Annex 6:

Cost estimation for the environmental mitigation and monitoring

Mitigation measure cost estimation

No.	Description	Qnty	Unit cost	Annual cost, USD	Frequancy (year)	Sub-Total, USD
A	***Pre-construction phase***					
1	De-mines of remains bomb/UXO in construction site, quarries, and proposed resettlement. Total area of 3550ha. (the unit cost (1,500-2000$/ha) based on de-mining rate in Cambodia, and the total area obtain from PECC1 resettlement expert (Mr. Duc))	3550	1,500		1	5,325,000.00
2	Land concession and forest consession, especially compensate to plantation and product (EVN/***PECC-1, MIME, MAFF, CDC, and local authority will deal on this issues***)					53,759,467.00
3	Compensation for whole resettlement of the project (***Base on the resettlement study results***)					
	Sub-total:					***59,084,467.00***
B	***Construction phase***					
1	Fish center construction	1	500,000		1	500,000.00
2	Forest-seeding-station	1	300,000		1	300,000.00
3	Water quality examination	1	1,000	1,000.00	5	5,000.00
4	Traffic sign and facilitator	1	5,000	5,000.00	5	25,000.00
	Sub-total:					***830,000.00***
C	***Operation phase***					
1	Baby fish production and fish center operation	1	100,000	100,000.00	10	1,000,000.00
2	Reforestration: (small) trees production/plantation, including tree station operation and forest management	1	1,000,000	1,000,000.00	30	30,000,000.00
3	Wildlife and its habitat conservation	1	500,000	500,000.00	30	15,000,000.00
4	Water quality examination	1	1,000	1,000.00	30	30,000.00
5	Training/capacity building or income restoration to PAH and APs, 1579HH	1579	300		1	473,700.00
6	Compensation to (in reservoir site) people livelihood due to the project will damage forest-byproduct by provide agricultural extension program and rural credit, etc.	1638	296	484,029.00	10	4,840,290.00
7	Compensation to upstream people livelihood due to the project will damage aquatic resources by provide agricultural extension program, feeding animal, feeding fish, and rural credit, etc.	6664	200	1,332,800.00	10	13,328,000.00
8	Compensate or improve tourism facility	1	50,000	50,000.00	10	500,000.00
	Sub-total:					***65,171,990.00***
	Grandt total			**3,473,829.00**		**125,086,457.00**

Note: - # of HH living along the Se San river in Rattanakiri — 4598 HH, data 2007, Obtain from commune profile of MoI
- # of HH living along the Srepok river in Rattanakiri and Mondulkiri — 1871 HH, data 2007, Obtain from commune profile of MoI
- # of HH will affect by Lower Se San 2 HPP — 1579 HH, data estimate in 2011 (by resettlement study team)
- # of HH living in project area — 1638 HH, data 2007 (commune profile)

Monitoring Cost Estimation

No.	Description	Frequency	Qty	Lab cost	Transport	Engineer rate*	Person	Amount	Total
Pre-Construction phase									
1	Investigate new settlement area to screen the impact on social and environment in place.	One time for draft final design, and one time for final design	2	0	100	120	3	660	1,320.00
2	Check the alignment of detour road, access road, and new resettlement area	One time for draft final design, and one time for final design	2	0	20	20	2	80	160.00
3	Check the detail project report to make sure the solving committee for the land conflict ready established and work effectively	One time for draft final design, and 5 time for final design and completed compensate	5	0	100	120	4	880	4,400.00
4	Check the compensation and resettlement action plan implementation are effective as real result on the reseltlement study	One time for draft final design, and 10 time for final design and completed solving	11	0	100	120	3	660	7,260.00
	Sub-total:								***13,140.00***
Construction phase									
1	Inspect on release flow, dimension of diversion canal that can do navigate of small boat. Check the canal functioning	two times in first construction stage and quaterly in whole construction period	22	20	20	20	3	120	3,080.00
2	Check drainage system make sure project implementing company and contractor adequate provide	Along the road construction and other construction site	20	0	20	20	2	80	1,600.00
3	Inspect on the erosion and sediment laden protection facilities/method, kake sure the mitigation measure are properly applied	Monthly in raining season entire construction period	20	0	20	20	2	80	1,600.00
4	Check waste management facility and its functioning use for project	Quaterly in whole construction period	20	0	20	20	1	40	800.00
5	Control/check water quality.10 parameters will take for examination such as pH, Conductivity or Total dissolved solid (TDS), DO, BOD5, COD, Tot-N, Tol-P, NO3 -N, PO4 –P, Tot-Coliform.	Quaterly in whole construction period	20	500	110	140	2	500	20,000.00
6	Control/check air quality that emitted from the construction activities. Parameters to be measure: TSP, NO2, SO2, CO, and Noise	Every 6 month entire construction period	6	2020	110	140	2	500	15,120.00

No.	Description	Frequency	Qty	Lab cost	Transport	Engineer rate*	Person	Amount	Total
7	Inspect on forest cutting for the project is exactly in the limit of project site required. Inspect to make sure there is not elligal reclamation or hunting from the project staff	Weekly or Monthly in clearing for the construction site and clearing in reservoir area	50	0	20	20	2	80	4,000.00
8	Inspect on the protection method and facilities	Weekly or Monthly in construction period	50	0	40	20	2	120	6,000.00
9	Control elligal fishing activies from project staff	Monthly in construction period	40	0	20	20	2	80	3,200.00
10	Inspect on the existing and access road that use	Quarterly in construction period	20	0	20	20	2	80	1,600.00
	Sub-total:								***57,000.00***
Operation phase									
1	Check any research on fauna and flora are carried out	Yearly in first 5 years operation period	5	0	110	140	2	500	2,500.00
2	Control/check water quality.10 parameters will take for examination such as pH, Conductivity or Total dissolved solid (TDS), DO, BOD5, COD, Tot-N, Tol-P, NO3 -N, PO4 –P, Tot-Coliform.	Every 6 month through operation phase	60	500	110	140	2	500	60,000.00
3	Check how was the fish research center worked?	Yearly in first 5 years of operation period	5	0	110	20	2	260	1,300.00
4	Check how was the forest-seeding-station worked?	Yearly in first 5 years of operation period	5	0	110	20	2	260	1,300.00
	Sub-total:								***65,100.00***
	Grad Total:								**135,240.00**

Note: * The above rate include accomodation, food, and poket money per field work
'- The cost above was counted with proposed operation period is 30 years

Cost Estimation of Mitigation Measures (by VN HPPs)

No.	Description	Annual Cost, (USD)	Frequancy, (Year)	Estimation Cost, (USD)
Pre-construction phase and during construction phase				
1	UXO, Mines		1	4,388,000.00
2	Collection of daily waste	12000	5	60,000.00
3	Reservoir clearance			
	Toxic chemical treatment		1	3,076,000.00
	Disinfection of residential areas and grave's remaining within reservoir		1	85,350.00
	Vegetation clearance 1km upstream of dam site		1	1,200,000.00
4	Mosquito prevention and medicine		5	20,066.00
5	Environmental Management	20,000	5	100,000.00
6	Land concession and forest consessioncompensation		1	53,759,467.00
7	Compensation for whole resettlement of the project			
Operation phase				
1	Baby fish production and fish center operation	100,000.00	10	1,000,000.00
2	Environmental Fund to Cambodia Government	500,000.00	30	15,000,000.00
	Total Cost			**78,688,883.00**

KINGDOM OF CAMBODIA

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APPENDIX OF EIA REPORT

FISHERY STUDY

TERRESTRIAL WILDLIFE STUDY

SOCIO-ECONOMIC STUDY

FOR

FEASIBILITY STUDY OF LOWER SE SAN 2 HYDROPOWER PROJECT, STUNG TRENG PROVINCE, CAMBODIA

Prepared by:

POWER ENGINEERING CONSULTING JOINT STOCK COMPANY 1 - VIETNAM

KEY CONSULTANTS CAMBODIA

Phnom Penh, July 2008

CONTENT

Appendix 1 IEIA/EIA report guideline MoE and ToR by PECC-1

Appendix 2 Fish study report

Appendix 3 Terrestrial wildlife study report

Appendix 4 Socio-Economic survey report

Appendix 1

IEIA/EIA report guideline MoE and ToR by PECC-1

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MINISTRY OF ENVIRONMENT
DEPARTMENT OF ENVIRONMENTAL
IMPACT ASSESSMENT REVIEW AND
MONITORING

Phnom Penh,.....

Guideline for conducting Environment Impact Assessment (EIA) Report

- Reference to Sub-decree on EIA Process, N^0 72 ANKR.BK Dated 11th August 1999,
- Reference to Prakas on Guidelines for preparing EIA Report, N^0 49 BST.SSR Dated 09th March 2000.

Department of Environmental Impact Assessment prepared a format of guideline for conducting EIA report. The Project's owner should prepare EIA Report to abide by this guideline; at least, EIA Report should be described as follow:

1. Project Summary

The project's owner should describe in short form with identification of project's goals and main objectives, methodologies, and key measures for reduction of environmental impact in EIA report.

2. Introduction

- Type, size, and location of the project
- Background of the project's location
- Within the framework of national and international laws and legislation standards.

3. Purpose of the Project

Project owner's should clearly explain about purpose of the project for recent and future.

4. Project Description

- Briefing alternatives: size, location, timeframe (stages of project construction, project operation, and project abandon or closure) and sources of labor forces.
- The production process: sources and quantity of raw materials to be used and finished products.
- Machinery requirement to run the project.
- Methodologies of wastes disposals in order to determine any environmental impacts.
- Description about the quantity and quality of solid and liquid waste to be disposed and discharged, sources of noise and vibration resulting from the process of this project (construction, operation) and the emission of particles into the atmosphere.
- Project planning.

5. Description of Environmental Resources

This part should be described all environmental resources needed such as:

5.1 Physical resources:

- Air (speed, quality, regime, climate,...)
- Water (surface and ground water quality, currents and quantity, ...)
- Land (soil quality, relief, geology, ...)

5.2 Ecological resources:

- Bio-diversity
- Fauna
- Flora
- Forest, etc....

5.3 Socio-economical resources

- Population and their settlement
- Infrastructure
- Land use
- Public health and welfare
- Condition of economic (livelihood, professional, and community)
- Custom, tradition and other group ethnic, etc.....

6 Public Participation

All opinion given by the public in EIA process should be addresses for all which can be contributed to the decision making process. Public participation includes:

- Local authorities and institutional approval
- Opinion of the public towards the developmental project
- Consultation
- Company interpretation.

7 Environmental Impact Analysis

All significant environmental impacts resulting from the project should be described in this part which includes:

7.1 Methodologies to identify the scope of the environmental impacts (by using the Matrix table).
7.2 Environmental impact during project construction
7.3 Environmental impacts during project operation
7.4 Environmental impacts after the project abandon or closure stage.
7.5 The extent and kinds of significant accumulative environmental impact.

8 Environmental Impact Mitigation Measures

Of the all environmental impacts stated above should be assessed by the project's owner in order to define a specific environmental impact mitigation measures.

9 Economical Analysis and Environmental value

In this part, the project's owner should indicate the benefits of the project comparing to the value or cost of the local environmental damages.

10 Environmental Management Plan

The environmental Management Plan is an important programme implemented by the project's owner and other institutional involved. These plans include:

- The Environmental Protection Measure in the stage of:
  - Project construction
  - Project implementation
  - Project abandon or closure.
- The Environmental Monitoring Programme in the stage of:

- Project construction
- Project implementation
- Project abandon or closure.

– Training programme

11 Institutional capacity

In this part, the project's owner should demonstrate that he has the institutional capacity top carry out the work association with the execution of EIA, and the implementation of the mitigation measures such as:

- Organization structure
- Budget/ schedule
- Staff skills
- Methodological tool and equipment.

12 Conclusion and Suggestion

In this part, the project's owner has to include over the assessment of environmental impacts both positive and negative aspects with full accountability and responsibility in the process of reporting the EIA as well as addressing some possible suggestions implicated in the project.

13 References

TOR
Environmental impact assessment

I. GENERAL

Lower Se San 2 HPP locates totally on Cambodian territory, the expected project site is about 1.3 km far from the confluence of Srepok and Se San downstream wards. The reservoir mainly locates in the Se San district, Stung Treng province.

Dam site is selected at the relatively flat river part, total length of the dam is about 6km. with the full supply level of 75m, the reservoir will submerge an area of 394 km^2 and resettlement households number is about 1224.

Main parameters of Lower Se San 2 HPP (planning document)

No.	I.1 Items	Unit	Quantity
1	Catchment areas	Km^2	49170
2	Mean annual flow	m3/s	1315
3	Full Supply Level FSL	m	75
4	Minimum Operating Level MOL	m	74
5	Reservoir surface area	Km^2	394
6	Reservoir volume Gross/ Active	10^6 m^3	2415.4/279.8
7	Installed capacity	Mw	420
8	Mean annual energy	10^6 kwh	2219.6
9	Dam Crest length / dam height	m	6100/24
10	Hydropower house at dam body	MW	420
11	220 Kv Transmission line	Km	250
12	Construction road	Km	5
13	Number of resettlment households	Households	1224

Note: The environmental impact from transmission line is not included in the EIA study in this stage. A separate EIA study for transmission line will be done in next study stage.

The EIA is expected to be prepared including Physical environment, Ecological environment and Social environment. Details studies of key fields and outline of EIA report are as follows:

II. PHYSICAL ENVIRONMENT

II.1 HYDROLOGY

The study team will describe of surface water and groundwater resources that presented in the project area. River flow and flooded level of each river is important information, secondary data and the study result shall be included. Groundwater table, yield, and availability shall be addressed too.

II.2 WATER QUALITY

This study aims at evaluating the water quality at present of surface water resources and underground water as well which are main sources supplying to the future reservoir, and this study is to forecast potential changes in water quality once the reservoir has been created.

The study on water quality will be implemented basin site investigation, sampling and forecasting.

Prepare a report on water quality includes:

- Results of monitoring water quality in recent years
- Results of analyzing surface water samples by properties such as pH, DO, COD, BOD_5, TSS, total N, NO_3, Coli form, total P, PO_4, Chlorophyll.
- Results of analyzing underground water samples by properties such as pH, TDS, NO2, NO3, Coliform, total P, PO4,Alkalinity, Fe, Mn, and As.
- The present status of quality of surface water on Se San and Srepok rivers.
- The present status of quality of underground water at locations surrounding the reservoir area, in the site and resettlement area
- Forecasting the water quality in future reservoir
- Spread pollution along rivers

II.3 CLIMATE

Climate in the project area includes rainfall and temperature shall be described based on the secondary data in the project area.

II.4 AIR QUALITY

This study is aiming at evaluating the present status of the air environment and noises level to be created in the dam construction site, powerhouse location, worker camp, resettlement sites, and potential impacts in the case of project construction.

Studies and evaluation on air quality will be done basing on field investigation, sampling and forecasting.

Basing on results gained from site investigation, sampling, a report on air quality and noise will be prepared which include:

- Results of monitoring air quality in recent years
- Results of analyzing the samples by properties such as CO, SO2, NO2, TSP, and noise.

II.5 SOIL AND EROSION POTENTIALITY

Purposes of this study is to assess erosion potentiality of river basin, project area and downstream.

The study on soil quality will be implemented basing site investigation, sampling and forecasting. The report includes following contents:

- Existing status of erosion in river basin, project area and downstream

- Erosion potentiality Map
- Assess erosion potentiality
- Propose mitigation methods

II.6 WATER USE

Purposes of this study are to:

- Evaluate potential impacts by the project construction to navigation on Se San and Srepok rivers and Propose navigation alternative in the case of hydropower project construction.
- Calculate water demand and evaluate water supply possibility of upstream and downstream area of project.

The study on water using will be done based on field investigation, analysis, water balancing and proposing mitigation methods.

On the basis of results gained from investigation, data gathering, a report on water demand and water use includes:

- Navigation demand on Se San and Srepok rivers
- Maximum load of ship, minimum dimension of ship lock and necessary flow for navigation or other solutions
- Estimation on water demand in the long term including:

  + Water demand of industrial, agricultural and domestic use in upstream areas

  + Water demand of industrial, agricultural and domestic use and ecological in downstream areas

  +Water demand of project worker camp.
- Water balancing to the upstream and downstream areas.
- Assessing impact on water use and mitigation methods.

III. BIOLOGICAL ENVIRONMENT

III.1 TERRESTRIAL SPECIES

The task here is studying on terrestrial ecology in the catchments area, reservoir area, resettlement area and downstream area.

The studies on terrestrial fauna will be done basing on field investigation, analysis and proposing overcome measures.

On the basis of results gained from investigation, data gathering, a report on terrestrial animal will be prepared. The report is expected to describe:

- Present status of terrestrial ecology and level of bio- diversification.
- List of terrestrial species and list of rare species
- Distribution of fauna and diagram

- Status of animal use
- Potential impacts due to project construction.
- Proposing management and protection methods.

III.2 VEGETATION AND FOREST

Implement study on vegetation and forest at the basin, reservoir area, resettlement area, and at the downstream.

Studying on vegetation and forest shall be implemented on the basis of field investigation, measuring standard plots, forecasting and proposing mitigation methods.

On the basis of results of investigation, survey, collecting document, report shall be prepared to assess on vegetation and forest. The report shall comprise of following contents:

- Present status of vegetation and determining forest states at the basin, reservoir area, resettlement area, and downstream
- List of flora species and list of rare species
- Areas of each type of forest
- Biomass of each type of forest
- Wooden reserves of each type of forest
- Present exploitation of forest
- Alternatives of afforesting and forest protection
- Map of vegetation and forest in the basin
- Map of vegetation and forest at the reservoir, resettlement and downstream areas.
- Potential impacts to flora due to project construction.
- Proposing management and protection methods.

III.3 WATER SUBMERGED ECOLOGY

This topic aiming to evaluate ecosystem of natural submerged land and present status of submerged land use and forecast submerged ecosystem in case construct hydropower plant.

Base on investigation, data and sampling, a report will be prepared including evaluation of biodiversity and economic value, potential impacts and proposing mitigation methods.

III.4 FISH, FISHERY AND AQUATIC LIFE

Objective of the study is to evaluate the impact of the Project to aquatic life, fish and fishery.

Study on fish, fishery and aquatic life shall be done on the basis of field survey, sample taken and forecasting.

On the basis of results of field survey, data collection, laboratory analyzed result, report on evaluation on fish, fishery and aquatic life shall be made with following contents:

- Present status of fish species and level of bio- diversification

- List of fishes species and list of rare species
- Movement of fishes and their characteristics
- Fish productivities at wet and dry seasons.
- How is important of fish source to local in term of socio-economic.
- Describing aquatic specimen and evaluating similarity of specimen and relationship to river water quality.
- Potential impact of the project to fish and aquatic life
- Mitigation methods

IV. SOCIAL ENVIRONMENT

IV.1 ETHNICITY

Objective is to study people groups affected due to the project.
The content report for studying and evaluating are as bellows:

- Ethnology, ethnological history and culture, customs, management structure and traditional production.
- Using of land, forest and level of meeting the demand of land, forest.
- Living standard, Economic structure, Income and expense, Poverty and hunger
- Social institution, Community custom law, Comunity and family festivals
- Present situation of education, diseases and health care

IV.2 HEALTH AND HEALTH CARE

The work is conducted in order to describe situation of local health and health care. From that basis, evaluation on health of local people, workers, replaced people when having the project shall be made.

Study of community health shall be performed on the basis of field investigation, analyzing and forecasting.

On the basis of field survey, collecting information, a report on evaluation of health and care health shall be made. The report shall comprise of following contents:

- Present status of health and health care situation of the community, especially water-related diseases
- Assessing potential impacts
- Mitigating mitigation methods.

IV.3 ARCHAEOLOGICAL RELICS

The study aims at investigating archaeological relics which will be submerged in future reservoir Lower Se San

A report on archaeological relics includes following contents:

- Scheme of submerged archaeological relics

- Scale, scope, characterizes, ages and values of archaeological relics
- Propose mitigation methods.

IV.4 CULTURAL/TRADITIONAL HERITAGE

Traditional and cultural resources of the ethnic shall be preserved as much as, investigation and survey would be done in each village or in each group.

IV.5 ENTERTAIMENT AND TOURISM

The study aims at evaluating on existing status of tourism at project area, tourism development and potential impacts.

Basing on field investigation, data gathering, a report on tourism in the project area. The report will describe:

- Study on existing status of tourism related to the project.
- Flow of tourists at present and forecast for future.

IV.6 PUBLIC CONSULTATION

Public consultation will be conducted at least 2 levels :

1. First level:

- Content of report is information of HPP project
- Objectives : all affected people and local authorities
- Place : affected communes and villages
- The results are opinion about project in written.

2. Second level:

- Content : Main result of project study and EIA study
- Meeting at suitable place in province or district
- Objectives : head of villages, representatives of village, bodies, authorities at district, commune, provincial and governmental levels.
- Results are comments about impacts, mitigation methods....in written.

V. Outline of EIA report

The EIA report shall be formatted as following:

V. 1 Executive Summary

V.2 INTRODUCTION

1. Purpose of the report
2. Stage of project preparation
3. Project environment and social objective
4. Project background
5. Extend of study
6. Brief outline of the content of the report

V.3 Legislation and Regulations Framework

V.4 PROJECT DESCRIPTION

1. Type of project
2. Need for project
3. Location
4. Size or magnitude of operation
5. Proposed schedule
6. Description of the project

V.5 BASELINE ENVIRONMENT

1. Physical environment
   - atmosphere (e.g. air quality and climate)
   - topography and soils
   - surface water
   - groundwater
   - geology/seismology

2. Ecological environment
   - fisheries
   - aquatic biology
   - wildlife
   - forests
   - rare or endangered species
   - protected areas

3. Social resources and economic development
   - population and communities (e.g. number, ethnic, employment)
   - health facilities
   - education facilities
   - infrastructure facilities (e.g. water supply, sewerage, power sources)
   - transportation (roads, harbors, airports, and navigation)
   - land use (e.g. dedicated area uses)

- agricultural development
- mineral development
- tourism facilities

- socio-economic conditions
- physical or cultural heritage
- historical, archaeological, or architectural significance.

V.6 ALTERNATIVE

Comparison of feasible alternatives for proposed project site, technology, and operational alternatives will be considered in the study. Alternatives will be compared in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions, and institutional, training and monitoring requirements. For each alternative, the environmental costs and benefits should be quantified to the extent possible, economic values should be attached where feasible, and the basic for the selected alternative should be stated.

V.7 ENVIRONMENTAL IMPACTS ASSESSMENT AND MITIGATION MEASURE

Review characteristic of each environmental impact follow by mitigation measure to the negative impact in different project phase as below:

- Project location
- Project design phase
- During construction phase
- During operation phase

V.8 Resettlement

Assessment based on the result from Resettlement study.

V.9 ENVIRONMENTAL MANAGEMENT PLAN

1. Institutional arrangement
2. Potential Environmental Impacts and Mitigation Measures
3. Monitoring Program with monitoring cost

V.10 PUBLIC CONSULTATION

1. Describe the process undertaken to involve the public.
2. Summarize major comments received from beneficiaries, local officials, community leaders, NGOs, and others, and describe how these comments were addressed

V.11 CONCLUSION

The EIA report will present the conclusions of the study including: (i) gains which justify project implementation; (ii) explanation of how adverse effects could be minimized or offset, and compensated to make these impacts acceptable; (iii) explanation of use of any irreplaceable resources; and (iv) provision for follow up surveillance and monitoring. Simple visual presentations of the type and magnitude of the impacts may aid the decision-maker.

REQUIREMENTS

1. Methodology to carry out EIA including data collections, surveys, assessing and reporting shall be account of recognized international EIA guidelines and frameworks (WB,ADB, Mekong) and acceptable in Cambodia.
2. Communications KCC and PECC 1 frequently as require
3. Reports:
    a. Inception report/scoping report presents findings in initial phase of project especially navigation and fish movement and describes an updated work plan shall be submitted not later than 6 weeks since contract signing.
    b. Progress report (short) shall be submitted every 6 weeks.
    c. Draft final EIA Report shall be submitted before 20 May, 2008.
    d. Final EIA report shall be submitted 15 days after receiving last comments from draft final report on 5 June 2008.

PECC-1 Responsible to provide documents as follows:

a. Result of Topographical study
b. Result of Geological, Minerals, and Seimic...study
c. Result of Hydrological study
d. Result of Resettlement study
e. Result of Economic analysis
f. Access road or existing road improvement
g. Summary of project parameters and location map

Appendix 2

Fish study report

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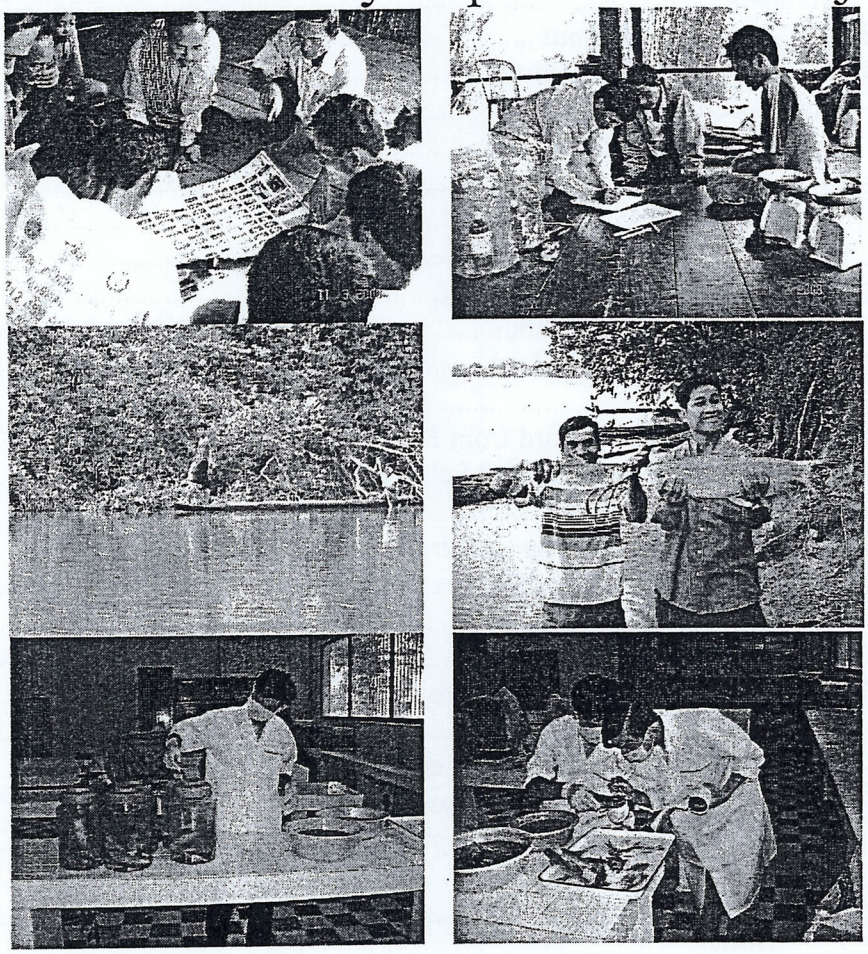
Final Report

Fisheries Research on Sesan and Srepok River

for

Lower Sesan 2 Hydropower Plant Project



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May 2008

CONTENT

I. Background 1
1.1 Study Area 1
1.2 Scope of the Study 1
1.3 Limitation of the Study 3
1.4 Objectives 3
II. Research Team 3
III. Time, Equipment and Method of Study 3
3.1 Time of Study 3
3.2 Equipment used 3
3.2.1 Logbook recording 3
3.2.2 Participatory Rapid Appraisal (PRA) 4
3.2.3 Survey 4
3.2.4 For fish measurement and identification 4
3.3 Methods 4
3.3.1 Interview Methods 4
3.3.2 Wild Fish Productivity 4
3.4 Fish Specimen Preservation 5
3.5 Species Identification 5
IV. Results 6
4.1 Survey and PRA 6
4.1.1 Sesan River 6
4.1.2 Srepok River 9
4.2 Fishing Gears and Methods 11
4.2.2 Fishing Methods Used 11
4.3 Status of Fish 12
4.3.1 Fish Species Record from PRA (focus group) and Survey 12
4.3.2 Fish Species Caught by Selected Fishermen 13
4.4 Rare Fish Species 14
4.4.1 List of Rare Fish Species from Selected Fishermen 14
4.4.2 List of Rarely Fish Species from PRA and Interview 16
4.5 Fish Movement 16
4.6 Fish Yield 17
4.6.1 Fish Yield Estimated in project area 17
A)- By using Focus Group (PRA) 17
B)- By research of selection fishermen 18
4.6.2 Fish yield estimation in upstream of project area (Ratanakiri Province) 19
4.7 Fishing Activities and Consumption 23
4.8 Aquatic Specimens 27
4.8.1 Inundated Forest 27
4.8.2 Birds 27
4.8.3 Reptiles 27
5 Conclusions and Recommendations 28
5.2 Conclusions 28
5.3 Recommendations 28

Tables

Table 4.1: Fish species found by Survey and PRA 12
Table 4.2: Fish species were caught by selected farmers 13
Table 4.3: Rare fish species 16
Table 4.4: Catch Estimation by PRA 18
Table 4.5: Catch estimation in upstream of the project site in Sesan in dry Season 18
Table 4.6: Catch estimation in Downstream of the project site Sesan in dry Season 19
Table 4.7: Catch estimation in Srepok River in dry Season 19
Table 4.8: Total catch in the upstream of the Sesan and Srepok River (Rattanakiri province) 14
Table 4.9: Total fish cost for both provinces (Stung Treng and Rattanakiri provinces) 15
Table: 4.10: Fish spawning in the project area 26
Table 4.11: List of bird in the project area 27

Figure

Figure 4.1: Occurrence of fish species in Sesan and Srepok River 15
Figure 4.2: Fishing hour by gear 24
Figure 4.3: Fishing day in the project area 24
Figure 4.4: Fish yield 25
Figure 4.5: Percentage of fish yield by Kg 25
Figure 4.6: percentage of fish sole in the project area 26

I. Background

Stung Treng province is located in the north-eastern part of Cambodia, about 455 km from Phnom Penh and adjacent to National road N^0 7 and 13. Stung Treng province is crossed by Mekong River downstream of the Khone Falls which are near the Laos and Cambodia border. The Sesan River meets the Mekong River at Stung Treng provincial centre. The Sekong and Srepok flow into the Sasan upstream of Stung Treng. Al these river are important for fish spawning and good habitat in dry season for some fish species.

In Stung Treng province, 5,000 tones of fish were caught by local fishermen in river fishing grounds and 2,000 tones of fish were caught by local fishermen in rice field. The total catch in Stung Treng province was 7,000 tones in 2006 (Fishery Administration report, 2006).

The project area for the proposed hydroelectric dam is located in the Sesan district of Stung Treng province which comprised four communes: Talat, Srekor, Kbal Romeas and Pluk. The commune have a combined total population of 7,544 person and 1,657 families.

Talat commune comprises four villages: Talat, Rum Poit, Svay Rieng, and Khsach Tmey. The total population of the four villages is 2,915 persons comprising 636 families.

Srekor commune comprises two villages: Srekor Muoy and Srekor Pir. The total population ot the two village is 1,477 persons comprising 323 families.

Phluk commune comprises two villages: Phluk and Ban Bung. The total population of the two villages is 1,092 persons comprising 264 families.

Kbal Romeas commune comprises four villages: Krobei Chrum, Kbal Romeas, Sre Sronok and Srepok. The total population of the four villages is 2,060 persons comprising 434 families (Commune profile, 2007).

In addition there are a large number of villages upstream of the project area which will be impacted by the dam principally through loss of fish migration from the Mekong River and Tonle Sap.

This study is very important to find out information from local fishermen on the general situation of fishing activities along the Sesan and Srepok River. The study was conducted by Royal University of Agriculture, Faculty of Fisheries.

1.1 Study Area

Three sites along the Sesan river and one site along the Srepok River were selected for study. The site along the Sesan were located in Sre Kor, Talat and Pluk Communes, and in the Kbal Romeas commune on the Srepok River as shown in Figure 1 below.

1.2 Scope of the Study

The study was conducted from early February 2008 to early May 2008. The study examined logbook records (catch data) in dry season and catch data in wet season based on secondary data, interviews on fish biodiversity and group discussion on fish migration and abundance fish species both commune and rare.

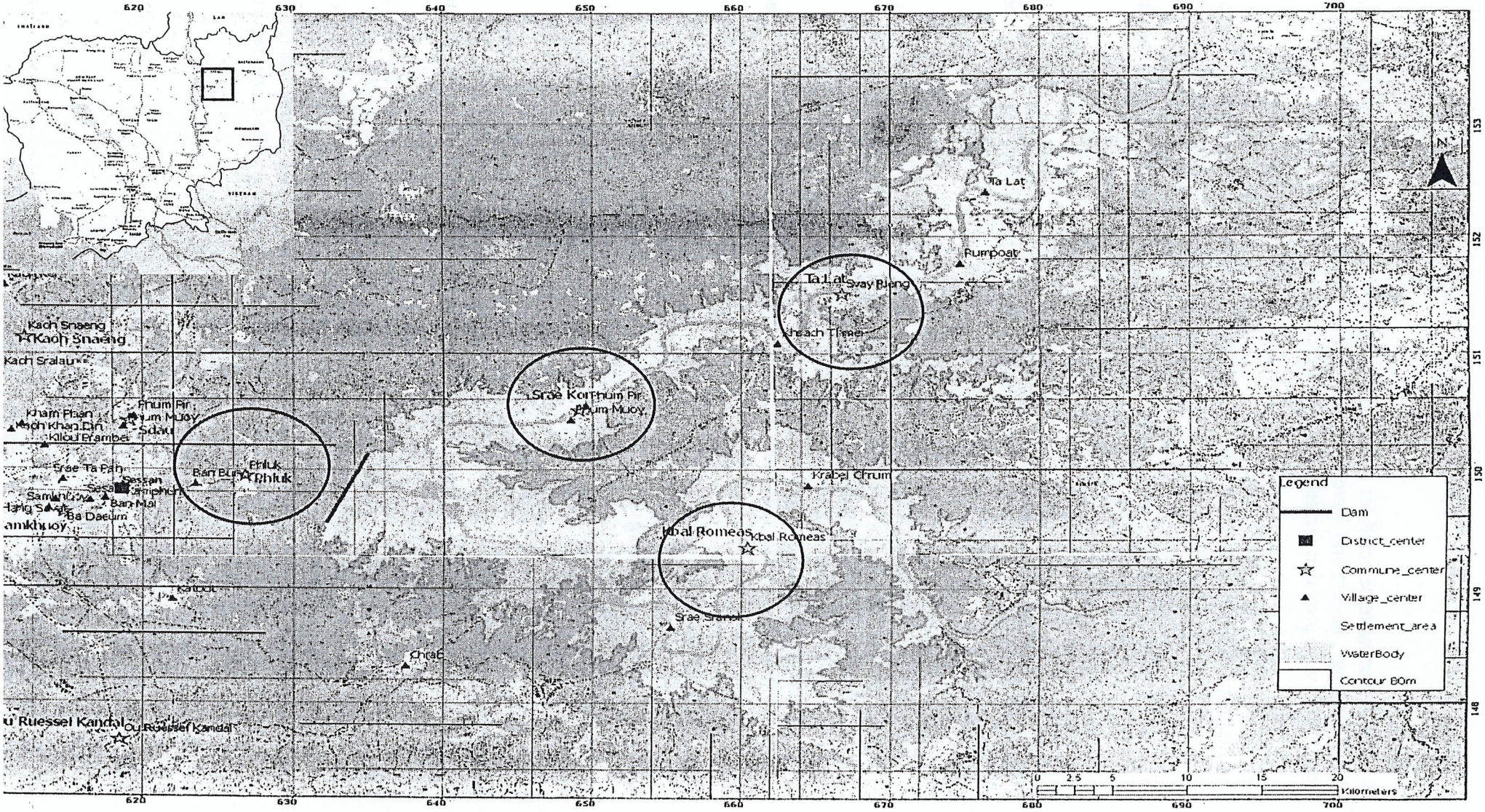

Figure 1, Study area: The red circle is the study area (Survey and Fishermen selection)

18 of fishermen were selected for study with good criteria (more than 5 year fishing, can write Khmer language, honest and have at least two type of main fishing gears in the study areas). Plastic tanks were provided for keeping fish (difference species) in the study areas.

1.3 Limitation of the Study

The study attempted to include both Sesan and Srepok Rivers but study did not focus on:

- Habitat measurement,
- General social economic situation,
- Details of aquatic specimens especially on reptiles, amphibians, some aquatic plant and fish species in the rainy season.
- Water quality in the study areas.

1.4 Objectives

The aim of this study was to ***create base-line information for fish productivity by catches and fish biodiversity in Sesan and Srepok Rivers.***

The specific objectives were to:

- Present the status of fish species and level of bio-diversification
- List of fish species and list of rare species
- Movement of fish and their characteristics
- Fish productivity (catchments) during the dry season
- Importance of fish resources to local villagers socio-economic terms
- Describe aquatic specimens (fish, reptiles, amphibians, some aquatic weeds/plants) exclude plankton

II. Research Team

- **Mr. HOUT Vutha** : Team Leader (Faculty of Fisheries)
- **Mr. CHEA Mong** : Researcher (Faculty of Fisheries)
- **Mr. OUL Noty** : Researcher (Faculty of Fisheries)
- **Mr. SOK Seyha** : Researcher (Fisheries of Administration)

III. Time, Equipment and Method of Study

3.1 Time of Study

This research was conducted for a total of three months from 30 January to 10 May 2008. It part of the research was divided into 6 trips:

- First trip (30 Jan – 08 Feb 2008): fishermen selection for logbook recording
- Second trip (15-19 Feb 2008): follow up fishermen for logbook recording
- Third trip (03-09 Mar 2008): data logbook collection and pilot questionnaire
- Forth trip (16-12 Mar 2008): questionnaire interviewing
- Fifth trip (01-05 Apr 2008): data logbook collection, interviewing and reporting
- From 05 Apr to 10 May 2008: data entry and analysis, draft and final reports

(See Detail in Annex 1)

3.2 Equipment used

3.2.1 Logbook recording

18 selected fishermen were provided:

- Scales (for fish weight)
- Rulers (for fish measurement)
- Pencils
- Books

- Plastic Tanks (for keeping fish specimens)
- Formalin solution for keeping fish specimens

3.2.2 Participatory Rapid Appraisal (PRA)

- White board markers
- Stickers
- Paper
- Fish posters

3.2.3 Survey

- Posters of fish
- Questionnaires (Annex 2)

3.2.4 For fish measurement and identification

- Balance with 0.1 g accuracy
- Fish measuring tape
- Plastic jar
- Paper
- Microscope
- Dissecting kite
- Glasses Plate
- Reagent

3.3 Methods

3.3.1 Interview Methods

An inquiry performed to estimate the number of fishermen in the project area, the number and types of fishing gears, the catches, the family consumption, fish species and the local market price for economic fishes.

The PRA (Participatory Rural Appraisal) and interview method were used while the project implementation. In addition 10 % of the identified fishermen were selected for interview (see details in annex 2) and about 10 to 20 fishermen were interviewed on fish migration, fish species (rare and common species), some aquatic species, inundated forest and fish characteristic (population, dry season refuge etc).

3.3.2 Wild Fish Productivity

Wild fish productivity was studied by analyzing its production in biomass (kg/ha/year or kg/km/y) and, when possible, in numbers (density). Theoretical values were based upon the appreciation of several physical and biological (living organisms) characteristics of the biotope which are easier to collect than the fish community itself. The other methods are based on fish sampling and will provide direct estimations of the fish community's biomass. For instance, Beverton and Holt's models (1966) enable to estimate the exploited production. The biomass enabling capture in ideal conditions is equal to the exploited production, in other words the fish production multiplied by the fishing mortality.

$$Y = F * B$$

Where Y = exploited production

B = optimal biomass

F = fishing mortality coefficient (estimation by different studies in Asia rivers and lakes)

The estimation of B was obtained as a result of the fish survey. The survey based on questionnaires, inquiries and logbook analyses made in the fishermen community. Such work was also conducted in fish markets and base on local population's consumption.

In particular the proposed study in Sesan and Srepok rivers focus on most the common fishing gears from the most selective (main gear) to the least selective (family gear).

The methodology was as follows:

- The fishermen using main fishing gear were asked to use the same techniques during the study
- During the study, a logbook was filled in by the research group. This logbook contains the daily information of catches (number and weight) with indications of species, gear, fishing effort and location of the capture;
- The data was centralized in an EXCEL database
- Catch per Unit Effort (PUE) was calculated each month for each fishing gear and for a river section of known surface.

At the same time an inquiry was performed to estimate the number of fishermen in the project area, the number of fishing gears and the family consumption.

3.4 Fish Specimen Preservation

Fish specimen preservation was done into two steps:

- Firstly fish were kept in 10 % of formalin solution soon after they were caught from the rivers by fishermen in each village.
- Secondly, after keeping the formalin solution for a few weeks the fish specimen were kept in water about 10 – 20 minutes to release the formalin from the fish body and then keep it in 5- 10 % of alcohol solution for any further identification.

3.5 Species Identification

The process of identifying fish requires keying and checking. If the fish classification were not known, the first is to key out the fish to orders and families in a preliminary key. Preliminary keys often include out-line drawing of characters and representative species as models. Finally, check the tentative identification by seeing if the capture locality is within the known range of the species and by comparing the specimen with published illustrations and descriptions (Cailliet, Love and Ebeling, 1986).

After the above identification process was finished, there were two ways guide to species by checking through external and internal characters (Walter.J.Rainboth, 1996):

External Character: By counting dorsal-fin spine, dorsal soft rays, anal spine and soft ray, Pectoral rays, Scale along literal line and pattern of body color

Internal Character: By counting gill rakers on the first arch.

IV. Results

4.1 Survey and PRA

Fishermen Participation in PRA

Commune	Village	# of Participant
Kbal Romear	Krorbey Chrum	12
Srekor	Srekor 1	10
Talat Commune	Svay Reang	15
Pluk	Pluk	25

Fishermen Participation in Interview

Commune	Village	Fishermen Interview
Pluk	Pluk	19
	Banh Bong	6
Talat	Talat	7
	Svay Reang	24
	Khsach Thmey	24
Sre Kor	Sre Kor 1	16
	Sre Kor 2	15
Kbal Romeas	Krorbey Chrum	17
	Kbal Romeas	10
	Sre Srornok	19
Total		**148**

4.1.1 Sesan River

Pluk commune (Sesan River downstream of the project site): The Two villages of Pluk and Banh Bung were visited and 25 fishermen were interviewed. About 20 fishermen joined the PRA to identify fish species (rare and abundant species) using fish posters, some of reptile, amphibian, inundated forest and fish migration.

Attending people in PRA

Village name	Total Participants	Fishing family		Non fishing family	
		#	%	#	%
Phluk	10	10	100	0	0
Banh Bung	10	10	100	0	0
Total:	20	20	100	0	0

Household survey

Village name	Interviewing HH	Fishing family		Non fishing family	
		#	%	#	%
Phluk	19	19	100	0	0
Banh Bung	6	6	100	0	0
Total:	25	25	100	0	0

Based on PRA and HH survey by fishery study team in March 2008 indicated 100% of the participants and interviewees have more or less fishing to support daily livelihood beside other job, and different fishing gears were practice in each family. The daily fish catch is 0.5kg/family in dry season and 0.6kg/family in wet season.

However about 95 % of total family in the commune are fishing, according to village chiefs said. This figure will apply for fish catch estimation in the study.

Downstream fishing family

Village name	Total Family	Fishing family	
		%	#
Phluk	196	95	186
Banh Bung	68	95	65
Total:	264		251

From the PRA and HH survey 6 fishermen were selected for daily fish catch in downstream station in study period of Feb-Apr. 2008.

In Pluk commune (Downstream of dam site)

No	Name	Sex	Age	Village	Gear Use
1	Thorn Say	M	25	Pluk	- Gill net: 50 m - Hook long line: 100 hooks
2	Sam Lum	M	26	Pluk	- Gill net: 50 m - Cash net - Hook long line: 40 hooks
3	Sarin Phally	M	45	Pluk	- Gill net: 30 m - Cash net - Hook long line: 100 hooks
4	Sing Phann	M	40	Banh Bung	- Gill net 50 m mesh size 8 cm - Cash net - Hook long line 50 hooks
5	Khut Nann	M	35	Banh Bung	- Gill net:.50 m mesh size 6 cm , 50 m mesh size 5 cm. - Hook long line: 100 hooks
6	Nou Savath	M	47	Banh Bung	- Gill net: 70 m mesh size 5 cm - Cash net

Srekor commune (Sesan River upstream of the project site): The Two villages of Srekor Muoy and Srekor Pei were visited and 31 fishermen were interviewed. About 15 fishermen joined the PRA to identify fish species (rare and abundant) using fish posters, some of reptile, amphibian, inundated forest and fish migration.

Attending people in PRA

Village name	Total Participants	Fishing family		Non fishing family	
		#	%	#	%
Srekor 1	8	7	100	0	0
Srekor 2	7	8	100	0	0
Total:	15	15	100	0	0

Household survey

Village name	Interviewing HH	Fishing family		Non fishing family	
		#	%	#	%
Srekor 1	16	16	100	0	0
Srekor 2	15	15	100	0	0
Total:	31	31	100	0	0

Based on PRA and HH survey by fishery study team in March 2008 indicated 100% of the participants and interviewees have more or less fishing to support daily livelihood beside other job, and different fishing gears were practice in each family. The daily fish catch is 0.2kg/family in dry season and 0.5kg/family in wet season.

However about 95 % of total family in the commune are fishing, according to village chiefs said. This figure will apply for fish catch estimation in the study.

Upstream fishing family in Srekor commune

Village name	Total Family	Fishing family	
		%	#
Srekor 1	165	95	157
Srekor 2	158	95	150
Total:	323	95	307

From the PRA and HH survey 2 fishermen were selected for daily fish catch in downstream station in study period of Feb-Apr. 2008.

Sre Kor Commune (Upstream of dam site)

No	Name	Sex	Age	Village	Gear Use
1	Toun Loun	M	51	Srekor Mouy	- Gill net: 205 m mesh size 5 cm. - Hook long line: 120 hooks
2	Kong Vy	M	42	Srekor Pir	- Gill net: 30 mesh size 5 cm - Cash net:

Talat commune (Sesan River upstream of project site): The four villages of Talat, Svay Reang, Rompot and Khsach Thmey were visited and 60 fishermen were interviewed. About 20 fishermen joined the PRA to identify fish species (rare and abundant) using fish posters, some of reptile, amphibian, inundated forest and fish migration.

Attending people in PRA

Village name	Total Participants	Fishing family		Non fishing family	
		#	%	#	%
Talat	5	5	100	0	0
Svay Reang	5	5	100	0	0
Rompot	5	5	100	0	0
Khsach hmey	5	5	100	0	0
Total:	20	20	100	0	0

Household survey

Village name	Interviewing HH	Fishing family		Non fishing family	
		#	%	#	%
Talat	7	7	100	0	0
Svay Reang	24	24	100	0	0
Rompot	5	5	100	0	0
Khsach hmey	24	24	100	0	0
Total:	60	60	100	0	0

Based on PRA and HH survey by fishery study team in March 2008 indicated 100% of the participants and interviewees have more or less fishing to support daily livelihood beside other job, and different fishing gears were practice in each family. The daily fish catch is 0.2kg/family in dry season and 0.5kg/family in wet season.

However about 95 % of total family in the commune are fishing, according to village chiefs said. This figure will apply for fish catch estimation in the study.

Upstream fishing family in Talat Commune

Village name	Total Family	Fishing family	
		%	#
Talat	72	95	68
Svay Reang	256	95	243
Rompot	53	95	50
Khsach hmey	255	95	242
Total:	636	95	604

From the PRA and HH survey 4 fishermen were selected for daily fish catch in downstream station in study period of Feb-Apr. 2008.

In Talat commune (Upstream of dam site)

No	Name	Sex	Age	Village	Gear Use
1	Lun Theng	M	55	Talat	- Gill net: 50 m mesh size 2.5 cm - Cash net: mesh size 2.5
2	Sann Koun	M	50	Svay Rieng	- Gill net: 30 m mesh size 3 cm, 40 m mesh size 2 cm. - Cash net: mesh size 2.5 cm
3	Py Vang	M	40	Svay Rieng	-Gill net: 15 m mesh size 2.5 cm, 30 m mesh size 3 cm, 45 m mesh size 5 cm, 40 m mesh size 7 cm, 30 m mesh size 4 cm, 20 m mesh size 2 cm - Angrut
4	Korn On	M	52	Khsach Thmey	- Gill net: 20 m mesh size 2 cm, 25 m mesh size 3 cm, 50 m mesh size 2.5 cm,

4.1.2 Srepok River

Kbal Romeas commune: The three villages of Sre Sronok, Kbal Romeas and Krobei Chrum were visited and 37 fishermen interviewed. About 15 fishermen joined the PRA to identify fish species (rare and abundant) by fish posters, some of reptile, amphibian, inundated forest and fish migration.

Attending people in PRA

Village name	Total Participants	Fishing family		Non fishing family	
		#	%	#	%
Sre Sronok	5	5	100	0	0
Kbal Romeas	5	5	100	0	0
Krobei Chrum	5	5	100	0	0
Total:	15	15	100	0	0

Household survey

Village name	Interviewing HH	Fishing family		Non fishing family	
		#	%	#	%
Sre Sronok	10	10	100	0	0
Kbal Romeas	10	10	100	0	0
Krobei Chrum	17	17	100	0	0
Total:	37	37	100	0	0

Based on PRA and HH survey by fishery study team in March 2008 indicated 100% of the participants and interviewees have more or less fishing to support daily livelihood beside other job, and different fishing gears were practice in each family. The daily fish catch is 0.6kg/family in dry season and 0.5kg/family in wet season.

However about 95 % of total family in the commune are fishing, according to village chiefs said. This figure will apply for fish catch estimation in the study.

Srepok fishing family

Village name	Total Family	Fishing family	
		%	#
Sre Sronok	104	95	99
Kbal Romeas	106	95	101
Krobei Chrum	177	95	168
Total:	387	95	368

From the PRA and HH survey 6 fishermen were selected for daily fish catch in downstream station in study period of Feb-Apr. 2008.

In Kbal Romeas commune

No	Name	Sex	Age	Village	Gear Use
1	Sorn Sophy	M	48	Krobey Chrum	- Gill net: 30 m mesh size 2.5 cm, 100 m mesh size 16 cm, 100 m mesh size 14 cm, 100 m mesh size 9 cm, 100 m mesh size 7 cm, 100 m mesh size 6 cm, 100 m mesh size 5 cm, 50 m mesh size 4 cm, 30 m mesh size 3 cm. - Hook Long line: 100 hook - Trou: 1gear - Cash net: 2 gear mesh size 2.5cm and 14 cm
2	Mann Keo	M	50	Krobey Chrum	- Gill net: 40 m mesh size 6 cm, 90 m mesh size 7 cm, 155 m mesh size 13 cm, 80 m mesh size 14 cm. - Hook long line: 200 hooks - Cash net
3	Srean Chhoeun	M	39	Kbal Romeas	- Gill net: 50 m mesh size 3 cm - Chan: 3 gears - Hook long line: 50 hooks
4	Bay Yoeun	M	25	Kbal Romeas	- Gill net: 85 m mesh size 5 cm, 25 m mesh size 4 cm, 60 m mesh size 7 cm - Chan: 1 gear - Cash net: mesh size 4 cm, 14 cm.
5	Ma Bunthorn	M	45	Sre Srawnok	- Gill net: 77 m mesh size 5 cm, 89 m mesh size 7 cm, 175 m mesh size 9 cm, 73 m mesh size 15 cm - Hook long line: 100 hooks
6	Un Sarun	M	56	Sre Srawnok	- Gill net: 90 m mesh size 4 cm, 80 m mesh size 8 cm, 80 m mesh size 9 cm. - Cash net: mesh size 8 cm

4.2 Fishing Gears and Methods

4.2.1 Fishing Gears

Gear Use

3 Main Fishing gears:

- Gillnet (Moang): each of mesh size is 2 cm, 2.5 cm, 3 cm, 3.5 cm, 4 cm, 4.5 cm, 5 cm, 6 cm, 7 cm, 8 cm, 9 cm, 13 cm, 14 cm, 15 cm, 16 cm and 17 cm), which approximately 95 % families of fishermen with one to two gillnet per household, but others have 3 to 10 of gillnet.
- Hook long line (Santouch Ronong): each fishing gear was tied with 45 to 100 hooks per fishermen, which Approximately 50 – 60 %.
- Cast net (Samnanh): each of cash net mesh 2.5 cm, 13 cm and 14 cm), which approximately 50 % of villagers used.

5 Other gears:

- Drop door trap (Chan) is made from bamboo
- Bamboo-made basket traps (Trou) is made from bamboo
- Horizontal cylinder trap (Lob) is made from bamboo
- Single hook set pole and line (Bangkai)
- Vertical hanging vast trap (Pong) for small fish is made from bamboo

4.2.2 Fishing Methods Used

A. Gillnet (Moang): Stationary gill net with variable mesh size is placed along the sides of a river or a canal and it is also set across the current and drifts downstream for a while. After it is taken up and the fish is removed (MRC, DOF and DANIDA, 2006). The target species are *Henicorhynchus spp, Barbodes spp, Rasbora spp, Morruslius chrysophekadion, Notopterus spp* etc… This gear is mostly used by the fishermen in the project site.

B. Hook Long Line (Santouch Ronong): multiple hooked long lines with short lines with a hook are tied at about 1 m intervals. It is used during the whole year; the branch line is fixed above the water in a way that allows the baited hooks to only just submerge under the surface. Where there are plants like grass, bushes or in flood forests the branch line can easily be fixed to the existing vegetation. It can also place this line at the bottom of the water surface. The target species are *Channa striata, Anabas testudineus, Mystus spp* etc…(MRC, DOF and ANIDA, 2006).

C. Horizontal cylinder Trap (Lob): The trap is used in canals in where there is a little current, in water depths of about 1 m. The top of the trap sticks out above the water. The trap is anchored to the bottom with pole. No bait is used and it often used together with a bamboo fence in deeper water. The target species are *Trichogaster sp, Channa striata, Barbodes altus, Barbodes gonionotus, Morulius chrysophekadion, Henicorhynchus spp* and others species (FAO, CD-ROM, 2002).

D. Cast net (Samnanh): The gear is operated either from a boat or from the shore of the river or while wading through shallow water. The target species are *Henicorhynchus spp, Paralaubuca spp, Mystus nemurus, Barbodes gonionotus, Cyclocheilichthys enoplos, Puntioplites spp, Trichogaster spp, Pristolepis fasciata, Ananbas testudineus, Morulius chrysophekadion, Chitala ornate* and others species (MRC, DOF and ANIDA, 2006).

E. Drop door trap (Chan): The trap is operated in river where there are low water, near shore, silence place and shade. It starts to operate in June to October in Stung Treng Province.

The target species are Trey Krum (*Osteochilus melanopherus*), Trey Khya (*Mystus wyckioides*), Trey Pruol (*Cirrhinus microlepis*) and other species (MRC, DOF and ANIDA, 2006).

F. Vertical hanging vast trap (Pong): The Trap is operated in river where there is clear water. The trap is stick with pole or three branch and use bait inside. It starts to operate in January to May in Stung Treng province. The target species are *Rasbora spp, Paralaubuca spp, Trichogaster spp and* other species (MRC, DOF and ANIDA, 2006).

G. Single hook set pole and line (Bangkai): the gear is operated in flooding season where there is in the inundated forest. The bait (Climbing perch, Botia and Gurami) is used for it operation. The target species is *Channa sp* (MRC, DOF and ANIDA, 2006).

4.3 Status of Fish

4.3.1 Fish Species Record from PRA (focus group) and Survey

Fishermen in downstream and Upstream Sesan River, and Srepok River were interviewed during the field work and also invited fishermen in village (between 10 – 30) focusing on fish biodiversity, inundated forest, birds and some reptiles species that are present in the project area (PRA method).

Fish species was classified by Order, Family and Species follow the Fishes of The Cambodia Mekong, 1996. The fish species from survey and PRA were combined together in order to show how many species were occurred in the project area.

During the study period 99 fish species were found belong to 9 Order and 22 Families (see detail in table 4.1- and Annex 3 part on specific species).

Table 4.1: Fish species found by Survey and PRA

Order	Family	Fish Species record in both river
Clupeiformes	Clupeidae	1
Osteoglossiformes	Notopteridae	3
Cypriniformes	Cyprinidae	39
	Cobitidae	3
Siluriformes	Clariidae	2
	Bagridae	10
	Ariidae	1
	Pangasiidae	7
	Schibeidae	1
	Siluridae	10
Perciformes	Channidae	5
	Lobotidae	2
	Polynemidae	1
	Sciaenidae	1
	Nandidae	1
	Anabantidae	1
	Belontiidae	3
	Osphronemidae	1
	Eleotridae	1
Beloniformes	Belonidae	1

Synbranchiformes	Synbranchidae	1
	Mastacembelidae	2
Pleuronectiformes	Soleidae	1
Tetraodontiformes	Tetraodontidae	1
Total		99

The Cypriniformes Order has the most species from downstream and upstream of the project site including the Srepok river (42), fellowed by Siluriformes Order with 31 species and the Perciformes Order with16 species (See Details in Annex 3).

4.3.2 Fish Species Caught by Selected Fishermen

The fish in the Sesan (above and below the project site) and Srepok River were collected from early February to March 2008 by selected fishermen and conserved in formalin. Each specimen was locally identified but where there was doubt, identification was done in the laboratory of Royal University of Agriculture, Faculty of Fisheries.

Downstream of the project site on the Sesan River 61 species were found belonging to 6 Order and 16 Families. Upstream of the project site on the Sesan River 34 species were found belonging to 6 Order and 11 Families. In teh Srepok River 69 species were found belonging to 8 Order and 20 Families (See Details in Annex 3).

The Cypriniformes Order was found with 30 species downstream of the project site on the Sesan river, 19 species upstream of the project site on the Sesan river and 31 species in the Srepok river followed by Siluriformes Order with 19 species in downstream of the project site on the Sesan, 9 species of the project site on the Sesan and 26 species in the Srepok River.

Table 4.2: Fish species were caught by selected farmers

Order	Family	Sesan Downstream	Sesan Upstream	Srepork River
Osteoglossiformes	Notopteridae			1
	Notopteridae	1	1	1
	Notopteridae	1		1
Cypriniformes	Cyprinidae	27	17	29
	Cobitidae	3	2	3
Siluriformes	Clariidae	1	1	1
	Bagridae	7	4	8
	Pangasiidae	6	2	7
	Schibeidae			1
	Siluridae	5	2	6
Perciformes	Channidae	3	2	2
	Belontiidae	1	1	
	Anabantidae	1	1	1
	Nandidae	1		1
	Lobotidae	1		1
	Osphronemidae	1		1
	Eleotridae	1		1
	Gobiidae		1	1
Beloniformes	Belonidae			1
Synbranchiformes	Mastacembelidae			1
Pleuronectiformes	Soleidae	1		1
Total		**61**	**34**	**69**

Conclusion:

- 87 of 130 fish species were caught by fishermen using 3 fishing gears during the 2 months research.
- The 87 fish species were not accurate representation at all when compared with Meach and Baird 2005.
- Other fishing gear should be selected for the research study
- Fish species research should be conducted at least one year

4.4 Rare Fish Species

4.4.1 List of Rare Fish Species from Selected Fishermen

Fish species were recorded by interview and fishermen selection. The interview was conducted directly with individual fisherman in each village by using fish posters (published by CEPA in 2006). The fishermen selection were caught during the study in the two river (Sesan and Srepok River). 99 fish species were found through interviewing and 85 species were caught by fishermen (see detail in Annex 3)

Among the 85 fish species captured, 42 species had an occurrence of less than 50 % (See figure 4.1).

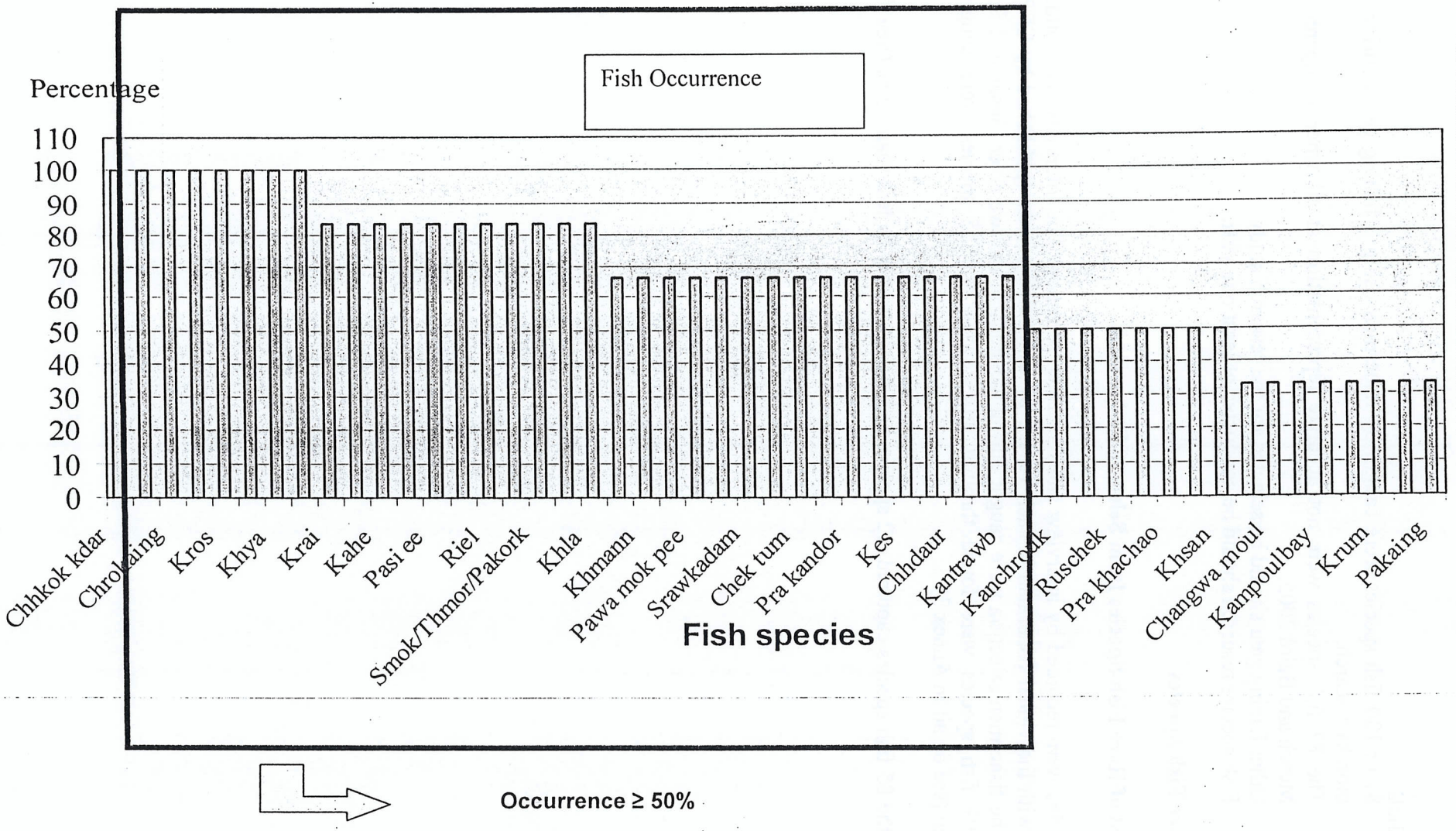

Figure 4.1: Occurrence of fish species in Sesan and Srepok River

4.4.2 List of Rarely Fish Species from PRA and Interview

The rare fish species were also recorded from interviews and PRA (Focus group). The results from selected fishermen are shown in figure 1 (the fish species less than 50 % of fish occurrence). The other results from the interviews are shown in table 4.3.The table is divided into three parts upstream of the project site on the Sesan River, downstream of the project site on the Sesan River and Srepok River

Table 4.3: Rare fish species

Order	Family	Downstream of the project site	Up of the project site	Srepok
Rajiformes	Dasyatidar	1	1	1
Osteoglossiformes	Notopteridae			1
Cypriniformes	Cyprinidae	6	8	17
	Cobitidae		2	
Siluriformes	Ariidae		1	1
	Pangasiidae	6	7	1
	Schibeidae		1	
	Siluridae		2	1
Perciformes	Channidae	1		1
	Polynemidae	1	1	1
	Sciaenidae	1	2	1
	Osphronemidae			1
	Eleotridae			1
Synbranchiformes	Synbranchidae			1
Pleuronectiformes	Soleidae			1
Total		**16**	**25**	**29**

8 of the fish species in table 4.3 are rare species in both the Sesan and Srepok River. Only three species (*Mekongina erythrospila*, *Bangana behri* and *Probarbus sp*) were recorded as rare species by CITES and Fisheries Administration (Fish poster in 2005).

Conclusion:

- 3 fish species of 43 fish species were rare species in Mekong River but the other 40 fish species could be the rare species in the project area.
- Those species became rare due to habitat lost, deep pools were filled up with sand, silt and rock by erosion in rainy season, feed lost (rock algae), and increase of turbidity in the river (Ian G. Baird et al., 2005).

4.5 Fish Movement

Generally, fish move from downstream to upstream or vice versa in the early of rainy season to find new habitat, spawning, feeding and during the dry season move to deep pools as a dry season refuge (Poulsen et al., 2004 and Sverdrup-Jensen, S. 2002). Based on information from wholesaler interviewing, PRA and survey fish migrate from May to July in downstream of the project site on the Sesan River, June to July in upstream of the project site on the Sesan River and in the Srepork River. This was also recorded by Poulsen et al., 2004 and Sverdrup-Jensen, S. 2002. The fishermen in the project site also explain that in early of rainy season the small Cyprinids migrate from downstream to upstream of the project site and Baird et al ., 2003 also said the small Cyprinids migrate from Great Lake to Mekong River. Baird et al., 2004 also

conclude that the two Cyprinids (*Scaphognathops bandanensis* and *Mekongina erythrospila*) are highly migratory species and others fish species are long distance migrators originate from the Great Lake and the Tonle Sap River.

58 fish species of 87 fish species are found in both Rivers (table 4.2). Based on this record fish in downstream and upstream of the project site in the Sesan River and in the Srepork River could move. However the study was conducted in the dry season and so most fish spent their time in deep pools for feeding and growing and it's also described by Poulsen at el., 2002.

Conclusion:

- Approximately 66 % of fish do move from above to below the project site and vice versa for seasonal spawning, feeding, new habitat and dry season refuge. The blocking of such movement by the dam will have significant impacts on upstream villages many of which rely heavily on fishing.
- It is difficult to confirm whether the fish caught in the upstream of the project site are migrating, as there is any clear evidence of migratory behaviour.

4.6 Fish Yield

4.6.1 Fish Yield Estimated in project area

A)- By using Focus Group (PRA)

Wild fish catch estimation was estimated from the focus group (PRA) in each village by asking related to catch, gear use, duration of fishing, how many days per month and how many months per season to estimate the annual yield in the project areas. In generally the people in the project area do fishing 250-255 hours in dry and wet season, see detail in annex 4.

From the PRA and household survey (Feb-Mar. 2008) found that fishing family in the project area as showed in table 4.4.

Table 4.4: Number of fishing family in project area

Village name	Total Family	Fishing family	
		%	#
Downstream of project area			
Phluk	196	95	186
Banh Bung	68	95	65
Total:	264	95	**251**
Upstream of the project area			
Srekor 1	165	95	157
Srekor 2	158	95	150
Talat	72	95	68
Svay Reang	256	95	243
Rompot	53	95	50
Khsach hmey	255	95	242
Total	959	95	**911**
Srepok River			
Sre Sronok	104	95	99
Kbal Romeas	106	95	101
Krobei Chrum	177	95	168
Total:	636	95	**604**

Table 4.5: Catch Estimation by PRA

No.	Project Areas	Yield in Dry season				Yield in Wet season			
		Daily catch/ family, in Kg	Fishing family	Fishing hour	Total catch, in Kg	Daily catch/ family, in Kg	Fishing family	Fishing hour	Total catch, in Kg
1	Downstream of Sesan	0.5	251	255	32002	0.6	251	250	37650
2	Upstream of Sesan	0.2	911	147	26783	0.5	911	90	40995
3	Srepork	0.6	604	225	49680	0.5	604	310	57040
	Total				108466				135685

Table 4.6: Summary of Catch Estimation by PRA in project area

No	Project Areas	Yield in Dry season (ton)	Yield in Wet season (ton)	Annual catch (ton)
1	Downstream of Sesan	32	37.65	69.65
2	Upstream of Sesan	26.78	40.99	67.77
3	Srepork	49.68	57.04	106.72
Total		**108.46**	**135.68**	**244.14**

The total catch in both rivers was about 242.14 tons for 1530 families (95 % are fishing family) it means that catch per day and per family is estimated at 0.49 kg/family/day.

B)- By research of selection fishermen

Two catch sections were selected on the Sesan River (one upstream and one downstream of the project site) and one on the Srepok River for the study of wild fish catch.

- Sesan upstream site: section from Sre kor commune to Talat village.
- Sesan downstream site: section from Bunh Bong village to Pluk village.
- Srepok River site: section comprising from Sre Sornok village to Krobey Chrum village.

Fishermen were identified and selected to record fish catch data in logbooks to establish a monthly survey of CPUE (Catch Per Unit Effort)/gear/fisherman. A total of 12 fishermen were identified from the Sesan River and six from the Srepok River.

Tables 4.7, 4.8and 4.9: summarise catches per fishing along the catch sections. The four most efficient gears were: Cast Net (Samnanh), Hook Long Line (Santouch ronorng), Gillnet (Morng) and Horizontal Cylinder Trap (Lob).

Table 4.7: Catch estimation in upstream of the project site in Sesan in dry Season

No	Fishing Gear	Number of HHs	CPUE (g /h/gear)	Hour/ day	Day/ month	Month/ year	Fish yield (g)	Fish Yield (ton)
1	Morng (100%)	911	3.36	12	20	6	4407782	4.41
2	Samnanh (50%)	456	531.76	2	10	6	29097907	29.1
3	Ronorng (50%)	456	77.16	12	10	6	25333171	25.33
4	Tom (5%)	46	8.89	12	6	6	176662	0.18
							Total	**59.02**

Table 4.8: Catch estimation in Downstream of the project site Sesan in dry Season

No	Fishing Gear	Number of HHs	CPUE (g/h/gear)	Hour/ day	Day/ month	Month/ year	Fish yield (g)	Fish Yield (ton)
1	Morng (100%)	251	1.2	12	20	6	433728	0.43
2	Samnanh (50%)	126	717.94	2	18	6	19539455	19.54
3	Ronorng (50%)	126	29.31	12	10	6	2659003	2.66
							Total	**22.63**

Table 4.9: Catch estimation in Srepok River in dry Season

No	Fishing Gear	Number of HHs	CPUE (g/h/gear)	Hour/ day	Day/ month	Month/ year	Fish yield (g)	Fish Yield (ton)
1	Morng (100%)	368	0.3	12	20	6	158976	0.16
2	Samnanh (50%)	184	770.61	2	15	6	25522603	25.52
3	Ronorng (50%)	184	23.28	12	6	6	1850480	1.85
							Total	**27.53**

Note: HHs: Households

After two months of survey, the catch estimation by logbook was around 81.65 tons (table: 4.7 and 4.8) in the Sesan River and 27.53 tons in the Srepork river. The fish yield in upstream of the Sesan river was more than downstream of Sesan and Srepok River.

The total catch in both rivers was about 109 tons for 1530 families (95 % are fishermen). This means that catch per day and per family estimated of **0.39 kg/family/day** (109 tone/1530 families/6months/30days) or **0.08kg/person/day** (109 tones/7,544 persons/6months/30days) during the dry season. The catch per day will increase if fishing during the wet season is included. The total cost of fish caught was **272,500 $ (109,000 kg * 2.5$ in average)** (fish price: larch fish 5 $, medium fish 2 $ and small fish 1 $) (Village fishermen in the project site, 2008).

4.6.2 Fish yield estimation in upstream of project area (Ratanakiri Province)

A)- Catch estimation by using the CPUE (Catch per unit Effort) and fishing hours were used the source from Meach and Baird, 2005 and total population was used the source from 3S River, 2006.

The total catch in Sesan river (Ratanakiri) was about 472.55 tons for 3664 families (90 % are fishing family). This means that catch per day and per family estimated of 0.36 kg/family/day (472.55 tone/3664 families/12months/30days) or 0.065kg/person/day (472.55 tones/20,035 persons/12months/30days). The total cost of fish caught was 1,417,659 $ (472550 kg *3 $/kg). The average fish price of 3 $/kg was sourced from local people in community base in Ratanakiri, 2008. The average value of catch per family per year therefore is approximately USD 387.91 ($1,417,659/3664 families).

The total catch in Srepok river (Ratanakiri) was about 177.01 tons for 1361 families (90 % are fishing family). This means that catch per day and per family estimated of 0.36 kg/family/day (177010 tone/1361 families/12months/30days) or 0.065kg/person/day (177.01 tones/7571 persons/12months/30days). The total cost of fish caught was 531,030 $ (177,010 kg *3 $/kg). The average fish price of 3 $/kg was sourced from local people in Ratanakiri, 2008. The average value of catch per family per year therefore is approximately USD 390.17 ($531,030/1361 families).

Table4.10: Total catch in the upstream of the Sesan and Srepok River, by using the CPUE (Catch per unit Effort) and fishing hours were used the source from Meach and Baird, 2005 and total population was used the source from 3S River, 2006.

Subscribe of 90 % of the total population are fishermen in Ratanakiri province					
Srepok River (The total family is 1361 families)					
Fishing gear	Fishermen Number	CPUE (kg)	Hour/year	Yield/Year (kg)	Yield/Year (tone)
Morng (95 %)	1293	0.082	1564	165824.66	165.82
Ronong (40 %)	667	0.064	189	8068.03	8.07
Bangkai (22 %)	299	0.057	182	3101.83	3.10
Samnanh (7 %)	95	0.13	1.2	14.82	0.01
Total Catch				**177009.342**	**177.01**
Sesan River (The total family is 3664 families)					
Fishing gear	Fishermen Number	CPUE (kg)	Hour/year	Yield/Year (kg)	Yield/Year (tone)
Morng (95 %)	3481	0.082	1564	446431.29	446.43
Ronong (40 %)	1465	0.064	189	17720.64	17.72
Bangkai (22 %)	806	0.057	182	8361.44	8.36
Samnanh (7 %)	256	0.13	1.2	39.94	0.04
Total Catch				**472553.308**	**472.55**

B) Catch estimation by using the CPUE (Catch per unit Effort) and fishing hours were used the source from recent research and total population was used the source from MoI, 2007.

Table 4.11: Total families in Upstream of the project area

Province	District	Commune	Village	Total families
Along the Sesan river				
Rattanakiri	Veum Sai	Hat Pak	Lam Pat	13
			Veun Hay	61
			Hat Pak	174
		Phnum Kok	Tiem Kraom	79
			Kok Prov	65
			Kok Lav	59
		Pa Kalan	Kampong Cham	82
			Pa Kalan	154
		Veun Sai	Ka Lan	156
			Thmei	45
			Pak Kae	66
			Veun Sai	126
		Ban Pong	Hvang	283
			Pong	177
		Kok Lak	La Meuy	128
			Rak	135
			Trak	51
			La Lai	77
		Ka Choun	Tiem Leu	81
			Ka Choun Kraom	99
			Ka Choun Leu	93
	Andoung Meas	Mai Hie	Tang Chi	*100*
			Dal	*100*

			Tang Se	*100*
			Nhang	*100*
		Nhang	Ka Chut	67
			Nay	68
		Ta Lav	Ta Lav	93
			In	57
			Ka Nat	155
			Kate	52
			Ka Nong	53
	Ou Ya Dav	Sesant	Ka Tang	57
			Pa Dal	96
			Phi	91
	Ta Veang	Ta Veaeng Leu	Chan	41
			Chuoy	81
			Ta Bouk	99
			Bangket	63
			Sanh	42
			Ke Kuong	53
			Rieng Vinh	48
			Phlueu Thum	46
			Phlueu Touch	50
			Ta Veaeng	206
		Ta Veaeng Kraom	Tumpuon Reung Thum	104
			Kaoh Pong	10
			Sieng Say	55
			Pha Yang	53
			Ta Ngach	24
			Phav	141
			Tumpuon Reung Touch	57
			Vieng Chan	32
Sub-Total:				***4598***
Along the Srepok river				
Rattanakiri	Koun Mom	Trapeang Chres	Sangkum	72
		Serei Mongkol	Srae Pok Thum	173
			Srae Pok Touch	130
			Neang Dei	41
		Srea Angkrong	Phum Muoy	91
			Phum Pir	113
			Phum Bei	112
	Lumphat	Chey Otdam	Ou Kan	68
			Srae Chhuk	101
			Sam Kha	74
			Dei Lou	150
			Thmei	160
			Lumphat	186
Mondulkiri	Kaoh Nheaek	Nang Khi Loek	Kaoh Meayeu Leu	*100*
		Ou Buon Leu	Tuol	*100*
			Ou Buon Leu	*100*
			Antreh	*100*
Sub-Total:				***1871***
Total:				***6469***

Source: Commune profile, 2007. Data obtained from MoI

Table 4.12: Total catch of the Sesan and Srepok River, by using the CPUE (Catch per unit Effort) and fishing hours were used the source from recent research and total population was used the source from MoI, 2007.

Subscribe of 90 % of the total population in upstream of reservoir site are fishing families					
Srepok River (The total family is 1684 families, data 2007, MoI)					
Fishing gear	**Fishermen Number**	**CPUE (g)**	**Hour/year**	**Yield/Year (g)**	**Yield/Year (tone)**
Morng (95 %)	1600	0.3	2880	1382145	1.382
Ronong (40 %)	674	23.28	864	13547932	13.548
Bangkai (22 %)	370	57	182	3843131	3.843
Samnanh (7 %)	118	770.61	360	32700281	32.700
Total Catch				51473489	51.473
Sesan River (The total family is 4138 families, data 2007, MoI)					
Fishing gear	**Fishermen Number**	**CPUE (g)**	**Hour/year**	**Yield/Year (g)**	**Yield/Year (tone)**
Morng (95 %)	3931	0.3	2880	3396635	3.397
Ronong (40 %)	1655	23.28	432	16647085	16.647
Bangkai (22 %)	910	57	182	9444531	9.445
Samnanh (7 %)	290	770.61	1440	321444981	321.445
Total Catch				350933231	350.933

The total catch in Sesan River (Ratanakiri) was about 350.933 tons for 4598 families (90 % are fishing families). The total cost of fish caught was USD 1,052,800.00 . The average fish price of 3 $/kg was sourced from local people in community base in Ratanakiri, 2008.

The total catch in Srepok river (Ratanakiri) was about 51.473 tons for 1871 families (90 % are fishing families). The total cost of fish caught was **USD 154,420.00.** The average fish price of 3 $/kg was sourced from local people in community base in Ratanakiri, 2008.

Summary of fish catch and its cost estimation in upstream of project area

Upstream of project area	Total catch (kg)	Fish price, $/kg	Total Cost, $
A) By using the CPUE (Catch per unit Effort) and fishing hours were used the source from Meach and Baird, 2005 and total population was used the source from 3S River, 2006.			
Sesan River	472550	3.00	1,417,650.00
Srepok River	177010	3.00	531,030.00
	649560		**1,948,680.00**
B) By using the CPUE (Catch per unit Effort) and fishing hours were used the source from recent research (February-May 2008) and total population was used the source from MoI, 2007.			
Sesan River	350933	3.00	1,052,800.00
Srepok River	51473	3.00	154,420.00
Total	402406		**1,207,220.00**

4.6.4 Fish Cost estimation in project area and upstream of project area

Fish price per Kg in Rattanakiri was higher than fish price per Kg Stung Treng province based on the information from local fishermen, and the cost estimation by using CPUE from previous study (**Meach and Baird, 2005**) was around USD 2.56 million , see table 4.13. The estimation in project area and upstream of project area by using CPUE from selected fishermen was around USD 1.8 million, see table 4.14.

Table 4.13: Total fish cost estimation by using secondary data Focus Group (PRA) and previous CPUE

Location	Yield in dry season (kg)	Yield in wet season (kg)	Total yield per year (kg)	Cost/Kg (USD)	Annual cost (USD)
In project area	108460	135680	244140	2.5	610,350.00
Upstream of project area			649560	3	1,948,680.00
Total:					2,559,030.00

Table 4.14: Total fish cost estimation by CPUE from research study Feb-May 2008

Location	Yield in dry season (kg)	Yield in wet season (kg)	Total yield per year (kg)	Cost/Kg (USD)	Annual cost (USD)
In project area	109180	135680	244860	2.5	612,150.00
Upstream of project area			402406	3	1,207,218.00
Total:					1,819,368.00

Conclusion:

- The fish catch is only during the dry season and does not include the wet season when catches will be higher according to the PRA results.
- The fish catch in upstream of the Sesan and Srepok River in Rattanakiri province was estimated by using secondary data and real data from this research to show the total catch although this estimation was not hundred percent accurate.

4.7 Fishing Activities and Consumption

The people who live along these rivers depend on farming, fishing, forest by-products and animal raising (buffalo and cattle). These activities play very vital role in their livelihood in the project areas, but fishing activity now has become vital for villagers both in the project area and above and below it.

In general fishermen spend their time from 2 to 4 hours per day on fishing activities and then they do other jobs although some fishing gears such as Moang, Santouch Renong and Tom are used between 8 to 12 hours/day, because these fishing gears are kept a long time in the water (fishermen interview in the project site 2008).

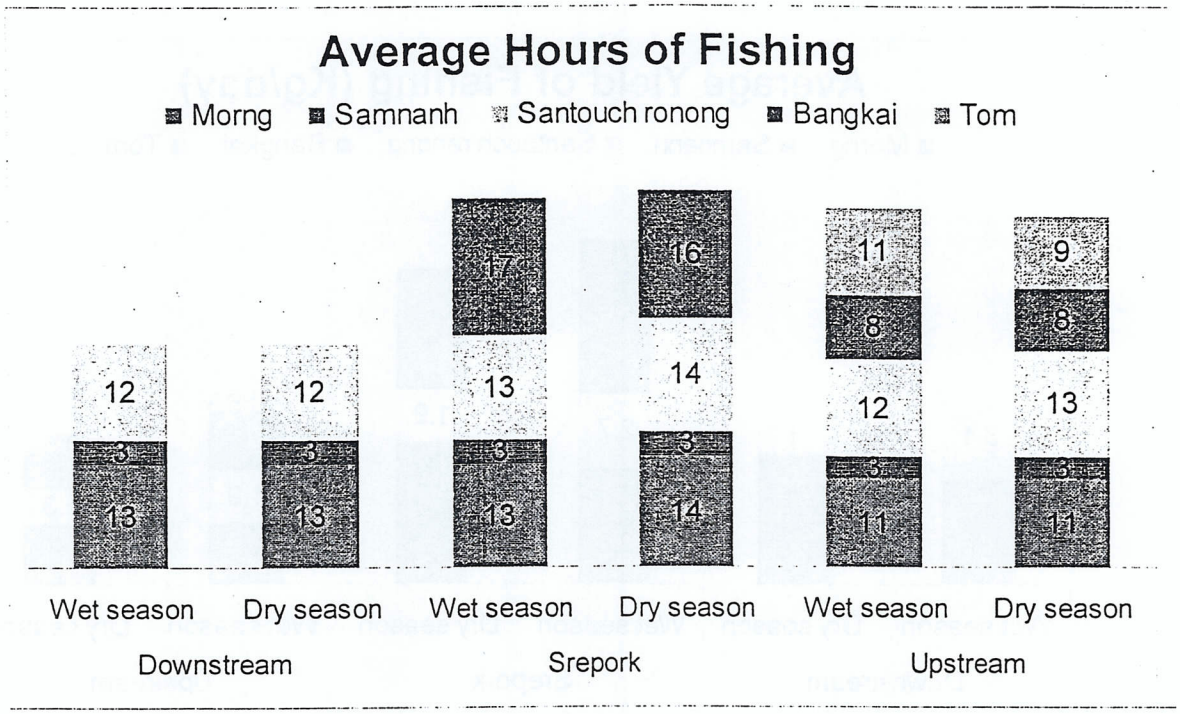

Figure 4.2: Fishing hour by gear

Based on the information from interviewing, fishermen spend between 10-25days/month in wet season and 14-24 days/month in dry season depending on fishing gears (Figure 4.3). The number of fishing days was not very different from both seasons even though in the wet season they are also busy with rice production activities.

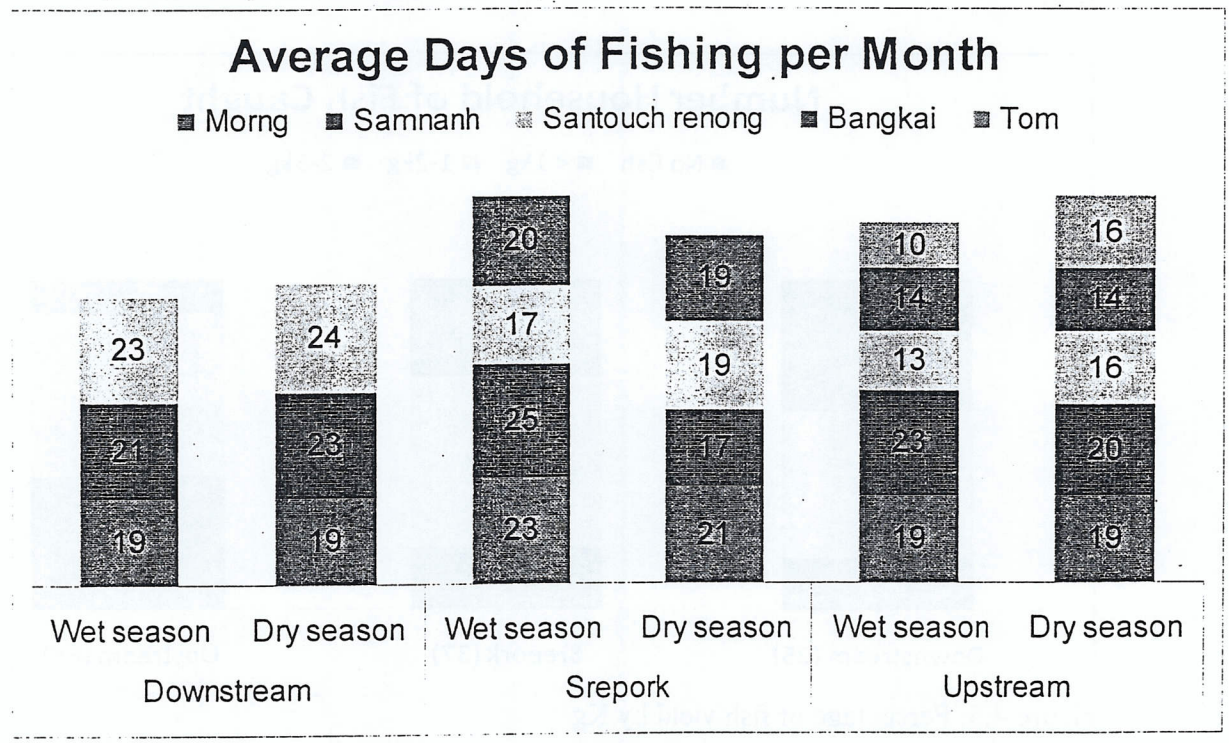

Figure 4.3: Fishing day in the project area

The fishermen in the study area catch fish on average between 0.5 to 5.5 kg/day in the wet season and 0.5 to 3.1kg/day in the dry season. The villagers consumed fish at least 0.5 kg/day/family and the maximum 3.1kg to 5.5 kg/day/family (fishermen interview in the project site 2008).

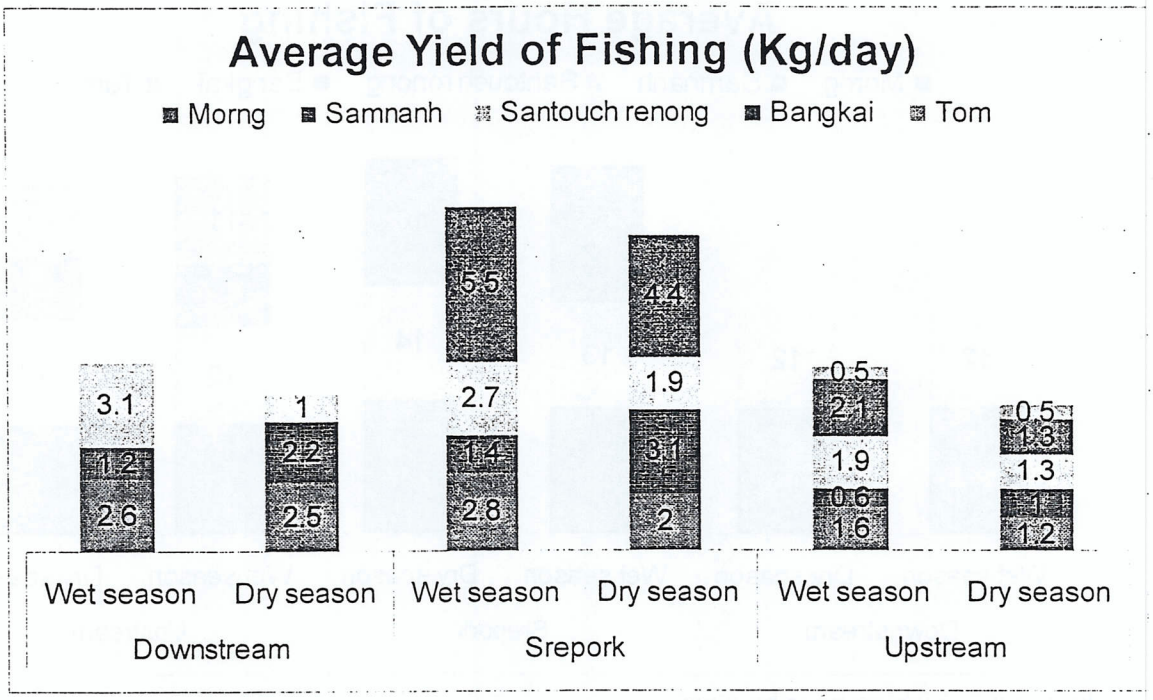

Figure 4.4: Fish yield

Figure 4.5 shows the fish yields per day/household for the study area upstream and downstream of the project site on the Sesan ans the study area on the Srepok River. Fish yield in upstream of the project site of the Sesan River was lower than downstream of the Sesan river and Srepok river.

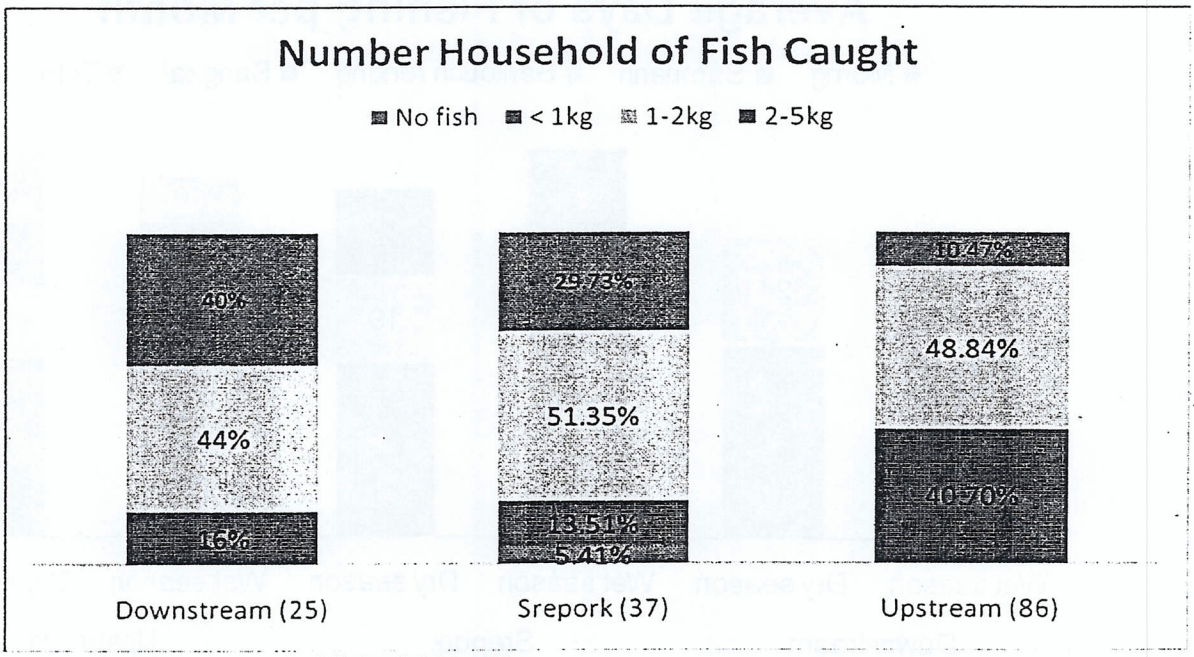

Figure 4.5: Percentage of fish yield by Kg

The villagers will sell fish if they catch more than 2 kg/per/day to get some money for household expense such as paid on health care service, ceremony and food (source from interviewed). Figure 4.5 shows that 100 % of fishermen sold fish where the yield was 2-5kg/day/family. None was sold if the yield less than 1kg/day/family as they use this for daily household consumption (fishermen interview in the project site 2008).

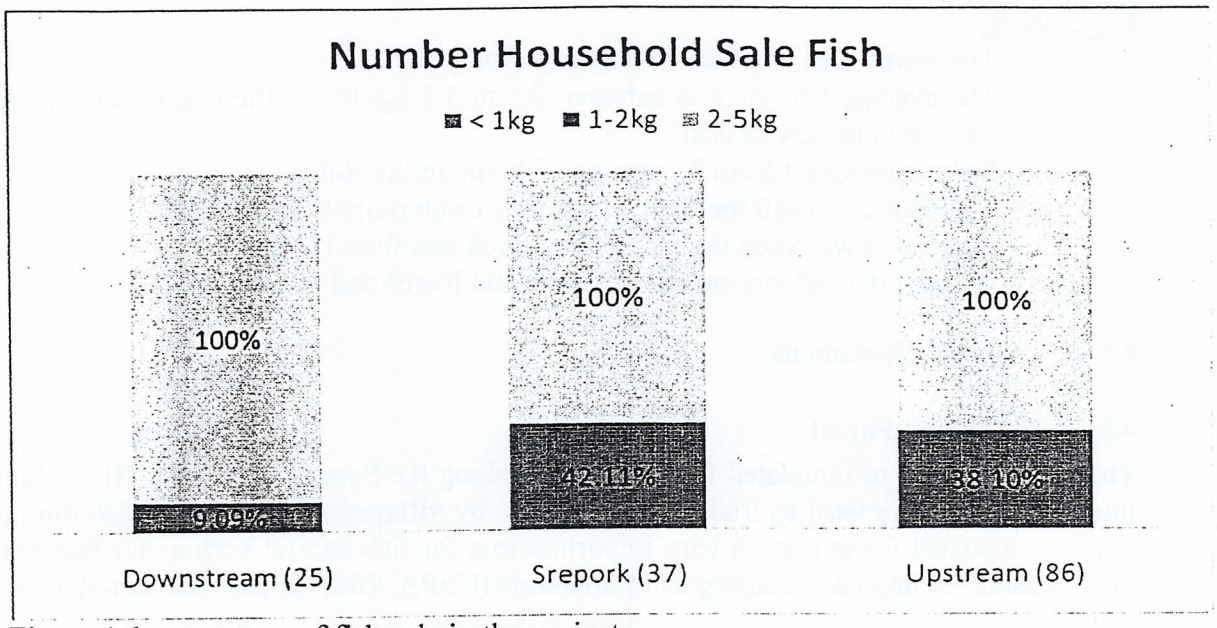

Figure 4.6: percentage of fish sole in the project area

Table: 4.15: Fish spawning in the project area

Season of Fish Spawning								
No	**Fish species**	**Scientific name**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**
1	Pasee i	*Mekongina erythrospila*						
2	Pra	*Pangasius hypophthalmus*						
3	Po	*Pangasius lamaudii*						
4	Pawamook pee	*Bangana behri*						
5	Proul	*Cirrihnus microlepis*						
6	Kaek	*Morulius sp.*						
7	Krum	*Osteochilus melanopleurus*						
8	Achkok	*Dangila spilopleura*						
9	Riel	*Henicorhynchus lobatus*						
10	Chhlang	*Hemibagrus nemurus*						
11	Chhpin	*Hypsibarbus sp.*						
12	Chdaur	*Channa macropeltes*						
13	Phtouk/Ros	*Channa striata*						
14	Khman	*Hampala dispar*						
15	Chrokaing	*Puntioplites falcifer*						
16	Khya	*Mystus wyckioides*						
17	Chektum	*Bagrichthys macropterus*						
18	Chhkok	*Cyclocheilichthys enoplos*						
19	Rahou	*Channa sp*						
20	Andaing	*Clarius batrachus*						
21	Romeas	*Osphronemus exodon*						

Based on the information from fishermen, the spawning season starts from May to August every year, but some fish species start from March such as *Channa* species (A.F. Poulsen et al., 2004) showed that fish spawning season start from May to June.

Conclusion:

- The lowest fish yield was 0.5kg/day/family
- The average fish yield is between 0.5 to 5.5 kg/day in the wet season and 0.5 to 3.1 kg/ day in the dry season
- Fishermen spend from 3 hours to 17 hours in the Rainy season
- Fishermen will sell the their fish if they catch more than 2 kg/day
- Fishermen will keep the fish if they catch less than 1kg/day
- Villager dependence on fish for food and livelihood is very high

4.8 Aquatic Specimens

4.8.1 Inundated Forest

There are 30 kinds of inundated forest recorded along the Sesan and Srepok River. Some of the inundate forest were used as traditional medicine by villagers, fed by some fish during the wet season. Inundated forest plays a very important role for fish habitat such as for fish spawning in rainy season, feeding and escaping from predators (CEPA, 2005-2006). (see detail in annex 5)

4.8.2 Birds

11 species of wild birds are found along the Sesan and Srepork River and some species eat fish in the river for some species. The table 4.9 showed the present birds in the project area.

Table 4.11: List of bird in the project area

No	Khmer Name	Scientific Name	English Name
1	Kok	*Egretta garzetta*	Little Engret
2	Morn Teuk	*Amaurormis phoenicuru*	White-breasted water hen
3	Pro Vek	*Dendrocygna javanica*	Lesser whistling duck
4	Tro Dok	*Leptoptilos dubius*	Greater Adjuntant
5	Kror Sa	*Ardea cinerea*	Grey Heron
6	Kaek Teuk	*Phalacrocorax niger*	Little Cormorant
7	Roneal Sor	*Mycteria cinerea*	Milky Stork
8	Traw Yong	*Threskiornis melanocephalus*	Black-headed Ibis
9	Ork Trey	*Ichthyophaga humilis*	Lesser Fish Eagle
10	Ty Tuy	*Bubo nipalensis*	Spot-bellied Eagle Owl
11	Kreal	*Grus antigone*	Sarus Crane

(Source from villager and Tan Sehta and Colin Poole, 2003)

4.8.3 Reptiles

Based on the information from villagers there are turtles, many kind of snakes, crocodile (saw by the fishermen in Pluk village, Pluk commune), and other species are present in the project area. These species are now rarely to seen.

5 Conclusions and Recommendations

5.2 Conclusions

The results of this study indicate that the fish species recorded in the project area less than the research of CEPA organization in 2006 (130 fish species) but this study was only conducted for a short time during the dry season. Fish species were recorded in 9 Order, 22 Family and 99 species by PRA and survey, and 6 Order, 21 Family and 87 species. Only three fish species (*Mekongina erythrospila*, *Bangana behri* and *Probarbus sp*) were recorded as rare species in general of Mekong River by CITES. Fish do move move from the above the project site to below it and vice versa for seasonal spawning, feeding, new habitat and dry season refuge. 0.19 kg/person/day is eaten by fishermen in the main stream of Mekong River (Sverdrup-Jensen, S 2002) but the fishermen in the project area ate fish only 0.08 kg/person/day. Fish yield in the project area in the dry season is decrease because of fish habitats were reduced (deep pools were filled up with sand, silt and rock by erosion in rainy season that impact to dry season refuge and feed lost (rock algae), and increase of turbidity in the river (Ian G. Baird et al., 2005). The fish used for household consumption is very important for villagers in the project area because fish provided high quality of protein and helps poor people from having to buy meat for daily food. Some reptiles (crocodile, Snakes etc…) and bird species such as Trodok (*Leptoptilos dubius*), Ty Tuy (*Bubo nipalensis*) etc… are seen but rarely in project area.

5.3 Recommendations

- More research on fish species and catches especially in rainy season.
- If construction hydro power in Sesan River a fish pass should be considered for sustainable of fish species in upstream. As a research result in Stung Chinit, Kompong Thom Province by Dr Lim Puy in 2006-2007.
- More research on inundated forest and birds.

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Annex 1: Detail Activities

Date	Activities	Morning	Afternoon	Note
02/02/08	Trip	Phnom Penh to Stung Treng		
03/02/08	Trip to Sesan district	Visited Sesan district	Visited provincial fisheries office	- Collection of general information related to population, fisheries status
04-07/02/08	Fishermen selection and training in each commune	Provincial centre to Pluk, Kbal Romeas, Talat and Sre Kor commune		- General information and selected fishermen for logbook and training how to record fish data.
08/02/08	Return	Stung Treng to Phnom Penh		
15/02/08	Trip	Phnom Penh to Stung Treng		
16-18/08	Log book collect and fellow up and market and fish collection centre survey on fish price	Provincial centre to Pluk, Kbal Romeas, Talat and Sre Kor commune		- Follow up selected fishermen on data record.
19/02/08	Return	Stung Treng to Phnom Penh		
03/03/08	Trip	Phnom Penh to Stung Treng		
04-08/03/08	- Data collection and PRA related to fishing situation in the four communes. - Pre test questionnaire with some fishermen in villages	Field work to Pluk, Kbal Romeas, Talat and Sre Kor commune		- PRA in group between 10 to 20 fishermen in each village and photo fish species and inundated forest along Seand and Srepok river.
09/03/08	Return	Stung Treng to Phnom Penh		
16/03/08	Trip	Phnom Penh to Stung Treng		
17-20/03/08	- Data collection (logbook and interview fishermen) for final information	Field work to Pluk, Kbal Romeas, Talat and Sre Kor commune		- Collection logbook and information and photo inundated forest and fish species in Sesan and Srepok river
21/03/08	Return	Stung Treng to Phnom Penh		
01/04/08	Trip	Phnom Penh to Stung Treng		
02-03/08	- Final logbook collection	Field work to Pluk, Kbal Romeas, Talat and Sre Kor commune		- Collected final data from fishermen in each village.
04/04/08	Return	Stung Treng to Phnom Penh		

Annex 2: Questionnaire

Interviewer.....
Date.....

Fishermen.....
Sex.....
Age.....
Nationality.....
Main job.....
Minor job.....

District.....
Commune.....
Village.....

1- Fishing Activities

				Rainy Season						Dry Season					
				Time		Duration			Catch	Time		Duration			Catch
Fishing Gears	nb.gear	nb.fishermen	Size	starting	ending	hours/day	days/mth	mth/season	kg/day	starting	ending	hours/day	days/mth	mth/season	kg/day
Mong															
Santouch Ronong															
Lob															
Samnanh															

2- Fishing gears use, Fishing area and Way to fishing

No	Fishing gear	Fishing Area			Way to fishing		
		River	Pond	Canal	Boat	Boat with Machine	Other
1	Morng						
2	Ronong						
3	Samnanh						
4	Lob						

3- Fish species that catch with egg

No	Fish species	See (month)	Not see (month)	Other
1	Pa sa ee			
2	Pra			
3	Po			
4	Pavamok muoy			
5	Pruol			
6	Kaek			
7	Real			
8	Krum			
9				
10				
11				

4- Fish consumption

Yield (kg)	Catch /day	Consume /day	Selling place			Fish price					
			Middle trader	Village market	Outside village	Wet season			Dry season		
						No1	No2	No3	No1	No2	No3
>1											
1-2											
2-5											
5-10											
>10											

Fish species (check list)				
Species			Rare	Rich
Abb.name	Local Name	Scientific Name		
Cl spp	Bawndol ampeou	*clupeoides*		
ClA	Bawndol ampeou/ Sderng	*Clupeichthys aesarnensis*		
ChO	Krai	*Chilata ornata*		
NoN	Slat	*Notopterus notopterus*		
DaS	Ach Kok	*Dangila spilopleura*		
SyO	Ampil tum	*Systomus orphoides*		
SyA	Angkat prak	*Systomus aurotaeniatus*		
RaA	Changwa mool	*Rasbora aurontaenia*		
EsL	Changwa chnout	*Rasbora spp*		
ES sp	Changwa phlieng	*Esomus spp*		
CyE	Chhkok	*Cyclocheilichthys enoplos*		
BaG	Chhpin	*Babodes goniontus*		
PuP	Chrakaing	*Puntioplites proctozysorn*		
LeH	Chrawlang	*Leptobarbus hoeveni*		
LuS	Dawng dao	*Luciosoma Setigerun*		
MoC	Ka ek	*Morulius chtysophekadion*		
BaA	Kahe	*Barbodes altus*		
AmT	Kambot chramos	*Amblyrhynchichthys truncatus*		

HaM	Khmann	*Hampala macrolepidota*		
DaN	Khnawng veng	*Dangila spp*		
OsH	Kros	*Osteochilus hasselti*		
Os spp	Kros Krahorm	*Osteochilus Spp*		
OsM	Krum	*Osteochilus melanopleurus*		
ThT	Linh	*Thynnichthys thynnoides*		
OsS	Lolok sor	*Osteochilus schlegeli*		
CiJ	Phkar cha	*Cirrhinus jullieni*		
CiM	Pruol	*Cirrhinus microlepis*		
HeS	Riel top	*Henicrohynchus siamensis*		
	Pase i	*Mekongine erythrospila*		
	Pawamok pee	*Bangana behri*		
NeB	Kul Prich	*Neolissochilus blanci*		
BaN	Proul Thmawr/ trey ses	*Barbichthys nitidus*		
CyL	Srawka kdam	*Cyclocheilichthys lagleri*		
MyM	Tim proek/Phkar krorbas	*Mystacoleucus marginatus*		
PaM	Chanteas pluk	*Parachela maculicauda*		
PaT	Slak russey	*Paralaubuca Typus*		
DIA	Kantouy krahom	*Discherodontus ashmeadi*		
BoT spp	Kanhchrouk	*Botia spp*		
BoH	Kanhchrouk chhnoht	*Botia helodes*		
BoM	Kanhchrouk krawhorm	*Botia modesta*		
Ac spp	Ruschek	*Acantopsis Spp*		
	Krobey	*Bagarius bagarius*		
MyN	Chhlang	*Mystus nemurus*		
HeB	Kanchos Kdaung	*Hemterbagrus bocurti*		
Gl spp	Kanchos krawbey	*Glyptothorax Spp*		
MyW	Kanchos thmor	*Mystus wycki*		
My spp	Kanchos	*Mystus Spp*		
My spp	Tanel	*Mystus Spp*		
MyW	Khya	*Mystus wyckioides*		
	Kanchos Chnout	*Mystus mysticetus*		
PaS	Chhwiet	*Pangasianodon siamensis*		
PaH	Pra	*Pangasius hypopthalmus*		
	Ke/ Pra ke	*Heterobagrus bocourti*		
	Pou	*Pangasius larnaudii*		
	Reach	*Pangasianodom gigas*		
MiM	Kes	*Micronema micronema*		
KrC	Kamplieu	*Kryptoperus cheveyi*		
BeD	Klang hay	*Belodontichthys dinema*		
WaA	Sanday	*Wallago attu*		
HeM	Krormorm	*Hemisilurus mekongensis*		
Om spp	Ta aun	*Ompok Spp*		
WaL	Stuak	*Wallago leeri*		
ClB	Andaing roueng	*Clarias batrachus*		
ClM	Andaing toun	*Clarias meladerma*		
Xen spp	Phtong	*Xenentodon Spp*		

MaS	Chhlonh	*Macrognathus siamensis*		
MaF	Kchoeung	*Mastacembelus favus*		
PaW	Kantrang preng	*Parambassis wolffi*		
PsN	Kanchanh chras	*Pseudambassis notatus*		
OxM	Damrey	*Oxyeleotris marmorata*		
BiB	Ksach	*Butis butis*		
AnT	Kranh	*Anabas testudineus*		
NaN	Khlar	*Nandus nandus*		
HeT	Kantrawb	*Hemlostoma temmincki*		
TrM	Kawmphleanh phluk	*Trichogaster microlepis*		
TrT	Kawmphleanh samrai	*Trichogaster trichoplerus*		
TrV	Kroem	*Trichopsis vittata*		
ChM	Chhdaur	*Channa micropelles*		
ChL	Kanh chorn chey	*Channa lucius*		
ChS	Phtuok	*Channa striata*		
ChO	Ksan	*Channa orientalis*		
ToX	Kancheak sla	*Toxotes Spp*		
MoC	Kampot	*Monotreta cambodgiensis*		
AcL	Andat chhke	*Achiroides leucorhynchos*		
	Broma			
	Pream sor			
	Pream leoung			
	Slab maoun			
	Pa phean			
	Om boung			
	Romeas			
	Kropes			
	Kanteay			
	Babel			
	Kampes			
	Bankong			

Annex 3: Fish record by PRA, Interview and Logbook

1. Fish species record by Interview and PRA

Order	Family	*Scientific name*	Local name
Rajiformes	Dasyatidae	*Amphotistius sp*	Trey Bawbel
Clupeiformes	Clupeidae	*Tenualosa thibaudeaui*	Trey Kbork
Osteoglossiformes	Notopteridae	*Chitala ornata*	Trey Ka ey
		Chitala blanci	Trey Krai
		Notopterus notopterus	Trey Slat
Cypriniformes	Cyprinidae	*Dangila spilopleura*	Trey Achkok
		Poropunitus deauratus	Trey Chamnangkoki/Trey lolok saw
		Rasbora spp.	Trey Changwa
		Rasbora tornieri	Trey Changwa moul
		Opsarius koratensis	Trey Changwa
		Luciosoma setigerum	Trey Changwa Ronaung
		Rabora borapetensis	Trey Changwa
		Cyclocheilichthys sp.	Trey Chhkok
		Cyclocheilicthys furcatus	Trey Chhkok kda
		Hypsibarbus sp.cf.vernayi	Trey Chhpin Meas
		Hypsibarbus wetmorei	Trey Chhpin kourng/pruy
		Hypsibarbus sp.	Trey Chhpin
		Puntioplites falcifer	Trey Chrokaing
		Macrochirichthys macrochirus	Trey Dangkteng
		Morulius sp.	Trey Kaek
		Barbodes altus	Trey Kahe
		Amblyrhynchichthys truncates	Trey Kambot chromos
		Cosmocheilus harmandi	Trey Kampoulbay
		Discherodontus ashmeadi	Trey Kantuy krohorm
		Hampala dispar	Trey Khmann
		Osteochilus hasselti	Trey Kros
		Osteochilus melanopleurus	Trey Krum
		Thynnichthys thynnoides	Trey Linh
		Osteochilus schlegeli	Trey Lolok sor
		Cirrihinus molitorella	Trey Pakaing
		Barbodes schwanefeldi	Trey Paphean
		Mekongina erythrospila	Trey Pasi ee
		Lebeo erythropterus	Trey Pawa mok moi
		Bangana behri	Trey Pawa mok pee
		Cirrihnus jullieni	Trey Phka cha
		Cirrhinus molitorella	Trey Phka kor
		Cirrihnus microlepis	Trey Proul
		Henicorhynchus sp	Trey Riel
		Henicorhychus crytopogon	Trey Riel Awng kam
		Henicorhynchus siamensis	Trey Rieltop/Rielmork
		Paralaubucus typus	Trey Slak ruseey
		Gyrinocheilus pennocki	Trey Smok/Thmor/Pakork
		Cyclocheilichthys sp.	Trey Srawkadam
		Probarbus jullieni	Trey Trawsak
	Cobitidae	*Botia sp.*	Trey Kanchrouk

		Botia modesta	Trey Kanchrouk krawhorm
		Acantopsis sp.	Trey Ruschek
Siluriformes	**Clariidae**	*Clarias macrocephalus*	Trey Andaing Toun
		Clarius batrachus	Trey Andaing Roueng
	Bagridae	*Hemibagrus nemurus*	Trey Chhlang/ Pakos
		Mystus filamentus	Trey Tanel
		Mystus sp.	Trey Kanchos
		Mystus multiradiatus	Trey kanchos chhnoht
		Heterobagrus bocourti	Trey Kanchos kdaung
		Leiocassis siamensis	Trey Kanchos para
		Mystus wolffi	Trey Kanchos pruy
		Mystus wyckioides	Trey Khya
		Mystus filamentus	Trey Khya thmor
		Bagrichthys macropterus	Trey Chek tum
	Ariidae	*Arinus sp.*	Trey Kaok
	Pangasiidae	*Pangasius concophilus*	Trey Ke
		Pangasius lamaudiei	Trey Po
		Pangasius sanitwongsei	Trey Po pruy
		Pangasius sp.	Trey Pra
		Helicophagus waandersi	Trey Pra kandor
		Pangasius sp.	Trey Chhwiet
		Pangasius macronema	Trey Chhwiet doung
	Schibeidae	*Laides siamensis*	Trey Chhwiet prak
	Siluridae	*Kryptopterus cryptopterus*	Trey Kamplieu/ Trey Prak
		Micronema micronema	Trey Kes
		Ompok hypophthalmus	Trey Ta aun
		Kryptopterus moorei	Trey Slab moun
		Micronema bleekeri	Trey Kes chamrov
		Ompok bimaculatus	Trey Kromorm
		Belodonticchthys dinema	Trey Klang hay
		Wallago attu	Trey Sanday
		Wallago leeri	Trey Stouk
		Bagarius sp	Trey Krobey
Perciformes	**Channidae**	*Channa macropeltes*	Trey Chhdaur
		Channa striata	Trey Phtuok/Raws
		channa orientalis	Trey Ksan
		Channa sp.	Trey Am boung
		Parambassis wolffi	Trey Kantrang pren
	Lobotidae	*Dantnioides guadrifasciatus*	Trey Khlar
		Datnioides microlepis	Trey Khlar
	Polynemidae	*Polynemus sp*	Trey Pream
	Sciaenidae	*Boesemania microlepis*	Trey Promah
	Nandidae	*Pristolepis fasciata*	Trey Kantrawb
	Anabantidae	*Anabas testudineus*	Trey Kranh
	Belontiidae	*Trichogaster trichopterus*	Trey Kamphlieng
		Schistura sp	Trey Pakok
		Trichogaster pectoralis	Trey Kawnthor
	Osphronemidae	*Osphronemus exodon*	Trey Romeas
	Eleotridae	Oxyeleotris marmorata	Trey Damrey
	Belonidae	*Xenentodon cancila*	Trey Ptoung

Synbranchiformes	Synbranchidae	*Ophisternon bengalense*	Antong
	Mastacembelidae	*Mastacemblus sp.*	Trey Khyeong
		Macrognathus siamensis	Trey Chhlonh
Pleuronectiformes	Soleidae	*Achiroides sp.*	Trey Andat chke
Tetraodontiformes	Tetraodontidae	*Monotreta sp*	Trey kampot

2- Fish species record by selected fishermen (logbook)

Order	Family	*Scientific name*	Local name
Osteoglossiformes	Notopteridae	*Chitala ornata*	Trey Ka ey
	Notopteridae	*Chitala blanci*	Trey Krai
	Notopteridae	*Notopterus notopterus*	Trey Slat
Cypriniformes	Cyprinidae	*Dangila spilopleura*	Trey Achkok
		Poropunitus deauratus	Trey Chamnangkoki
		Rasbora spp.	Trey Changwa
		Rasbora tornieri	Trey Changwa moul
		Cyclocheilichthys enoplos	Trey Chhkok
		Cyclocheilicthys furcatus	Trey Chhkok kda
		Albulichthys albuloides	Trey Chhkok Tituy
		Hypsibarbus malcolmi	Trey Chhpin kdar
		Hypsibarbus pierrei	Trey Chhpin kourng/pruy
		Hypsibarbus sp.	Trey Chhpinmeas
		Leptobarbus hoeveni	Trey Chrawlang or Trey knuoch
		Puntioplites falcifer	Trey Chrokaing
		Luciosoma bleekeri	Trey Dang dao
		Macrochirichthys macrochirus	Trey Dangkteng
		Morulius sp.	Trey Kaek
		Barbodes altus	Trey Kahe
		Amblyrhynchichthys truncates	Trey Kambot chromos
		Cosmocheilus harmandi	Trey Kampoulbay
		Discherodontus ashmeadi	Trey Kantuy krohorm
		Hampala dispar	Trey Khmann
		Osteochilus hasselti	Trey Kros
		Osteochilus melanopleurus	Trey Krum
		Thynnichthys thynnoides	Trey Linh
		Osteochilus schlegeli	Trey Lolok sor
		Cirrihinus molitorella	Trey Pakaing
		Barbodes schwanefeldi	Trey Paphean
		Mekongina erythrospila	Trey Pasi ee
		Lebeo erythropterus	Trey Pawa mok moi
		Bangana behri	Trey Pawa mok pee
		Cirrihnus jullieni	Trey Phka cha
		Cirrhinus molitorella	Trey Phka kor
		Cirrihnus microlepis	Trey Proul
		Henicorhynchus lobatus	Trey Riel
		Henicorhynchus siamensis	Trey Rieltop/Rielmork
		Paralaubucus typus	Trey Slak ruseey
		Gyrinocheilus pennocki	Trey Smok/Thmor/Pakork

		Cyclocheilichthys sp.	Trey Srawkadam
		Probarbus jullieni	Trey Trawsak
	Cobitidae	*Botia lecontei*	Trey Kanchrouk
		Botia modesta	Trey Kanchrouk krawhorm
		Leiocassis siamensis	Trey Kanchrouk thmor
		Acantopsis sp.	Trey Ruschek
Siluriformes	**Clariidae**	*Clarius batrachus*	Trey Andaing
	Bagridae	*Bagrichthys macropterus*	Trey Chek tum
		Hemibagrus nemurus	Trey Chhlang/ Pakos
		Mystus sp.	Trey Kanchos
		Mystus multiradiatus	Trey kanchos chhnoht
		Heterobagrus bocourti	Trey Kanchos kdaung
		Leiocassis siamensis	Trey Kanchos para
		Mystus wolffi	Trey Kanchos pruy
		Mystus wyckioides	Trey Khya
		Mystus filamentus	Trey Khya thmor
	Pangasiidae	*Pangasius concophilus*	Trey Ke
		Pangasius lamaudii	Trey Po
		Pangasius hypophthalmus	Trey Pra
		Pangasius bocourti	Trey Pra khachao
		Helicophagus waandersi	Trey Pra kandor
		Pangasius cf. polyuranodom	Trey Chhwiet
		Pangasius macronema	Trey Chhwiet doung
	Schibeidae	*Laides siamensis*	Trey Chhwiet prak
	Siluridae	*Kryptopterus cryptopterus*	Trey Kamplieu/ Trey Prak
		Micronema micronema	Trey Kes
		Ompok hypophthalmus	Trey Ta aun
		Kryptopterus moorei	Trey Slab moun
		Micronema bleekeri	Trey Kes chamrov
		Ompok bimaculatus	Trey Kromorm
		Wallago attu	Trey Sanday
		Wallago leeri	Trey Stouk
		Bagarius yarrelli	Trey Krobey
Perciformes	**Channidae**	*Channa macropeltes*	Trey Chhdaur
		Channa striata	Trey Phtuok/Raws
		Channa sp.	Trey Am boung
	Belontiidae	*Trichogaster trichopterus*	Trey Kamphlieng
	Anabantidae	*Anabas testudineus*	Trey Kranh
	Nandidae	*Pristolepis fasciata*	Trey Kantrawb
	Lobotidae	*Coius undecimradiatus*	Trey Khla
	Osphronemidae	*Osphronemus exodon*	Trey Romeas
	Eleotridae	Oxyeleotris marmorata	Trey Damrey
	Gobiidae	Glossogobius giuris	Trey Khsan
Beloniformes	**Belonidae**	*Xenentodom cancila*	Trey Ptoung
Synbranchiformes	**Mastacembelidae**	*Mastacemblus sp.*	Trey Khyeong

3- List of Rare fish species by interview and PRA

Family	*Scientific name*	Local name	Down-stream Sesan	Up-stream Sesan	Srepok
Dasyatidar	*Amphotistius sp*	Trey Bawbel	1	1	1
Notopteridae	*Chitala ornata*	Trey Ka ey			1
Cyprinidae	*Poropunitus deauratus*	Trey Trey lolok saw			1
	Cyclocheilichthys sp.	Trey Chhkok			1
	Cyclocheilicthys furcatus	Trey Chhkok kda			1
	Hypsibarbus sp.	Trey Chhpin			1
	Morulius sp.	Trey Kaek			1
	Cosmocheilus harmandi	Trey Kampoulbay			1
	Discherodontus ashmeadi	Trey Kantuy krohorm			1
	Hampala dispar	Trey Khmann			1
	Osteochilus melanopleurus	Trey Krum			1
	Thynnichthys thynnoides	Trey Linh	1	1	
	Cirrihinus molitorella	Trey Pakaing	1	1	1
	Mekongina erythrospila	Trey Pasi ee	1	1	1
	Lebeo erythropterus	Trey Pawa mok moi	1	1	1
	Bangana behri	Trey Pawa mok pee	1	1	1
	Cirrihnus jullieni	Trey Phka cha			1
	Cirrihnus microlepis	Trey Proul		1	1
	Gyrinocheilus pennocki	Trey Smok/Thmor/Pakork		1	1
	Probarbus jullieni	Trey Trawsak	1	1	1
Cobitidae	*Botia sp.*	Trey Kanchrouk		1	
	Botia modesta	Trey Kanchrouk krawhorm		1	
Ariidae	*Arinus sp.*	Trey Kaok		1	1
Pangasiidae	*Pangasius concophilus*	Trey Ke	1	1	
	Pangasius lamaudiei	Trey Po	1	1	
	Pangasius sanitwongsei	Trey Po pruy	1	1	
	Pangasius sp.	Trey Pra	1	1	1
	Helicophagus waandersi	Trey Pra kandor	1	1	
	Pangasius sp.	Trey Chhwiet	1	1	
	Pangasius macronema	Trey Chhwiet doung		1	
Schibeidae	*Laides siamensis*	Trey Chhwiet prak		1	
Siluridae	*Kryptopterus cryptopterus*	Trey Kamplieu/ Trey Prak			
	Wallago leeri	Trey Stouk		1	
	Bagarius sp	Trey Krobey		1	1
Channidae	*Channa macropeltes*	Trey Chhdaur			1
	Channa sp.	Trey Am boung	1		
Polynemidae	*Polynemus sp*	Trey Pream	1	1	1
Sciaenidae	*Boesemania microlepis*	Trey Promah		1	1
	Trichogaster pectoralis	Trey Kawnthor	1	1	
Osphronemidae	*Osphronemus exodon*	Trey Romeas			1
Eleotridae	Oxyeleotris marmorata	Trey Damrey			1

Synbranchidae	*Ophisternon bengalense*	Antong			1
Soleidae	*Achiroides sp.*	Trey Andat chke			1
		Total	16	24	29

Family	*Scientific name*	Local name	Down-stream Sesan	Up-stream Sesan	Srepok
Dasyatidar	*Amphotistius sp*	Trey Bawbel	1	1	1
Cyprinidae	*Cirrihinus molitorella*	Trey Pakaing	1	1	1
	Mekongina erythrospila	Trey Pasi ee	1	1	1
	Lebeo erythropterus	Trey Pawa mok moi	1	1	1
	Probarbus jullieni	Trey Trawsak	1	1	1
Pangasiidae	*Pangasius sp.*	Trey Pra	1	1	1
Polynemidae	*Polynemus sp*	Trey Pream	1	1	1

4- List of Rare species by selected fishermen

Order	Family	*Scientific name*	Local name	Sesan Down	Sesan Up	Srepok
Osteoglossiformes	Notopteridae	*Chitala ornata*	Trey Ka ey			1
	Notopteridae	*Notopterus notopterus*	Trey Slat	1		1
Cypriniformes	Cyprinidae	*Poropunitus deauratus*	Trey Chamnangkoki			1
		Rasbora spp.	Trey Changwa	1		
		Rasbora tornieri	Trey Changwa moul	1		1
		Albulichthys albuloides	Trey Chhkok Tituy	1		
		Hypsibarbus pierrei	Trey Chhpin kourng			1
		Hypsibarbus sp.	Trey Chhpinmeas			1
		Leptobarbus hoeveni	Trey Chrawlang o		1	
		Luciosoma bleekeri	Trey Dang dao		1	
		Macrochirichthys macrochirus	Trey Dangkteng	1		
		Amblyrhynchichthys truncates	Trey Kambot chromos			1
		Cosmocheilus harmandi	Trey Kampoulbay			1
		Discherodontus ashmeadi	Trey Kantuy krohorm		1	1
		Osteochilus melanopleurus	Trey Krum	1		1
		Thynnichthys thynnoides	Trey Linh	1		
		Osteochilus schlegeli	Trey Lolok sor			1
		Cirrihinus molitorella	Trey Pakaing	1		
		Cirrihnus jullieni	Trey Phka cha		1	
		Henicorhynchus siamensis	Trey Riel top	1		1
		Probarbus jullieni	Trey Trawsak	1		
	Cobitidae	*Botia modesta*	Trey Kanchrouk krawhorm		1	

			chhnoht			
		Heterobagrus bocourti	Trey Kanchos kdaung		1	
		Leiocassis siamensis	Trey Kanchos para	1		1
		Mystus wolffi	Trey Kanchos pruy	1		1
	Pangasiidae	*Pangasius lamaudii*	Trey Po	1	1	1
		Pangasius hypophthalmus	Trey Pra			1
		Pangasius macronema	Trey Chhwiet doung	1		1
	Schibeidae	*Laides siamensis*	Trey Chhwiet prak			1
	Siluridae	*Kryptopterus cryptopterus*	Trey Kamplieu	1		1
		Ompok hypophthalmus	Trey Ta aun		1	
		Kryptopterus moorei	Trey Slab moun			1
		Micronema bleekeri	Trey Kes chamrov			1
		Ompok bimaculatus	Trey Kromorm	1		
		Wallago attu	Trey Sanday	1		1
		Wallago leeri	Trey Stouk		1	
Perciformes	**Channidae**	*Channa sp.*	Trey Am boung	1		
	Belontiidae	*Trichogaster trichopterus*	Trey Kamphlieng	1	1	
	Eleotridae	Oxyeleotris marmorata	Trey Damrey	1		1
Beloniformes	**Belonidae**	*Xenentodom cancila*	Trey Ptoung			1
Synbranchiformes	**Mastacembelidae**	*Mastacemblus sp.*	Trey Khyeong			1
Pleuronectiformes	**Soleidae**	*Achiroides sp.*	Trey Andat chke	1		1
			Total	21	11	27

Annex 5: List of Inundated forest in the project area

No	Khmer Name	Lao Name	Scientific Name	Used
1	Romdeng	Kok khey	*Alpinia galanga*	Tree size: 0.01 m, high: 1.5m, Nov-Decem has flower, Feb-March fruit ripe, Flower and fruit ate by Trey Romeas and Trey Chhpin.
2	Rey Teuk	Kok Khey khelao	*Homonoia riparia*	Tree size: 0.1 m, high: 1.5 m, Feb-March fruit ripe, Flower and fruit ate by Trey Romeas and Trey Chhpin.
3	Tros	Kher Ben	*Conbretum trifliatum*	Tree size: 0.05 m, high: 2 m, has purple flower and fruit ate by Trey Romeas and Trey Chhpin.
4	Rang Teuk	Ka Dounnam	*Barringtonia acutauqula*	Tree size: 0.8 m, high: 7 m
5	Chhke Tuoy	Kok Khan kong	*Mallotus anissopodus*	Tree size: 0.3-0.4 m, high: 4-5 m, fruit ate by non scale fish.
6	Vor Ta an teuk	Kher Taan		
7	Phnom Phneng	Kok Huoloeung	*Hymenocardia*	Tree size: 0.1 m, high: 2-3 m.
8	Tonlea	Kok phak kum		Tree size: 0.3-0.4 m, high: 3-4 m, white brown of tree, white flower, big fruit about 0.05 m and ate by Trey Romeas and Trey Chhpin.
9	Kdol	Kok Khan Leoung	*Nauclea orientalis*	Tree size: 0.3-0.5 m, high: 5-10 m, fruit eat by Trey po Trey Chhpin, Trey Ke...
10	Chrey Krem	Kok Haihert	*Ficus racemosa*	Tree size: 0.3-0.5 m, high: 4-6 m, fruit eat by Trey Romeas, Trey Chhpin, Phkar kor…
11	Vor Savmav	Kheou Nhunhhang	*Passiflora foetida*	Tree and fruit eat by Trey Romeas, Trey Chhpin, Trey Traw cheakdamrey…
12	Lvea Chek	Mak Der	*Nauclea orientalis*	Tree size: 0.3-0.5 m, high: 5-10 m, fruit eat by Trey Romeas, Trey Chhpin, Trey Po, Trey Ke…
13	San Dan	Kok Kdan	*Garcinia lourreiri pierre*	Tree size: 1.5-2 m, high: 3-5 m
14	Svay Teuk	Kok Samphor	*Grewia sinuata*	Tree size: 0.2-0.4 m, high: 3-4 m, fruit eat by Trey Romeas, Trey Chhpin, Phkar Kor, Sraw kakdam…
15	Chanlos Teuk	Mak Huotnam	*Lepisanthes rubigignosa*	N/A
16	Kror Bao	Mak Kabao	*Hydnocoarpus*	N/A
17	Beng Teuk	Kok Hai	*Litsea pierrei*	N/A
18	Vor Nonoung	Khoeu	*Luffa aegytiaca*	N/A

	prey	Makkhum		
19	Vor Pdaoteuk	Khoeu Vaynam	*Calamus godfroyi*	N/A
20	Chhe Tealteuk	Kok Njornam	*Dipterocarpus alatus*	N/A
21	Pring Teuk	Kok Makvakhao	*Eugenia cineria*	N/A
22	Mean Teuk	Kok meannham	*Dimocarpus longan*	N/A
23	Thkov	Kok Kou	*Anthocephanlus chinensis*	N/A
24	Rom Denhteuk	Kok kasev	*Elaeocarpus lanceifolius*	N/A
25	Kanhnje Baydach	Say Sou	*Capparis micracantha*	N/A
26	Anh Chanhteuk	Kok Seav		N/A
27	Kror Muoch	Sum Soy	*Antidesma acidum*	N/A
28	Bay Kdang	Kok Khaohem	*Lemaireocereus*	N/A
29	Dang Keabkdam	Kok Maokhon	*Antidesma ghaesembilla*	N/A
30	Russey Khley	Kok Maylai	*Bambusa bambos*	N/A