resource monitoring is gathered by fishers but handled and stored by the Fisheries Administration, unlike information from self-monitoring gathered and managed by CFi members themselves;
- **information management**: in the case of fish resource monitoring, information is of digital nature (after data entry in computers) and subsequently stored in databases, for quantitative analysis using for instance statistical methods; in CFi self-monitoring, the information can be of different nature (numerical, coded, verbal), stored locally (e.g. notebooks) and processed using means available at the CFi level.

	Fish resource monitoring	CFI self-monitoring			
Scale	Kratie and Stung Treng provinces	Each CFi fishing area			
Focus	Fish only	Fish and other criteria of local relevance			
Purpose	Assessment of the project benefits in terms of fish resource sustainability	Assessment of the benefits of each CFi Management Plan			
Target	FiA, decision makers CFi for information	CFi FiA for information			
Operators	FiA	CFi members			
Information management	Using computers, databases, statistics	Using local CFi resources			

Table 1: Comparison of fish resource monitoring and CFi self-monitoring

These aspects are illustrated in Figure 1 and Figure 2. Overall, the scientific fish resource monitoring has been put in place for project outcome assessment and contribution to national resource management evaluation, whereas the CFi self-monitoring is developed for local monitoring but also building of local capacity, awareness and ownership.



Figure 1: Comparison of CFi self-monitoring with scientific fish monitoring (FiA 2019)

WHY COMPLEMENT MANAGEMENT PLAN MONITORING AND FISH MONITORING WITH COMMUNITY FISHERY SELF-MONITORING?

• **Management plan monitoring** is focused on CFi activities and people who implement these activities; it is done by *each* CFi with some assistance of the FiA, in particular during the project implementation period

• Fish resource monitoring reflects national management of fisheries resources, and is implemented by the FiA following scientific standards (e.g. sampling in several representative ecological zones, statistical data analysis). Data gathering focuses on fish and fishing; it is done in collaboration with CFi fishers but is top-down (data gathering protocol imposed, data analysis is centralized) and is limited to the project implementation period.

In this context,

• **CFi self-monitoring** is designed to be done by each CFi. It is focused on CFi fish catches (i.e. catches specific to the locally dominant ecological zone of the CFI) but can also integrate environmental or socioeconomic factors of relevance to the CFi. Information gathering may not be rigorously scientific, but the focus here is on capacity building for autonomous management, improved organizational capabilities, increased ability to discuss with administrations or NGOs, and long-term autonomy.





Figure 2: Comparison of scientific fish monitoring (left) with CFi self-monitoring (right): scale, number of CFi involved, criteria considered, operators, technical means (adapted from FiA 2019)

2. CONCEPTUAL BACKGROUND

2.1. Self-monitoring in the fishery management spectrum

Fisheries management involves five main activities (adapted from Halls et al. 2005):

- 1. Formulating development plans
- 2. Formulating corresponding management plans
- 3. Implementing plans to meet the management objectives
- 4. Evaluating the performance of management plans
- 5. Adjusting the process and the plans for improved or continued relevance

The activities covered in the present manual correspond to step 4, more specifically the gathering of information and assessment of the status of resources covered by management activities.

In Cambodia the approach chosen for inland fisheries management is co-management, which can be described as "a partnership arrangement in which the community of local resource users (fishers), government, other stakeholders (boat owners, fish traders, boat builders, business people, etc.) and external agents (non-governmental organizations, academic and research institutions) share the responsibility and authority for the management of the fishery" (Pomeroy and Rivera-Guieb 2006).

Practically, co-management consists of "a spectrum of governance arrangements from almost entirely state governance to almost entirely user group governance (Jentoft and McCay 1995).

In this variable governance framework, evaluating the performance of management plans can be done by different operators, using different strategies. Five broad types of data gathering and monitoring for fisheries management can be identified:

- data gathering and analysis by scientists, for line agencies (centralized management);
- data gathering by fishers based on a protocol defined by scientists, for data analysis by scientists and communication of results to line agencies (participatory research);
- data gathering by fishers, data analysis by scientists, presentation of results to both fishers and line agencies for joint decision making (co-management);
- data gathering by community members (fishers, volunteers, etc.) for compilation and analysis by scientists. Findings are generally communicated back to the public, and decision making can be either centralized or joint (citizen science);
- data gathering by fishers or fishing community members, data analysis by fishing community members, decision-making by community members (self-monitoring, self-management).

DATA GATHERING	by scientists	by fishers	by fishers	by communities	by communities
DATA ANALYSIS	by scientists	by scientists	by scientists	by scientists	by communities
RESULTS	for line agencies		for communities	s and line agencies	for communities
MANAGEMENT CENTRALIZED MGT.		CO-MA	NAGEMENT	SELF-MANAGEMENT	

These strategies are summarized in Table 2.

Table 2: Different strategies involving data gathering for natural resource management

Self-monitoring in the spectrum of co-management approaches

In the spectrum of co-management approaches, the present self-monitoring program is therefore close to citizen science. It differs from the pure co-management framework for fisheries described for instance in Halls *et al.* (2005a, 2005b) and reflects the recognition, by example by Graham et al. (2006) in their community fisheries management handbook, that "in most fisheries management systems, research is done by a governmental scientific system that decides what is to be studied" and that local people may be or feel excluded from the process.

Citizen science can be defined as research and monitoring in which members of the public collect, categorize, transcribe or analyze data (Bonney *et al.* 2014), and recent years have seen a dramatic increase in citizen science activity worldwide (Conrad and Hilchey 2011). Chandler *et al.* (2017) highlight a difference between a) *citizen science*, in which volunteers participate in some or all aspects of environmental assessments often led by institutional scientists, and b) *community-based monitoring*, i.e. a type of citizen science in which local stakeholders use their own resources to monitor natural resources to achieve goals that make sense to them (Danielsen *et al.* 2014). The self-monitoring considered here pertains to that sub-category.

Novelty of the proposed approach

In their global review of 460 monitoring programs involving non-scientists, Chandler *et al.* (2017) identify 40 community-based monitoring programs. In other words, community-based monitoring programs represent less than 10% of all citizen-based monitoring initiatives. A deeper analysis of Chandler's dataset shows that a third of these 40 community-based programs monitor fish or fishing (i.e. 13 out of 460, or 3%). Only a few of these programs use methods, processes or units defined by communities themselves (e.g.: Obura 2001). Thus, the innovative approach proposed here corresponds to the development of new tools for management by community fisheries, at the tip of a spectrum of methods increasingly empowering local communities.

Pros and cons of the approach

Luzar et al. (2011) recognize the challenges inherent to self-monitoring in a context of high rates of illiteracy or innumeracy, and unfamiliarity with the hypothetico-deductive framework – which makes the rigorous collection of scientifically valid data challenging for a number of communities. However, these authors also recognize that local people have a subsistence-oriented environmental knowledge relevant to data collection focused on pertinent indicators and a permanent presence on site, whereas professional scientists often temporarily visit sites and may not have developed equivalent detection skills.

When the focus is on community-based monitoring rather than the broader citizen science, several studies conclude that data quality can be quite good, even in technical disciplines such as stream and water quality monitoring, hydromeorology or geology (Rossiter *et al.* 2015, Walker *et al.* 2016. Storey *et al.* 2016). Castello (2004) or Campos-Silva and Peres (2016) document the very positive impact of community-based monitoring on fish species protection in Brazil. Such self-monitoring initiatives can even lead to the creation of a management dash-board at the community level, as illustrated by Béné *et al.* (2009) in Africa, or in Cambodia (Figure 3).

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Figure 3: Dashboard of community management performance indicators in health and education (Phlouk Commune, Stung Treng Province, December 2019)

The various modalities of local participation in natural resource monitoring have been reviewed by Danielsen *et al.* (2009), and Cigliano *et al.* (2015) identify several types of positive outcomes from a monitoring implemented by community members themselves:

- in terms of site management (long-term data, improve rapid response to and detection of episodic or stochastic events, enhanced sustainability of monitoring and management),

- in terms of capacity building (collaboration, participation, integration of multiple knowledge sources)

- in education (awareness and inspiration, individual behavior change, science literacy and critical thinking)
- in policy development (in particular cooperative policy development and implementation, policy evaluation).

Storey *et al.* (2016), working on stream monitoring, conclude that "involving community members in scientific monitoring increases both their knowledge and their ability to discuss this knowledge with professionals, potentially increasing their influence in decision-making processes".

On the negative side, participatory science studies and community-based monitoring face a possible nonengagement of people. Reasons can be fear of engaging in a new topic, time constraints or limited return expected from the study. (Martin *et al.* 2016). In our case we initially proposed CFi members a questionnaire to identify and anticipate main barriers (see Methodology section).

Increasing project acceptance also implies paying attention to who is proposing the project to the community, i.e. convincing then involving an opinion leader first, so that the self-monitoring initiative is pretented to the community by a trusted leader or influencer (Howell *et al.* 2015). This person can be different depending on each CFi. Practically, this consists in bringing together a few community leaders first and consult them for a collective decision about on the best approach vis-à-vis their community.

3. METHODOLOGY FOR PROTOCOL DEVELOPMENT

The development of the self-monitoring is based on five methodological steps:

- Gathering of fishers' feedback, after a presentation of intentions
- Assessment of monitoring themes (preferred, doable) and of suggested approaches
- Development of a series of methodological sheets (self-monitoring modules)
- Testing of each module and validation or modification
- Finalization of a manual and training material

We present these steps below.

3.1. Consultation of CFC members and of local Cantonment officers

The results detailed below reflect the opinion of 28 Community Fishery Committees members consulted in Stung Treng on 10 July 2018. Forty-two participants, including 12 women, were invited. These CFC members and fishers were presented the intention underpinning the initiative (see Annex 1), and requested to provide feedback about the proposed initiative. Similar comments were also sought from Cantonment staff in both Stung Treng and Kratie Provinces.

Out of 28 CFC members consulted, 24 were positive about the approach, and 4 were not interested due to absence of financial support. All Cantonment officers were positive – provided that this monitoring remains simple-, and saw in this initiative an opportunity to build local capacity, to strengthen the comanagement process, to flag necessary action, to generate useful info for Cantonments to better assist community fisheries and to complement scientific information for a baseline in case of dam development. FiA also underlined the need to distinguish information to be gathered by fishers (i.e. focus on fish) from what is to be gathered by CFI members (who are not necessarily fishers; in particular information relative to people or processes in the community)

In December 2019, the project team visited five communities representing specific conditions:

- Krala Peas in Stung Treng Province, downstream of Don Sahong Dam in Laos;
- Phlouk Meanchey in Stung Treng Province, downstream of Lower Sesan 2 Dam;
- Tomnub Pak in Kratie Province, mainly a reservoir fishery;
- Kampi in Kratie Province, a CFi featuring islands, pools and wetlands;
- Anlong Preah Kou in Kratie Province, a CFi characterized by mainstream deep pools.

Community Fisheries Committees of these sites were consulted, presented the objectives of the project (see Annex 1) and systematically interviewed about the following points:

- What CFi *could* monitor (in particular expectations or problems not reflected in their management plan);
- What CFi want to monitor (themes, variables and areas of interest to CFis);
- What CFi can monitor (effort implied, manpower, cost, resources, etc.);
- **What information can be recorded** (nature of the information: verbal, coded, quantitative; how information/data can be recorded);
- How information can be processed (calculation means, summaries possible);
- How information can be shared with authorities or FIA (informally? in written?)

Interviewees were then presented with various options for coding and synthesizing information (Figure 4), and they indicated the one they preferred (basically, no coding).



Color coding

	2020	2021	2022	2023
Variable 1				
Variable 2				
Variable 3				
Variable n				

"A, B, C, D" coding

	2020	2021	2022	2023
Variable 1	D	C	C	А
Variable 2	А	В	A	С
Variable 3	С	С	С	C
Variable n	D	D	A	A

No coding (actual numbers)

2020 2021 2022 2023 Variable 1 12 8 7 2 Variable 2 50 48 53 25 Variable 3 182 182 184 180 Variable n 2 2 18 19

Figure 4: Options for information synthesis

Based on lessons learnt from the consultations, a more specific questionnaire was designed (Annex 2). However, due to COVID-related constraints in 2020 its use could not be implemented

3.2. Conclusions from the consultations

Of the 28 CFC members consulted, fifteen saw as top priority the monitoring of (illegal) fishing, six the monitoring of management results and outcomes, four the monitoring of fish, and one the monitoring of fishing or income, respectively.

Monitoring fishing

A majority of CFC members consulted were interested in monitoring poaching. Among members focused on this aspect, 100% wanted to pay priority attention to the fishing gear used, while 85% were also interested in monitoring the origin of poachers ("name and shame" approach). However, consultees did not want to frontally and personally address illegal fishing in order to avoid creating personal conflicts in the village. They indicated that "infraction report boxes" were already in place in some CFi and recommended the extension of this technique.

Cantonment officers recommended a monitoring that would also allow assessing the benefits of patrolling, in particular to determine the optimal patrolling frequency (i.e. cost/effectiveness ratio, effectiveness being quantified via the number of offences or the legal fishers' catch). They also flagged the need to distinguish fishers using illegal methods (i.e. plain poaching) from fishers fishing legally in a given CFi area while being from another village or CFi – which is a major issue between fishers but not an illegal activity. Regardless of poaching, Cantonment officers also recommended i) a monitoring of the number of fishers (which allows a better assessment of the management success, in case the catch per fisher remains constant but the number of fishers increases), and ii) a monitoring of the distance to fishing grounds, as

an indicator of (decreasing) local abundance. They also underlined the fact that fishing effort should integrate the dimensions and mesh size of nets, but that recording these parameters is arduous.

Monitoring fishery management results

When consulted about the monitoring of management outcomes, 14 participants out of 28 saw as a priority a focus on identifying the best conservation interventions.

Cantonment officers also recommended a focus on management outcomes, but underlined the fact that monitoring of "conservation zones" is unnecessary at the moment as they are not actually implemented.

Monitoring fish

Overall, monitoring fish catch does not raise strong interest among communities: four participants only out of 28 recommended monitoring the trend in total abundance and 6 out of 28 recommended monitoring the trend in catch of valuable species. The latter parameters are not seen as priorities for monitoring as they are intuitively perceived by fishers from their daily activities. In all cases fishers and CFC members recommended to focus at best on a few species of specific interest (either commercial or as a marker; e.g. *Henicorynchus sp., Mekongina erythrospila, Probarbus sp., Channa sp.*).

Cantonment officers recommended more specifically monitoring of breeding fish (i.e. of individuals with eggs) and of valuable species in relation to habitat (where do they spawn? network of observation about the ecology of valuable species).

Monitoring fishery socioeconomics

Monitoring fish processing was not seen as a priority by CFi members consulted, as this activity is not locally very developed. However, FiA officers proposed a module on fish processing, so that successful CFi can share information about most relevant species for processing, best prices and recommended cost-effective processing methods.

Cantonment officers recommended a module on the monitoring of fish prices offered by fish collectors and mongers, in order to provide fishers with better economic information.

CFi members did not express interest in monitoring broader social variables such as nutrition or health status, immigration, access rights or role of women (these are seen as being the responsibility of village heads, authorities or NGOs).

Monitoring other variables

Villagers expressed their interest in monitoring their relationship with the Fisheries Administration and the responsiveness of the latter, in order to improve actual co-management.

Building on their experience from Yali and Nam Theun 2 dams, Cantonment officers recommended a module focused on the monitoring of water levels, of water quality (a measurement relevant to water fluctuation downstream of dams, in particular to document any hydropeaking operation) and of algal development - even though the modalities and units of such measurements were unclear to all.

Cantonment officers also recommended the development of a module on aquaculture (monitoring of who is successful, why, which fish species are farmed, how are they farmed?).

Recording and summarizing results

Means locally available to analyse numerical information consist in small calculators and telephones. In terms of calculation skills, a majority of fishers and CFC members consulted indicated that they were familiar with addition, subtraction or multiplication, but less so with division and not with averaging. Only a few young CFC members in villages close to cities have a smartphone, and they highlight the high cost, for them, of accessing Internet –resulting in a restricted use of it. None of the CFC or village offices has a computer.

A large majority of interviewees indicated their preference for tables of actual numbers. Coding with letters was unclear to many and color coding (red/orange/green) was not meaningful to villagers unfamiliar with traffic lights.

3.3. Testing and validating proposed methods

We present below ten self-monitoring methods developed for the project, based on interactions with communities and Cantonment officers.

Methods were developed based on the themes, recommendations and constraints identified during consultations. These monitoring methods were put in place in five pilot CFi between February and December 2020. Constraints linked to the COVID pandemic (international trips impossible, internships canceled, meetings with communities canceled during virus outbreaks) restrained the development of additional modules. However, the ten modules presented here have been reviewed, commented and improved during a consultation with communities and FiA officers (in particular CFis who tested these methods) on 26 February 2021. A final vote among the 30 meeting invitees showed a 100% endorsement and a recommendation for large scale training about these methods was issued.

4. MONITORING FISHING

4.1. Monitoring the number of fishers

OBJECTIVE

This activity is for Community Fisheries that want to quantify the number of local village fishers operating in their fishing area.

METHOD

What to do

Visit each household and ask how many members practice fishing in this household. Questions must distinguish:

- people who do part time self-consumption fishing (fishing for family meals)
- people who do part-time fishing (fish is sold but fishing represents less than 50% of total household income);
- people who do commercial fishing (fish is sold and fishing represents more than 50% of the total household income)
- people who are full time professional fishers

Note: threshold "50% of income from fishing" is used in livelihood modules of the project to define professional fishing, but this arbitrary threshold is subject to recurrent debates, and also to seasonality (fishing can represent more than 50% of households' income in some seasons, and less in others), which complicates the definition of full-time vs. part-time fishers.

Frequency

This extensive and heavy census should be done once a year, or twice a year if possible (open and closed fishing seasons)

Who does it

This census is to be done by CFC members or volunteers

Time needed

This census is expected to take a few days

INFORMATION MANAGEMENT

Recording information

Information should be recorded using the following sheet (Table 3). The total number of people in each category should be summed up.

A census implemented a few days long each year during several years allows assessing trend in the number of fishers.

Household number	Name of the family	Number of people catching fish for self- consumption (including women and children)	Number of people catching fish for self- consumption and sale	Number of people catching fish for sale only	Remark
Household #1					
Household #2					
Household #3					
SUM					

Table 3: Information sheet to monitor the number of fishers

4.2. Identification of offenders

OBJECTIVE

This activity is for CFi that want to record infractions and identify the people of the village who repeatedly commit infractions, without creating personal or social conflicts.

Note: Infractions noticed during CFi patrolling are already recorded as part of the Community Fishing Area Management Plan (CFAMP) activities and of the interaction between the CFi and the Fisheries Administration. The approach proposed here has already been implemented, in a way considered successful by stakeholders, under the guidance of the Northeastern Rural Development NGO (NRD) in Kratie Province.

METHOD

What to do

• Get from FiA a clear list of legal vs. illegal gear (including the season of legal use)

• Put in place, in the Commune Office or in the CFi Office, a box for people to anonymously report infractions, date, name of the offender, name of the gear used and nature of the offence: illegal fishing or encroachment (i.e. fisher from another community fishing in the CFI fishing area). See Figure 5.

Date?Name of offender?Name of gear?Illegal fishing or encroachment?Villagers should be able to access the box any time and to anonymously drop their notes. Ideally, the boxshould have two padlocks and the keys should be held by two different CFC members (Figure 6).

					0.0
Dat	te				_
Na	me of	offend	er		_
N	ame oj	f gear			_
1	liegal	fishing	or encr	oachm	ent
F					

Figure 5: Standard sheet to report fishing offences

- Inform the community about the purpose of the box:
 - to document the intensity of illegal fishing
 - to formally identify the main infraction gears
 - to curb illegal practices by identifying and publicly naming those who repeatedly fish illegally



Figure 6: Infraction report box

Frequency

The box is open every month during a CFi meeting.

Every three month, the trends of the last three months should be assessed (has the number of infractions increased, decreased or remain stable?)

Who does it

The box should be opened by the CFC members in charge, in front of the audience.

No discussion with offenders named is initiated during the meeting. Illegal practices should be handled using the Conflict management procedures identified in the project Fisheries co-management training manuals.

Time needed

This activity is straightforward and does not consume much time.

INFORMATION MANAGEMENT

Recording information

The CFC records figures in a dedicated notebook used only for that purpose.

Each month, when the box is opened, the CFC should sort notes by name of offender then record the names of offenders identified, the number of infraction reports for this month for each offender, and the gear reported for each offender.

Name of offender	Gear reported	Number of illegal fishing reports	Number of encroachment reports
Name A			
Name B			
Name C			
Unknown name			

Table 4: Information table for fishing offences

Information communication

Information may remain within the community for internal conflict management, or handed over to authorities for action In addition, the CFC can inform CFi members and local authorities about the trend in numbers of offenders.

5. MONITORING FISHERY MANAGEMENT RESULTS

5.1. Monitoring the benefit from patrolling

OBJECTIVE

This activity is for Community Fisheries willing to assess the benefits of patrolling or determine the patrolling frequency that produces optimal results

METHOD

What to do

Take note of each patrolling trip done, of the cost of each patrolling trip (boat, petrol, people's time) and note, after a number of patrolling trips, of the result or benefit from that monitoring.

Cost of patrolling:

- Cost of petrol for a patrol trip (KHR) \rightarrow daily cost of petrol (A)
- Income of a fisher per month divided $25 \rightarrow$ daily cost of a fisher patrolling (B)
- Number of fishers in a patrol (C)
- Cost of engine maintenance over a year, divided by 365 → Daily cost of the engine (D)
- Number of boats in each patrol (E)
- Number of days of patrolling per month (F)
 Cost of a day of patrolling, per boat: A + (BxC) + D = G
 Cost of a month of patrolling: E x F x G = H

Frequency

Review should be done each month, during a monthly CFC meeting.

Who does it

This is to be done by the CFC

Time needed

The amount of time spent patrolling is determined by the CFC, based on available resources (boats, fishers, etc.). The above calculation can help determine the optimal cost/benefit of patrolling.

INFORMATION MANAGEMENT

Recording information

Record in a specific notebook:

- the number of patrols done each month,
- the cost of each patrol (boat, petrol, people's time) in KHR or USD;
- the number of infractions noted during patrols;
- the number of offenders caught or notified or the number of gears seized;
- the number of illegal gears seized (if relevant)
- remarks, if any

See Table 5.

Patrol number	Date	Cost of the patrol (riel or USD)	Number of infractions noted	Number of offenders caught or notified	Number of illegal gears seized	Remark
Patrol #1						
Patrol #2						
Patrol #3						
Sum		Total cost of patrolling	Total number of infractions	Total number of offenders caught or notified	Total number of gears seized	

 Table 5: Information table about patrolling cost/benefit

The above table can be analysed as, for instance:

- trend, over several months, in the number of infractions or of gears seized
- proportion of infractions noted vs. offenders caught or notified
- cost of apprehending one offender (total cost of patrolling divided by the number of offenders)
- frequency of patrolling vs. number of gear seized (i.e. to identify optimal frequency of patrolling based on gears seized)

-

Information communication

These results can be kept for internal use or communicated to other CFi during annual gathering as a way to communicate and spread most effective fishery management strategies.

5.2. Identification of best management interventions

OBJECTIVE

This activity is for Community Fisheries willing to identify their most successful management initiatives, as assessed by their male and female members.

METHOD

What to do

The CFi should list the management interventions detailed in its Management plan, and call a CFi meeting to consult the CFI members about their assessment of results and benefits from *each activity*. The present assessment is **based on CFi members' opinions only**.

Questions should be, for each activity:

- How many members think that this activity has a positive impact on the community?
- How many members think that this activity has a positive impact on the fish resource?
- How many members think that this activity has a positive impact on the environment?
- How many members think that this activity has a positive impact on the society and by gender?
- How many members think that this activity should be continued?

Importantly, male and female community members should vote separately, so that the CFC can assess the respective satisfaction rate for each gender. This process will allow flagging measures that might satisfy one gender but not the other, without seeing the opinion of minority female members lost in a common vote.

Note: We recognize that an assessment of management results based on members' opinions only is insufficient (quantitative measurement of results is desirable) but the method is proposed as a preliminary step before a systematic review of management actions, since the continuation of management efforts mainly depends on CFi members' opinions.

Frequency

This assessment is to be done once a year, during a full CFI meeting.

Who does it

The assessment is to be organized by the Community Fishery Committee, with all CFi members voting.

Time needed

Time needed depends on number of activities listed for consideration. Overall, voting might take around one hour as part of an annual meeting.

INFORMATION MANAGEMENT

Recording information

The results of votes should be noted as indicated below (Table 6).

Name of activity	Percentage of male CFI members positive about benefits <u>for</u> <u>the community</u>	Percentage of <i>male</i> CFI members positive about benefits f <u>or</u> <u>the fish resource</u>	Percentage of <i>male</i> CFI members positive about benefits <u>for</u> <u>the environment</u>	Percentage of <i>male</i> CFI members deciding to continue the activity
Number of <i>male</i> CFI members		()	X)	
Number of <i>men</i>	positive about benefits for the community (A)	positive about benefits for the fish resource (B)	positive about benefits for the environment" (C)	who decide to continue the activity (D)
Percentage of <i>men</i> positive about the activity	%=(A*100)/X	%=(B*100)/X	%=(C*100)/X	%=(D*100)/X
Name of activity	Percentage of <i>female</i> CFI members positive about benefits <u>for</u> <u>the community</u>	Percentag of <i>female</i> CFI members positive about benefits <u>for</u> <u>the fish resource</u>	Percentage of <i>female</i> CFI members positive about benefits <u>for</u> <u>the environment</u>	Percentage of <i>female</i> CFI members deciding to continue the activity
Number of <i>female</i> CFI members		()	X)	
Number of <i>women</i>	positive about benefits for the community (A)	positive about benefits for the fish resource (B)	positive about benefits for the environment" (C)	who decide to continue the activity (D)
Percentage of <i>women</i> positive about the activity	%=(A*100)/X	%=(B*100)/X	%=(C*100)/X	%=(D*100)/X

Table 6: Information tables about opinions regarding each activity.Tables distinguish votes from malesand female CFi members. Formulas given allow calculating the percentage of opinions for male andfemale members respectively.

The above table is the summary of the CFi members' perspective on the annual fishery management interventions.

Information communication

The above table can be used to communicate preferred management results to other CFi during annual gatherings.

6. MONITORING FISH

6.1. Monitoring fish catches

OBJECTIVE

This activity is for Community Fisheries willing to record the catch of individual fishers as indicators of the catch in the CFI, and to assess the trend over several years.

METHOD

What to do

The monitoring unit is one day of fishing by one fisher with one gear.

- For each fishing day recorded, identify the gear
 - (it does not make sense to compare the daily catch of different gears)
- Five levels of accuracy, increasingly demanding, can be considered:
 - 1) All species are lumped, and only the total number of fishes is counted. This corresponds to a very basic monitoring of the average number of fishes caught per fisher per day.
 - 2) All species are lumped, and only the weight of the total daily catch is measured. This allows monitoring the biomass caught by a fisher per day.
 - 3) All species are lumped; total number of fishes and total weight of all species are measured. This allows monitoring the biomass caught by a fisher per day and the average weight of an unspecific fish (in order to assess whether fishes caught are getting smaller, without being to show whether smaller fishers correspond to smaller individual of the same species, or a changes in species composition towards smaller species)
 - 4) Number of fishes and weight by species are measured for selected species. These selected species can be species of particular interest (either because of their commercial value, or because it is felt they are declining). The species of interest are often named in the Management Plan. This monitoring allows assessing the trend in catch by species and to calculate the average size of fishes by species.
 - 5) *Number of fishes and weight by species are measured for all species.* This allows assessing the trend in catch by species and to calculate the average size of fishes by species.

Option 3) is the best compromise between monitoring effort (pressure on fishers involved in the monitoring, time requirement, need of a scale) and quality of the biological information gathered.

Frequency

Monitoring should be done at least one day per week. Each month, the CFC meets to review the catches.

Who does it

In order to integrate the variability in fishing effort, at least **two fishers** should do the monitoring in each CFi. Monitoring should be done by volunteer fishers, in particular individuals recognized as full-time professional "elite fishers". In several communities, volunteers are CFC members, but it can be other fishers.

If several fishers contribute to the monitoring, the quality of monitoring is strengthened. In that case, it is preferable to involve fishers who use similar gears (e.g. gill nets).

Since monitoring is demanding (risk of volunteers dropping out), a turnover is recommended: each volunteer works during one or two months, then another fisher with a similar gear and fishing effort takes over.

Time needed

Time required depends on the level of accuracy expected (see levels 1 to 4 above). Options 1) is the fastest (only counting fish and noting this value, once a week). Option 2) is fast but requires a scale. Option 3) requires about 10 mn at most for each fishing operation measured. Option 4) is more demanding and depends on the number of selected species. Option 5) is quite demanding in terms of fisher's time (need to name, count and weight each species caught) and time requirement depends on the size and diversity of the catch of the day.

INFORMATION MANAGEMENT

Recording information

One single notebook should be dedicated to the monitoring. In order to keep the information in one single place, the fish monitoring notebook should be handed by the previous fisher to the next fisher, each fisher taking his daily notes in that notebook.

Records from the notebook should be reported in a table (Table 7). Each record represents one day of fishing by one fisher with one gear.

Month	Specie	es A	Species B		Species C	
	Number of fish	Catch (kg)	Number of fish	Catch (kg)	Number of fish	Catch (kg)
Fishing #1						
Fishing #2						
Fishing #3						
Fishing #n						
Sum	Total weight (kg)	Total nb of fishes	Total weight (kg)	Total nb of fishes	Total weight (kg)	Total nb of fishes

Table 7: Information table for fish catches depending on the monitoring option selected.Weight is recorded in kilograms as fishers use mechanical scales in kg.

Each month, the CFC meets to calculate the sum of catches per species, and possibly the average catch per species per day during that month.

f

Information communication

For each target species, the CFC can report to authorities or NGOs the total weight and total number of fishes per month monitored in their CFi (importantly, this is not the total catch of the CFi, but only the catch of the fishers monitored).

Ideally, the CFC should also report, for each month, the average catch per fisher per day (this information gives a more detailed account of the fish catch by integrating the fishing effort).

Over many months, this information can indicate the trend in the catch of the fishers monitored.

The present monitoring is focused on information gathering by communities for their own use. However, if several villages implement this protocol at the same time and in the same way (i.e. same data collection option), a compilation of data sets from these villages is also relevant for fisheries analyses at a provincial or national scale.

7. MONITORING FISHERY SOCIOECONOMICS

7.1. Monitoring of fish prices

OBJECTIVE

This activity is for CFi fishers who want to compile information about fish prices offered by traders, in order to get more bargaining power.

Note: this activity implies that there is room for bargaining at the level of traders, which is not always the case (traders also are subject to strong market constraints and to competition). It also ignores the direct agreements often put in place between traders and fishers (e.g.: when the fisher pre-finances the cost of fishing gear, in exchange for exclusive rights to buy the fish caught).

METHOD

What to do

This activity requires the cooperation of several fishers.

Information is simply recorded by consulting each fisher about the price he gets per kilogram for a given species. Neither traders nor fishers are named.

Frequency

This information can be compiled once a month, possibly more often at times of strong fishing intensity, when fish prices vary a lot.

Who does it

One of the CFC members can volunteer to interview fishers and record information. Names of fishers should not be recorded.

Time needed

The time required for that activity depends on the frequency of gathering, but may not require more than a few hours of one person each month.

INFORMATION MANAGEMENT

Recording information

Fish prices are recorded by species and fisher

Fish species	Price per kg (fisher #1)	Price per kg (fisher #2)	Price per kg (fisher #3)
Species A			
Species B			
Species C			
Species D			

Table 8: Information table about price per kilogram per target specie and per fisher

Information communication

Information is presented back to all fishers during CFi meetings, once a month or more often during intensive fishing periods.

7.2. Monitoring income from key fish species

OBJECTIVE

This activity is for Community Fisheries willing to assess the income per fisher from a few species considered commercially important. This monitoring allows integrating price elasticity (price per kilo increases when catches decline) and reflect the actual income from fishing.

Note: A more comprehensive economic monitoring including cost of fishing, value of secondary species or value of household self-consumption is desirable, but was considered too complicated by communities consulted.

METHOD

What to do

Identify first the list of species of interest. Consider five to ten species.

The monitoring unit is one day of fishing by one fisher with one gear.

• For each species of particular interest, record weight of the catch and price per kg

Month	Species A			Species B			Species C		
	Weight (kg)	Price per kg	Income	Weight (kg)	Price per kg	Income	Weight (kg)	Price per kg	Income
Fishing #1									

Table 9: Information table about fish catch and income for each fishing operation

Frequency

If this monitoring is combined with a monitoring of other catches (see section 6.1), then it should be done at least one day per week by each fisher involved.

If this monitoring is not combined with a monitoring of other catches but limited to the value of a few key species, then it should be done at least three days per week by each fisher involved.

Each month, the CFC meets to review catches and income.

Who does it

Monitoring should be done by volunteer fishers, in particular individuals recognized as "elite fishers". In several communities, volunteers are CFC members, but it can be other fishers.

In order to integrate the variability in fishing effort, at least **two fishers** should do the monitoring in each Community Fishery.

Since monitoring is demanding (risk of volunteers dropping out), a turnover is recommended: each volunteer works during one or two months, then another fisher with a similar gear and fishing effort takes over.

Time needed

Weighting the catch by species of interest and noting the price per kilogram takes about 15 minutes after each fishing session.

INFORMATION MANAGEMENT

Recording information

One single notebook should be dedicated to the monitoring. In order to keep the information in one single place, the fish monitoring notebook can be handed by the previous fisher to the next fisher, each fisher

taking his daily notes in that notebook. A more confidential option implies one notebook by fisher, and a notebook at the CFC to combine the information from different fishers.

Each month, the CFC meets to calculate for each target species the sum of catches and the gross income, and possibly the average income per fisher per day during that month.

Month	Species A			Species B			Species C		
	Weight (kg)	Price per kg	Income	Weigh t (kg)	Price per kg	Income	Weight (kg)	Price per kg	Income
Fishing #1									
Fishing #2									
Fishing #3									
Fishing #n									
Sum	Total weight (kg)		Total income	Total weight (kg)		Total income	Total weight (kg)		Total income
Average catch per fishing per day	Total weight (kg) / Nb of fishing operations		Total weight (kg) / Nb of fishing operations		Total weight (kg) / Nb of fishing operations				
Average income per fishing per day	Total income / Nb of fishing operations		Total income / Nb of fishing operations		Total income / Nb of fishing operations				

Records from the notebook(s) should be reported in a table (Table 10). Each record represents one day of fishing by one fisher with one gear. Calculations and summaries should be done each month.

Table 10: Information table about fish catches and income from fishing

Information communication

For each target species, the CFC can report to authorities or NGOs the total weight and total income per month monitored in their CFi (importantly, this is not the total catch and income of the CFi, but only the catch and income of the fishers monitored).

Ideally, the CFC should also report, for each month, the average catch per fisher per day and the average gross income per fisher per day (this information gives a more detailed account of the fish catch and income by integrating the fishing effort).

Over many months, this information can indicate the trend in the *catch and income* of the fishers monitored.

8. MONITORING OTHER VARIABLES

8.1. Monitoring water level

OBJECTIVE

This activity is for Community Fisheries willing to monitor the variations of water level, for instance in relation to flooding or downstream of a dam.

Note: the monitoring system proposed below is for an assessment of local hydrological variability, i.e. relative measurements only. A similar approach was introduced in some places along the Mekong by the Asian Disaster Preparedness Center. In case of a large scale issue, FIA or MOWRAM authorities can standardize CFI records by relating the water level measured locally on a given day to a measurement the same day on a standard gauge in a nearby reference hydrological station.

METHOD

What to do

• During the dry season, at minimal water level, plant by the river or in the floodplain a pole whose height is superior to the expected maximum water level. It is essential to solidly implant the pole as it should resist to several annual floods.

• Buy three or four tailor meters, and nail the first meter as low as possible on the pole

• Nail additional meters on top of the first one, in order to ensure 3 or 4 meters of measurement (depending on the local variability in water level). See Figure 7.



Figure 7: Technique for water level measurement

Alternatively, for high water levels

• During the dry season, select a strong tall tree as close as possible from the river (ideally with its roots in the water). Zero mark should be down in the water, with increasing heights upwards.

• Buy three or four tailor meters, and nail the first meter as low as possible on the tree trunk. Make sure the measurements are in centimeters, not in inches.

• Nail additional meters on top of the first one, in order to ensure 3 or 4 meters of measurement (depending on the local variability in water level). See Figure 8.



Figure 8: Alternative technique for water level measurement

Alternatively, in the Mekong mainstream

If precise measurement is not required, then concrete studs marking navigation channels can be used as a reference to assess the relative variability of the water level, at least in the dry season (Figure 9). In such case:

- choose a reference concrete stud visible from the bank.
- record the number of steps of this stud (e.g. the right stud on Figure 9 features 8 steps)
- note for each measurement which step is covered by water



Figure 9: Concrete studs marking navigation channels and water level in the Mekong mainstream

Frequency

The frequency of water level measurements should be adapted to the frequency of the variability to be recorded: weekly for normal river fluctuations, daily or more often in case of rapid fluctuations, for instance downstream of a dam.

Who does it

The measurement should be done by a volunteer CFC member.

Time needed

Visual recording only takes a minute or so.

INFORMATION MANAGEMENT

Recording information

Information should be recorded in a dedicated notebook. Note date and water level for each record.

In absence of any computer to plot data, the best way to flag important or rapid fluctuations is to highlight records based on the increment from record to record (Figure 10).

05/07/2019	255 1+5
12/07/2019	260 3+5
19/07/2015	2.65 \$ +30
26/07/2013	2.95 110
02108/2019	3.05 1+10
10/08/2019	3.154+5
16/08/2013	3.204+5
23/08/2019	3.25
30/08/2013	3.251
5/03/2013	3.35
13/09/2013	3.40
20/09/2019	3.50
27103/2013	3.55
1.1	

Figure 10: Example of water level records, in which important fluctuations are highlighted

Information communication

It is strongly recommended to share these records with local authorities or NGOs, so that they can i) better plot them using computers, and ii) relate them to standard gauges of the national hydrological monitoring system, for adjustment and validation. This process will strengthen the credibility and validity of locally gathered data.

8.2. Assessing women's satisfaction

OBJECTIVE

This activity is for CFi or CFi women groups that want to promote the involvement of women in management or decision-making, or to assess women's benefits from the CFi activities.

METHOD

What to do

The activity consists in making sure that women express their opinion, in particular through votes.

• The CFC or women in the CFi should identify, at the beginning of the year, a series of topics specific to women or relevant to them. For instance:

- Contribution of women to CFi management
- CFi activities benefitting women
- Attention paid by the CFi to women's concerns

These topics might reflect those identified in the Management Plan in relation to women's activities.

• Once every six month or once a year, during a full CFi meeting, women (and only women) should vote and express their opinion about the above topic, and answer the question "as a woman, are you satisfied about... [name the topic]". See Table 6 in section 5.2, in which men and women vote satisfaction independently.

• The CFC should record the number and/or proportion of positive answers and initiate a discussion about this result (conclusions, next steps, time frame)

• Results of each previous vote should be presented to the audience at each follow-up meeting, and the questions previously asked and voted should be submitted to voting again, in order to assess progress in women's opinion about how the issues of relevance to them have been dealt with.

Frequency

This vote of women should take place every six month or once a year

Who does it

This activity should be organized by the CFC, and all the women of the CFi should be informed about the upcoming meeting in which female-specific issues will be discusses and voted. All women of the CFi should, as much as possible, take part to these meetings.

Time needed

It takes 2-3 hours of meetings per semester.

INFORMATION MANAGEMENT

Recording information

The questions asked to women and the results of their votes should be recorded in the meeting minutes.

Information communication

The questions debated and the results of votes are mainly for internal use, but can be communicated to FiA or NGOs.

8.3. Monitoring interaction with local authorities

OBJECTIVE

This activity is for Community Fisheries that want to objectively characterize their interaction with the Fisheries Administration and other stakeholders such Commune Council. Being able to quantify the quality of that interaction is seen by CFis as a way to improve the quality of co-management. Such assessment can help Cantonment heads to allocate appropriate human resources to co-management, or to request more resources from the central FiA if needed

METHOD

What to do

• Identify one issue requiring action by FiA (e.g. getting a document signed; organizing a patrol; reducing local poaching). The issue can be identified at the first phone call or interaction requiring follow-up.

- characterize the level of complexity of that issue: Low, Medium, Complex
- record each phone call to the Cantonment officer in relation to that issue
- record each visit by a Cantonment officer in relation to that issue
- record each letter to FiA in relation to that issue

Frequency

Make a record for any action in relation to that issue.

Who does it

This should be done by the CFC member in charge of the issue

Time needed

This monitoring only requires the time necessary to record interactions.

INFORMATION MANAGEMENT

Recording information

Information should be recorded in a dedicated notebook (Figure 11).

1	NTERACTION WITH FIA	0.0
55	sue: omplexity level:	_
(Call #1 date:	_
1	Call #2 date:	_
	Call #3 date:	_
	Visit #1 date:	
	Letter #1 date:	
	I E G G G	-

Figure 11: Monitoring of interactions with the Fisheries Administration

Information communication

This information should be shared with FiA officers is charge of each issue.

8.4. Filing

The information gathered is meant to be accessible over a long period of time in order to identify long-term trends; this requires systematic filing and storage.

The method recommended for doing so simply consists in archiving records and notes in dedicated folders (preferably clip folders) identified and stored for long-term archival. The cost of such filing system is fully compatible with CFI budgets.



Figure 12: Filing of the information gathered for long-term storage and use

9. CONCLUSION

The proposed set of 10 monitoring techniques is designed to be useable at the Community Fisheries level, using local means for local needs. The information gathering proposed does not require more than a basic calculator (Casio or telephone calculator), nor any numerical analysis more complex than averaging.

Monitoring tools cover fishing (number of fishers, identification of offenders), fishery management results (benefits from patrolling, best interventions), fish yield (catch by fisher), fishery socioeconomics (fish prices, fishers' income) and environment (water levels, women's participation, com=-management interactions). These techniques aim at providing Community Fisheries with tangible information ("data") to objectively describe trends over years, assess outputs of management intervention or document issues in view of addressing them in collaboration with authorities or NGOs.

This approach is novel, as there are very few community-based fishery monitoring programs in the world, and almost all existing ones include the gathering of data to be analyzed by external scientists, not by communities themselves. Here, the analysis becomes local, management gets informed and oriented by actual data, and situations are objectively documented for a better collaboration with line agencies or NGOS.

Cambodia is therefore exploring and developing, through the Mekong Integrated Water Resources Management project phase III, innovative ways to strengthen Community Fisheries and increase the effectiveness of fisheries management at the local level.

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11. ANNEX 1: PRESENTING THE INITIATIVE TO COMMUNITIES FOR FEEDBACK

The slides below are those presented to Community Fisheries leaders, before being presented to Community Fisheries members, together with more details about the monitoring tools propsoed.

DEVELOPING A CFI SELF-MONITORING PROGRAM

We propose to develop a common monitoring program for Community Fisheries to record information:

- relevant and useful to them
- gathered by themselves, in each CFi
- that can be analysed and summarized by themselves
- used to guide and adapt their management

For example information on:

- fish catch
- poaching and infractions
- income from fish
- etc. (to be determined by all CFi and tailored in each CFi)

WHY SELF-MONITORING IN EACH CFI?

- To observe local trends in the resource (down, up, changing, etc.)
- To observe consequences of local Management Plan and adjust actions
- To communicate with FiA, government, other CFi

Examples:

- 3SPN: impact of Yali dam -> communities had to communicate problems to the authorities
- Sharing information between CFI to learn from each other (best options for protection; enforcement, etc.)

WHAT TO DO?

Record data or information in a organized way (same between all CFI) Which information?

- o on fish?
- on fishing?
- o on management and results of management?
- on poaching?
- o on income?
- o etc.

WE WOULD LIKE TO HEAR ABOUT WHAT YOU WOULD LIKE TO MONITOR Some examples below

Information on management

Assess results from management initiatives, and cost/benefit

- More abundance?
- More species?
- More valuable species?
- More breeders or juveniles?
- Best conservation interventions?
 - o Brush parks?
 - o no-take zones?
 - o seasonal fishing ban?

What else?



Information on fish

Trends

- Catch per fisher
- Catch of all fishers
- Size of fish
 - o smaller individual or smaller species?
 - o proportion of large fish?
- Nature of fish
 - o more/less local fish, migratory fish?
 - o more alien species?
 - o more/less valuable species?
- Breeders and juveniles
 - o more/less breeders?
 - o more/less juveniles?

What else?

Information on poaching

Units: what do we count: number of people poaching? number of boats poaching? Use of fishing gears (unit?)

Village of origin of poaching fishers

What else?





Information on fishing

Trends

- Number of fishers per fishing area?
- Changes in gear?
 - Mesh size of gillnets
 - Number of gears per fisher
 - New gears

What else?



Information on post-harvest

- Income from fishing?
- Fish processing
 - Changes in fish processing
 - Cost/benefit of method(more being done, more profit ?)
- Change in beneficiaries

What else?

THANK YOU!



12. ANNEX 2: ADDITIONAL QUESTIONNAIRE TO COMMUNITIES BEFORE IMPLEMENTING SELF-MONITORING

In addition to meetings with community leaders, we propose below a questionnaire based on Martin et al. (2016). The survey targets community members who have been presented the proposed monitoring as detailed in Annex 1. The questionnaire is aimed at better understanding the motivations of fishermen to participate in the program or not, in order to amend the offer in the future.

What is your gender?
□ Male □ Female

Do you think it is important to protect the environment?

□ Yes □ No □ I don't know

Do you think this project is a good idea?

□ Yes □ No □ I don't know

Do you think it is a good thing to participate to the proposed monitoring?

□ Yes □ No □ I don't know

Do you think that your participation to the proposed monitoring will help to protect/manage the freshwater environment?

□ Yes □ No □ I don't know

Do you think that your participation to the proposed monitoring will increase your own knowledge?

□ Yes □ No □ I don't know

Do you fear you may lose money in the short term with the proposed monitoring?

□ Yes □ No □ I don't know

Do you think you gain money in the long term with the proposed monitoring?

□ Yes □ No □ I don't know

Do you think that participating to the proposed monitoring may influence your reputation?

Do you think that your participation to the proposed monitoring will provide information for the benefit of everyone?

□ Yes □ No □ I don't know

Are you interested in what will be done with the data of the monitoring?

□ Yes □ No □ I don't know

What is positive about the proposed monitoring? (several answers possible)

	 This project is relevant to my problems 	 I can contribute to management 	I can learn about new things			
	 Engaging is good for my reputation 	Our income can increase	The river can be better protected			
	Fish can be better protected	Nutrition can be secured	 Monitoring can continue even without external assistance 			
	We can document local problems	 We can better communicate with authorities 	🗆 Other			
What is negative about the proposed monitoring? (several answers possible)						

 This is not relevant to my problems 	I do not have time to contribute	I will not learn anything
 Engaging may have a negative influence on my reputation 	 This is not economically useful to me 	The river, fish or nutrition cannot really be protected
l do not feel I can usefully contribute	 Management does not require monitoring 	 Monitoring requires permanent external assistance
ur problems cannot be documented this way	 Authorities will not pay attention to what we monitor 	🗆 Other

Background

The project "Mekong Integrated Water Resources Management - Phase III" is funded by the World Bank. The objective of this project is to establish the foundation for effective water resource and fisheries management in the northeast of Cambodia. Within this project, Component 1 (Fisheries and aquatic resources management in Northern Cambodia) is executed by the Fisheries Administration and implemented by the Inland Fisheries Research and Development Institute. The objective of this component is to improve the management of fish and aquatic resources in selected areas in Kratie and Stung Treng provinces.

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