



CAMBODIA NATIONAL MEKONG COMMITTEE

Basin Development Plan Programme

***Sub-Area Analysis and Development
The Se San/Sre Pok/Se Kong Sub-Area
SA – 7C***

**January 2005
Phnom Penh, Cambodia**

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Acronyms and Abbreviations

ADB	:	Asian Development Bank
AIT	:	Asian Institute of Technology
ASEAN	:	Association of South East Asian Nations
BDP	:	Basin Development Plan (MRC)
CARDI	:	Cambodian Agricultural Research and Development Institute
CARE	:	CARE International in Cambodia
CARERE	:	Cambodia Area Rehabilitation and Regeneration Project
CDC	:	Council for the Development of Cambodia
CIAP	:	The Cambodia- IRRI-Australia Project
CNMC	:	Cambodia National Mekong Committee
DANIDA	:	Danish International Development Agency
DFW	:	Department of Forestry and Wildlife
DIT	:	Department of Industrial Technology
DOF	:	Department of Fisheries
DWSS	:	Department of Water Supply and Sanitation
EIA	:	Environmental Impact Assessment
EU	:	European Union
FAO	:	Food and Agriculture Organization
FWUCs	:	Farmer Water User Communities
GDP	:	Gross Domestic Product
GEF	:	Global Environmental Facility
GMS	:	The Greater Mekong Sub-region
HRD	:	Human Resource Development
HRM	:	Human Resource Management
I & D	:	Irrigation and Drainage
IDE	:	International Development Enterprises
IDRC	:	International Development Research Canada
IFReDI	:	Inland Fisheries Research and Development Institute
ILO	:	International Labor Organization
IOs	:	International Organizations
IRRI	:	International Rice Research Institute
IUCN	:	International Union for the Conservation of Nature
JICA	:	Japan International Cooperation Agency
Lao PDR	:	Lao People's Democratic Republic
LMB	:	Lower Mekong Basin
MAFF	:	Ministry of Agriculture, Forestry and Fisheries
MIME	:	Ministry of Industry, Mines and Energy
MLMUPC	:	Ministry of Land Management, Urban Planning and Construction
MOE	:	Ministry of Environment
MOH	:	Ministry of Health
MOP	:	Ministry of Planning
MOT	:	Ministry of Tourism
MOWRAM	:	Ministry of Water Resources and Meteorology

MPWT	:	Ministry of Public Works and Transport
MRC	:	Mekong River Commission
MRCS	:	Mekong River Commission Secretariat
MRD	:	Ministry of Rural Development
MW	:	Mega Watt
NCAC	:	National Committee for Assisting the Community
NCDP	:	National Capacity Development Project
NCHP	:	National Center for Health Promotion
NGOs	:	Non-Governmental Organizations
NRM	:	Natural Resources Management
NTFP	:	Non Timber Forest Products
PADEK	:	Partnership for Development in Kampuchea
PCD	:	Pollution Control Department
PDAFF	:	Provincial Department of Agriculture, Forestry and Fisheries
PDE	:	Provincial Department of Environment
PDIME	:	Provincial Department of Industry, Mines and Energy
PDT	:	Provincial Department of Tourism
PDWRAM	:	Provincial Department of Water Resources and Meteorology
PIPs	:	Public Investment Programs
PRASAC	:	Programme de Rehabilitation et d'Appui au Secteur Agricole du Cambodge
PRDC	:	Provincial Rural Development Committee
RGC	:	Royal Government of Cambodia
RWS	:	Rural Water Supply
SAWG	:	Sub-Area Working Group
SEDP I	:	First Five-Year Socio-Economic Development Plan
SEDP II	:	Second Five-Year Socio-Economic Development Plan
SEDRP	:	Socio-Economic Development Requirements and Proposals
SIDA	:	Swedish International Development Agency
SMEs	:	Small and Medium Enterprises
UN	:	United Nations
UNDP	:	United Nations Development Programme
UNICEF	:	United Nations Children's Fund
UNTAC	:	United Nations Transitional Authority in Cambodia
USAID	:	The United States Agency for International Development
WB	:	World Bank
WHO	:	World Health Organization
WRAM	:	Water Resources and Meteorology
WRM	:	Water Resources Management
WSM	:	Watershed Management
WUG	:	Water User Groups
WUP	:	Water Utilization Programme
WWF	:	World Wide Fund for Nature

Foreword

In partnership with the Mekong River Commission Secretariat (MRCS) Basin-wide initiative, the Cambodia National Mekong Committee (CNMC) is leading the effort in Cambodia on the Basin Development Plan (BDP) Programme. This programme seeks to develop both an *initial plan* as a guiding framework for basin-wide water and water-related resources development in a sustainable manner and a *sustainable planning process*.

It gives me great pleasure to introduce the Se San/Sre Pok/Se Kong Sub-area Analysis and Development. This has been undertaken by the Sub-Area Working Groups of the Se San/Sre Pok/Se Kong Sub-area, with a focus on eight sectors: *irrigated agriculture; watershed management; fisheries; hydropower; navigation, transport, river works; tourism and recreation; water supplies; and flood control and management* sub-sectors and four cross cutting themes: *socio-economies, human resource development, environment and participation*..

The Sub-area Analysis and Development set the context for Basin-wide development strategies and formulation of cross-border sector development, the two first-stages of the five stages of the BDP planning process by defining the macro-issues at the country level. Amongst ten Sub-areas in the Lower Mekong Basin, five Sub-areas have been delineated in the Cambodian part of the Mekong River Basin. The report serves as a vital resource of reference for CNMC-BDP and MRCS-BDP Teams and Local Consultants in developing Basin wide management strategies and cross-border sector development.

This report is the fourth Cambodia Sub-area Report after the Tonle Sap, Delta, and Northern Cambodia-Southern Laos and Kratie Sub-area Report produced within the framework of the BDP planning process. Members of Sub-area Working Groups sourced from the concerned Provincial Departments in the Se San/Sre Pok/Se Kong Sub-area, with overall guidance and coordination by the CNMC Secretariat. This approach ensured full ownership of each stage of production.

On behalf of the Chairman of the Cambodia National Mekong Committee (CNMC), I would like to extend my sincere thanks and profound gratitude to all leadership of the CNMC and Line Ministries for their persistent guidance and constructive recommendations and especially for full participation and support from Ministries concerned that gave rise to the success of this report.

Again, on behalf of the Chairman of the CNMC, I wish to thank and acknowledge the assistance of several local authorities within the Se San/Sre Pok/Se Kong Sub-area and Se San/Sre Pok/Se Kong Sub-area Working Groups for their full collaboration and support, dedicated endeavors and enthusiasm that contributed greatly to the successful completion of this report.

I would also like to acknowledge and appreciate the efforts of the CNMCS-BDP Team, particularly *Mr. Watt Botkosal*, National BDP Coordinator and *Dr. An Pich Hatda*, National Specialist for their outstanding coordination, technical assistance and facilitation to the Se San/Sre Pok/Se Kong Sub-area Working Group members in bringing out this valuable report.

Particular thanks are due to *Mr. Jeffrey Himel*, Short-term International Consultant to the CNMC for his technical assistance, valuable advice and guidance, to *Dr. Pichara Leang*, Support Local Consultant, and to *Mr. Yem Dararath*, Local Consolidating Editorial Consultant for his inputs to the successful finalization of the Se San/Sre Pok/Se Kong Sub-area report.

I am of the belief that this report will become an important resource of document for development of Sub-area and Basin-wide management strategies, which will contribute ultimately to the development for the LMB. Additionally, I hope that this report will serve as Sub-area cross-sectoral references, which can be further used by any interested groups such as government agency, private sector and civil society.



Sin Niny
Vice Chairman of CNMC
Chairman of BDP Sub-Committee

Phnom Penh
January 2005

PART I

Executive Summary

CHAPTER 1: INTRODUCTION

1.1. Background

The Basin Development Plan (BDP) formulation started on 1st October 2001, as one of the three core programmes of the Mekong River Commission (MRC). The formulation involves the National Mekong Committees (NMCs) in each country, national planning and line agencies, and a wide range of other government, private sector and civil society actors. The work is supervised by the MRC Joint Committee and by National Sub-Committees.

The BDP seeks to develop both an *initial plan* as a framework for the basin-wide water and water-related resources development and a sustainable *planning process* in the four member states of the MRC, including Cambodia, Lao PDR, Thailand and Vietnam.

The BDP team in each country has been initiating studies and analysis in a number of Sub-areas making up the Lower Mekong Basin (LMB). This is the first stage of the BDP development process. Five Sub-areas have been delineated in the Cambodian part of the Mekong Basin (MB).

In Cambodia, the Cambodia National Mekong Committee (CNMC) is leading the efforts on the BDP. The overall process involves reviewing, collecting, analyzing relevant data and information and conducting forums at regional, national and provincial levels. Background study is being finalized at national level through sub/sectoral reviews by Technical Officials from line agencies involved.

The work in the Sub-areas is being divided into two components as following:

- **Component A: Review and Analysis**
 - Review of provincial and sector plans/data and insight collection; and
 - Analysis.
- **Component B: Scenario and Strategy Development**
 - Scenario development; and
 - Strategy development.

The Sub-area review and analysis will provide the basis for formulating the scenarios and strategies for water use in the sub-areas and subsequently in the region. It will therefore be essential that *the level of detail be tailored and targeted to facilitate macro thinking and analysis and the promotion of suitable oversight and vision in the subsequent stages*. The outcomes for each sub-area analysis will therefore be:

- Summary of present conditions and context for development;
- Summary of water availability, ecological demands and present water uses;

- Identification of opportunities, concerns and risks; and
- Formulation of development objectives.

1.2. Process of Sub-Area Study and Analysis

Sub-area studies involve:

- **Preliminary review:** Review of available information at regional, national and sub-area levels to provide overviews of key issues, review of development plans/programmes (either already prepared or under preparation) and preparation of GIS and related information from MRC data sets;
- **Identification of key issues and sectors;**
- **Information collection:** Identify information gaps, collate or collect required information (particularly from national and provincial agencies);
- **Analysis:** Identify sub-area development objectives, formulate scenarios and strategies and identify potential projects/programmes; and
- **Public consultation:** Include local knowledge and opinions.

It is proposed that the process of sub-area study and analysis should be orientated around two forums. The process can then be broken down into a number of steps as follows:

- **Review:** Mainly through activities coordinated at MRC Secretariat;
- **Forum 1:** A multi-stakeholder forum within the sub-area to consider sub-area information, identify key issues and information gaps, and prepare a work plan for further study and analysis;
- **Implementation of work plan:** Mainly collection of further information as defined at Forum 1; and
- **Forum 2:** A second multi-stakeholder forum to agree on sub-area development objectives, scenarios and strategies and to identify potential projects/programmes.

1.3. Development of Scenarios and Strategies

According to the BDP, scenarios are not about predicting the future; rather they about perceive the future in the present. A scenario is a hypothetical combination of events and physical conditions, describing a possible future situation. Development scenarios will be formulated in order to illustrate anticipated limits to the long-term basin development, as well as the significance of external driving forces and uncertainties about applied key assumptions.

Development strategies will be drafted as a tool for identification and assessment of development projects and programmes. Development and management strategies will be

formulated for each sub-area and each relevant water related sector. This will be done in a close dialogue with the stakeholders, and drawing on related MRC programmes.

The strategies need to be justified in terms of: (i) socio-economic implications; (ii) environmental implications; (iii) human resources development implications; and (iv) national priorities, strategies and plans.

1.4. Importance of the Report

The report might also be useful for governmental institutions, external support agencies, project evaluation teams, investors and technical specialists in helping them understand:

- The current condition of various development sectors at provincial levels around the Se San/Sre Pok/Se Kong Sub-area;
- The trends within and future plans of the sectors within the Se San/Sre Pok/Se Kong Sub-area;
- The linkages between one sector and another;
- The cross-cutting themes: socio-economic, environment, public participation and human resources aspects; and
- The Trans-boundary issues within the Se San/Sre Pok/Se Kong Sub-area.

CHAPTER 2: OVERVIEW OF THE SE SAN/SRE POK/SE KONG SUB-AREA

2.1. Baseline Description

The Se San/Sre Pok/Se Kong Sub-area (7C), which covers an area of approximately 21,055 Km² is located in the northeastern part of Cambodia. According to the CNMC-BDP study and analysis (April, 2004), the 7C Sub-area encompasses partly or entirely three provinces, namely Mondulkiri (50%), Ratanakiri (100%) and Stung Treng (62%).

The 7C Sub-area is characterized by a very low population density, the lowest in Cambodia, ranging between zero and 20 persons per Km². It is to be noted the presence of quite a significant proportion of ethnic groups in this area. For instance in 2002, the population of the Ratanakiri province comprised 70% of various ethnic groups, while Mondulkiri province's population is made of 80% of ethnic group people and Stung Treng 23%. In Ratanakiri are found eight main ethnic highland groups who are Krung, Tampoun, Jarai, Kachak, Kavet, Brao, Lun and Phnong. There are also lowland Lao as well as a number of Chinese and Vietnamese, who mainly live in population centers along the very few major roads (Sam Ath Sith et al, 2002b).

Most people living in the sub-area rely on agriculture for their livelihoods. Upland paddy rice is a main crop for most farmers. Moreover, many of them, especially the ethnics also make their living by collecting forest products. Paddy rice is grown in some areas. A variety of vegetable and food crops are also grown, particularly in dry season. These crops are grown not only for their consumption but also for sale. Some industrial crops are also grown for sale.

Besides agriculture, trade is also an important source of household income for people in the sub-area, especially for those who are living in the provincial towns and also for rural people bringing products to the market. According to report produced by the Ministry of Planning it can be concluded that 95 % of the sub-area is considered to be remote area. Industrial activities mostly take place in the provincial towns or places not so far from the towns.

Many sectors rely on water resources for their development. These sectors include irrigated agriculture, fisheries, water supply and sanitation, inland navigation, hydropower and tourism. The current trend is shortage of water supply in many areas, including domestic purposes. Serious competition for agricultural water use is intensifying between fast growing population and irrigation development. Pollution of both surface and underground water is extensively provoked by industrialization pressure, urbanization and absence of repressive law against environment destructors.

An estimate has indicated that the water availability per capita is approximately 6,220m³/year. The water demand for the Delta Sub-area has not been known due to lack

of data and information. Anyway, the water demand per capita for Cambodians is estimated about 12 m³ per year (MRC, 2002i).

2.2. The Agenda for Development

After the July 1998 election, the Government of Cambodia adopted the Triangle Strategy in which the promotion of economic and social development composes the third side of the triangle. One of the numerous and urgent priorities identified was an extensive reform of the administrative system. Administration reform includes decentralization, military demobilization, legal and judiciary, gender equity, public financial management, anti-corruption, and natural resource management.

The long term Vision of the Government is *"to have a socially cohesive, educationally advanced, and cultural vibrant Cambodia without poverty, illiteracy, and disease, which will allow each person to be the best that it is in them to be"*.

The strategic message of the plan is that Economic growth is a prerequisite for poverty reduction and the key to growth is private sector development, which will be achieved largely through sustained improvement in the government environment. Specific strategies for civil service reform including decentralization, military demobilization, legal and judiciary, gender equity, public financial management, anti-corruption, and natural resource management. In pursuing a higher economic growth path Cambodia will be established as a popular ecological and culture tourism destination.

The Government recognizes that achieving national development objectives relies crucially on creation of a more positive and predictable business environment to facilitate the development of the private sector with a special consideration to the development of small and medium-sized enterprises, as the engine of increased investment, higher incomes and more employment.

Physical infrastructure development is another major area in which the RGC plays an important role. The limited coverage and poor condition of existing infrastructure constrain private sector-led development and access to health and education services, especially by the poor.

A numbers of key development issues have been identified, including irrigated agriculture, irrigation, fisheries, navigation, flood control and management, hydropower, watersheds management, tourism, and water supply.

PART II

Sub-area Study and Analysis
(Forum #1)

CHAPTER 3: INTRODUCTION

3.1. General

Literature and studies about the Se San/Sre Pok/Se Kong Sub-area are scarce and mainly focus on the ethnological and political aspects related to e.g. threat on indigenous traditions and culture, challenges of decentralization, etc. Few adopted a trans-sectoral approach, emphasizing global trends, potentials-opportunities, constraints and treats. Another deficiency is the lack of effort to provide a comprehensive reflection on the cross-cutting issues as well as on the trans-boundary issues by putting into evidence the relationships between the different components. The identification and analysis of the trans-boundary issues is of importance for planning and decision-making of the riparian Governments.

The purpose of this work is to attempt to provide an in-depth analysis of the development plan of the Northeastern Cambodia that has been delimited as the Se San/Sre Pok/Se Kong Sub-area in the Basin Development Plan (BDP) of the Lower Mekong Basin.

This analysis emphasizes the challenges and implications of the development of the Se San/Sre Pok/Se Kong Sub-area. It mainly calls upon a critical review of existing documents produced by various relevant stakeholders, e.g. the Mekong River Commission (MRC), the Cambodia National Mekong Committee (CNMC) and the Provincial Sectoral Departments.

3.2. Objective

The objective of the Sub-area analysis is to provide the basis for formulating scenarios and strategies for water use in the Sub-area and region.

3.3. Tools and Methodology

3.3.1. Tools

A number of documents have been utilized in this in-depth analysis so that a wide and comprehensive view is made possible:

- The first category of documents reviewed is composed of Provincial Sectoral Department Planning and Reviews of three provinces, namely Mondulakiri, Stung Treng and Ratanakiri.
- The second category of materials includes the National Sector Reviews on Irrigation, Agriculture, Fisheries, Hydropower and Tourism Development. It also includes the Se San/Sre Pok/Se Kong Sub-area studies and analysis conducted by a national consultant for CNMC that was released in April 2004.
- The third category encompasses MRC and CNMC materials including the Regional Sector Overviews prepared by the MRC-BDP team, the Draft

Guidelines on Sub-area analysis (MRC, 2002c). It also includes additional materials compiled in the BDP Archive CD-ROM.

- The fourth category of materials comprises the 2003 State of the Basin Report (MRC, 2003d) and the Social Atlas of the Lower Mekong Basin (MRC, 2003c). Additional maps and LandSAT imagery have been extracted from the People and the Environmental Atlas of the Lower Mekong Basin, MRC in order to enrich the analysis of spatial relationships and to assist with visualization of resources, environmental and land use, and connections between sub-areas.
- The fifth category includes various independent research publications such as:
 - Sam Ath Sith et al, 2002-1, Addressing Anarchy. Decentralization and Natural Resource Management in Ratanakiri Province, Northern Uplands of Cambodia. SEI-REPSI Reports Series No. 2.
 - Himel, Jeffrey & Nhem Sovanna, 1997, Balancing Change – Paddy Rice and Water Control in Ratanakiri, Phnom Penh.
 - Colm, Sara, 1996, Effects of Oil Palm Plantation Development on Indigenous Communities, Ratanakiri Province, Cambodia, Natural Resource Management Project, Phnom Penh.

As the Sub-area analysis will rely heavily on secondary data (derived and summarized from other sources), an important role of the first forum was to assess whether the data adequately reflected the real situation, identify information gaps and agree on a work plan to collect missing and needed information.

3.3.2. Methodology

The in-depth analysis is conducted through three complementary tasks:

- Document review and analysis
- Stakeholders consultation; and
- Analysis of the outcomes of the Informal Working Group Session in 2003 prior to the Forum 1 and the outcomes of the 2004 Forum 1 in Kampong Cham.

3.3.2.1. Documents Review and Analysis

Materials are provided by MRC, CNMC and additional ones from CDRI, IFRDI, ADB, UNDP, and WB. The in-depth analysis relies heavily on secondary data – derived and summarized from other sources.

3.3.2.2. Stakeholders Consultation

The stakeholder consultation was conducted following a guide-question checklist, emphasizing critical issues to be addressed, trends, constraints, potential development plans and relevant projects in the Se San/Sre Pok/Se Kong Sub-area. For this, several key stakeholders - whom we acknowledge for their availability - have been met including:

- MRC: Dr Mak Solieng, Natural Resources Development Planning, Dr Tue Kell Nielson, Consultant and Mr Thim Ly, Junior Riparian Professional (JRP)
- CNMC: Dr An Pich Hatda, Dep. Director-BDP National Specialist and Mr Watt Botkosol, Dep. Director-Planning Dept. and National BDP Coordinator.
- IFRaDI: Mr Lieng Sopha, Dep. Director-AMCF
- MAFF-DoF: Mr Sam Nuov, Deputy Director, Department of Fisheries
- MAFF: Mr Kith Seng, Director of Planning, Statistics and Intern. Coop. Dept.
- Seila Prog- UNOPS: Mr Scott Leiper, Senior Prog. Advisor
- Min. of Public Works & Transport: Mr Va Sim Soriya, Director of Planning Dept.
- Min. of Water Resources and Meteorology: Mr Pech Veasna

3.3.2.3. Analysis of Outputs of the Informal Working Session prior to Forum 2

This work is based on the proceedings of the informal working session prior to the Second Stakeholders' Forum that is further planned in 2004.

Basically, this analysis aims at assessing the level of understanding on the sub-area development planning and the ability of the working group in identifying development objectives and proposing a scenario formulation at the Forum 2.

CHAPTER 4: BASELINE DESCRIPTION

4.1. Geographical Features

4.1.1. Coverage

The Se San/Sre Pok/Se Kong Sub-area (7C) which covers an area of approximately 21,055 Km²⁽¹⁾ is located in the northeastern part of Cambodia. According to the CNMC-BDP study and analysis (April, 2004), the 7C Sub-area encompasses partly or entirely three provinces, namely Mondulkiri (50%), Ratanakiri (100%) and Stung Treng (62%). The maps below show the geographical coverage of the Se San/Sre Pok/Se Kong Sub-area in terms of provinces and districts.

Table 1: Numbers of Districts and Areas within the Se San/Sre Pok/Se Kong Sub-area

Province	No. of Districts ^(*) within the 7C Sub-area	Area (Km ²) within the 7C Sub-area ^(**)
Mondulkiri	4	6,660
Ratanakiri	9	11,786
Stung Treng	3	2,609
Total	16	21,055

Note: (*) Partly or entirely

(**) Source: MRC "Districts in Cambodian Sub-areas-Using new boundaries (2003) and BDP Sub-areas as of January 2004".

In terms of district coverage, the Cambodian part of the 7C Sub-area encompasses partly or entirely 16 districts as shown in Figure 1.

The total area of the 7C Sub-area represents approximately 11.5% of the total area of Cambodia. The total population estimated in 2002 within the 7C Sub-area is 163,254 inhabitants, equivalent to 1.25% approximately of the total population of Cambodia. The population estimation within the 7C Sub-area is based on the Commune Database Version 5.3 of the Ministry of Planning-General Directorate of Planning.

4.1.2. Elevation

In average, the 7C Sub-area is located of maximum 500 meters above sea level, thus forming the highest part of Cambodia. Within the 7C Sub-area, the highest elevation is found in the northeastern part with some areas along the border exceeding 500 and reaching 600 meters.

The geological formation of the Sub-area is mostly characterized by the Kontum Massif which is thought to be some of the earliest in Southeast Asia, dating to the Precambrian era, i.e. 2.3 billion years ago.

¹ Source: MRC "Districts in Cambodian Sub-areas-Using new boundaries, 2003" and BDP Sub-areas as of January 2004.



Figure 1: Provinces covered by the Sub-area 7C

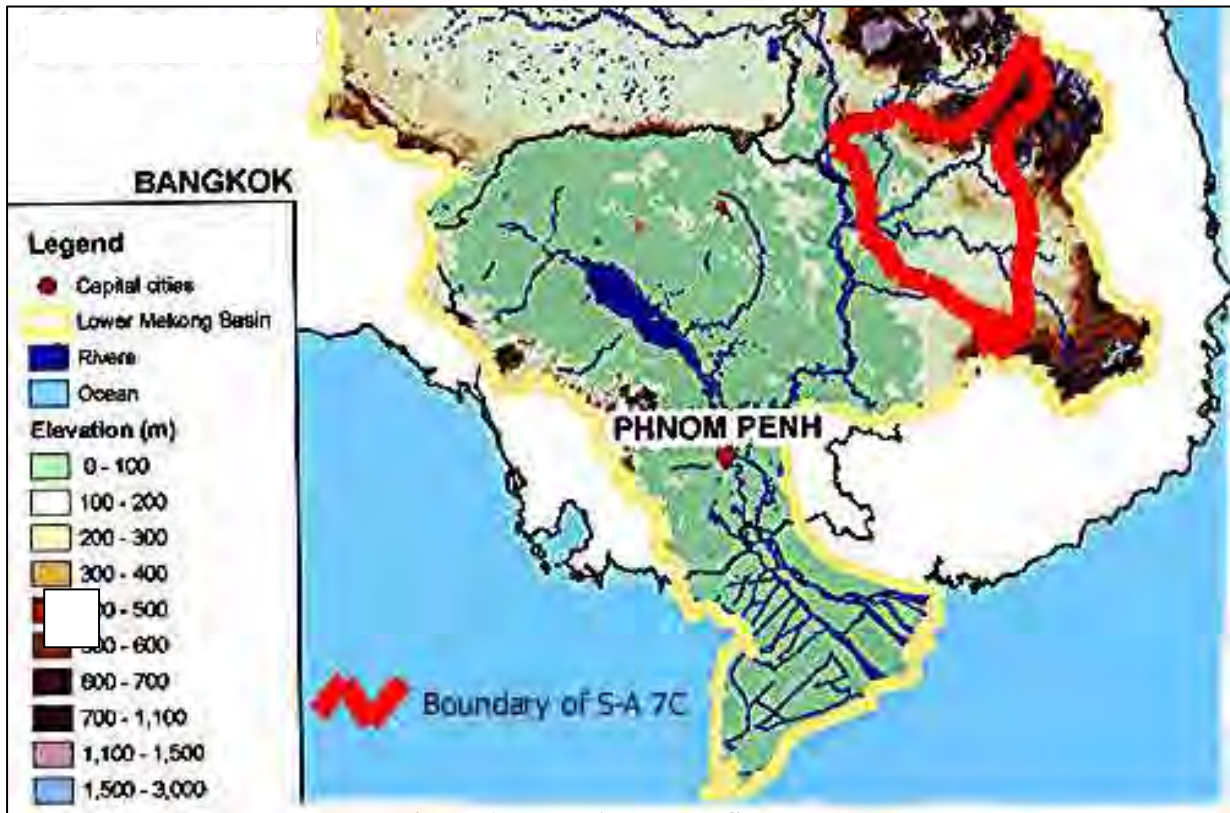


Figure 2: Elevation above Sea Level

4.1.3. Soil

In this Sub-area, Soils are mainly composed of acid lithosols, lateritic clay and spots of hydromorphic soils. Along the rivers, are found brown or non-differentiated alluvial soils. The central part of Ratanakiri province includes red soils derived from volcanic basalt deposits with high water holding capacity.

4.1.4. Land Cover

The huge majority of the Se 7C Sub-area is occupied by forests. There should be contact with the Geography Department of the Ministry of Land Management, Urban Planning and Construction, so that updated information on land use as well as various administrative and other data sets can be gathered. Statistics from MRC on land use give some additional indications.

The presence of forests in this Sub-area leads to intensive exploitation for logging provoking conflicts between the ethnic minority population and stakeholders of the private and the public sector, as well as harmful effects on the environment.

Agricultural activities are mainly based on swidden agriculture systems comprising upland rice mixed with a variety of other root, herb and food crops. There is lowland rice grown in small stream valleys and next to the major rivers. Rubber, coffee, oil palm and

other industrial crops are being grown in increasing area. Those activities are strongly dependent on rainwater since the irrigation infrastructure is poorly developed.

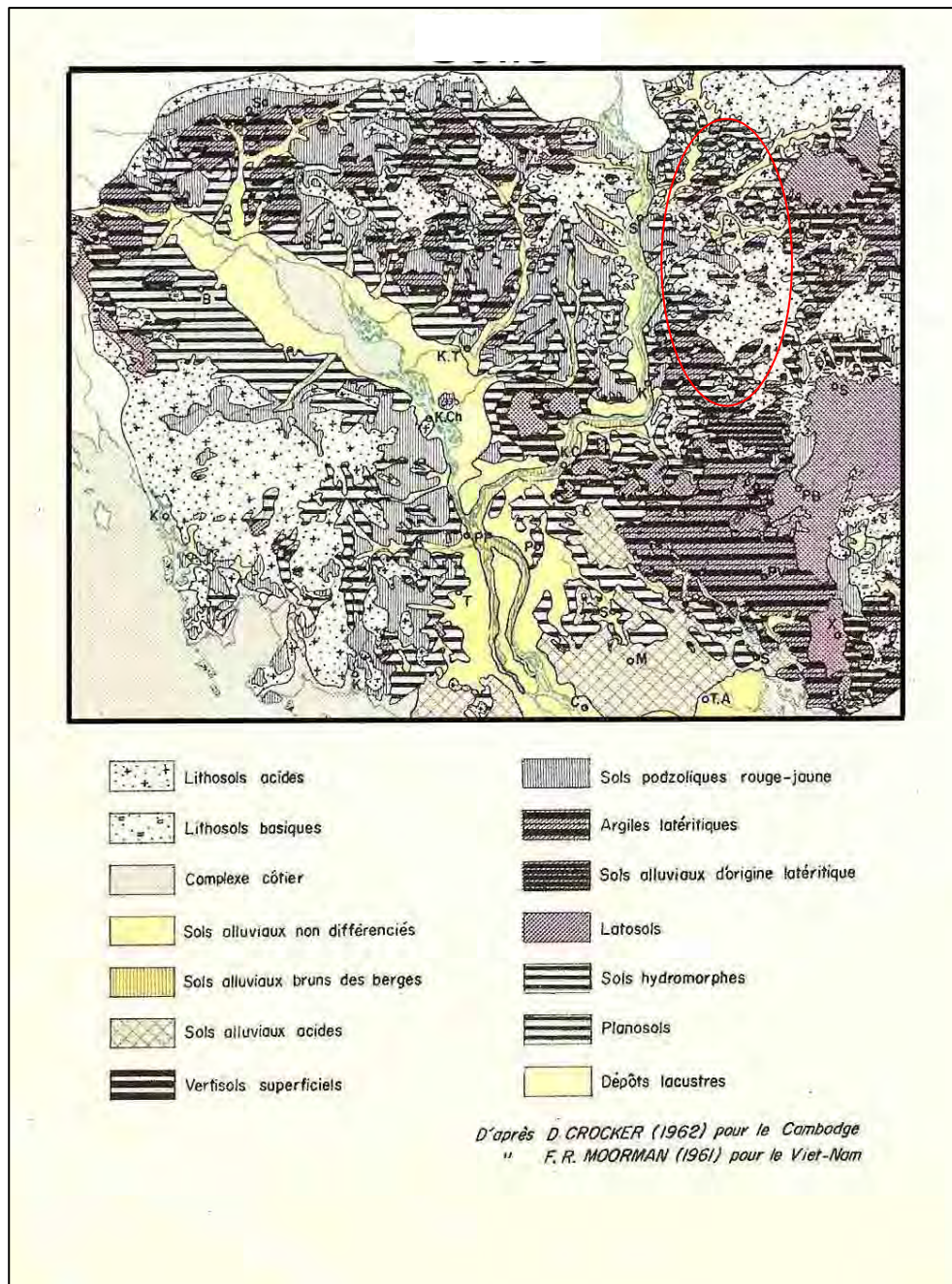


Figure 3: Soil Map of the 7C Sub-area

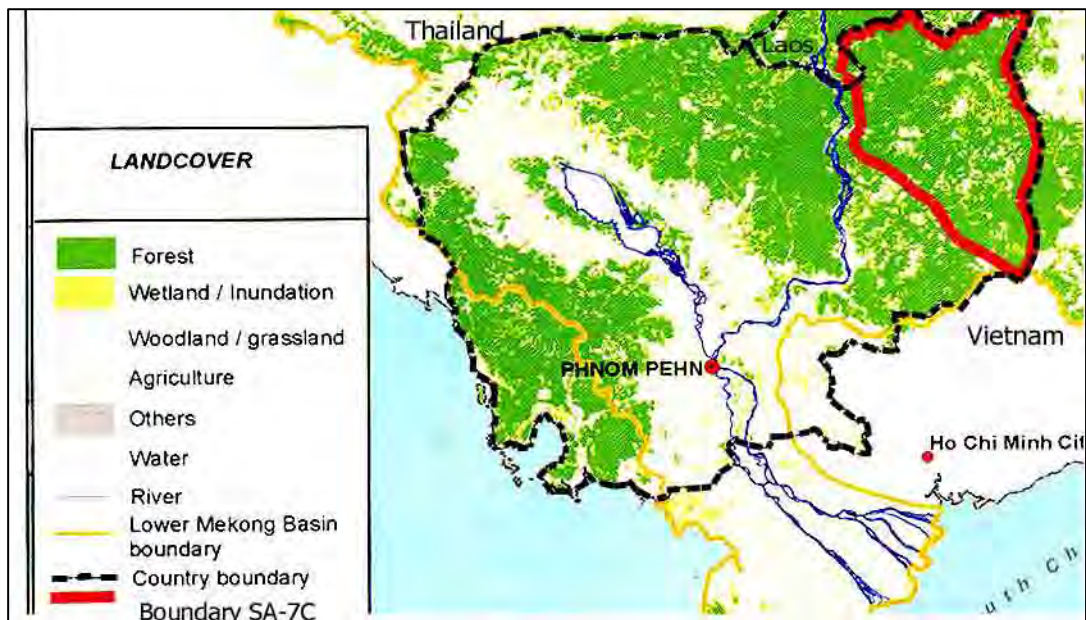


Figure 4: Land Cover of the 7C Sub-area

4.2. Population and Livelihoods

4.2.1. A Very Sparse Human Settlement

The 7C Sub-area is characterized by a very low population density, the lowest in Cambodia, ranging between zero and 20 persons per Km². It is to be noted the presence of quite a significant proportion of ethnic groups in this area. For instance in 2002, the population of the Ratanakiri province comprised 70% of various ethnic groups, while Mondulakiri province's population is made of 80% of ethnic group people and Stung Treng 23%. In Ratanakiri are found eight main ethnic highland groups who are Krung, Tampuan, Jarai, Kachak, Kavet, Brao, Lun and Phnong. There are also lowland Lao as well as a number of Chinese and Vietnamese, who mainly live in population centers along the very few major roads (Sam Ath Sith et al, 2002b).

4.2.2. Some Elements of the Socio-economic Conditions

Most people living in the sub-area rely on agriculture for their livelihoods. Upland paddy rice is a main crop for most farmers. Moreover, many of them, especially the ethnics also make their living by collecting forest products. Paddy rice is grown in some areas. A variety of vegetable and food crops are also grown, particularly in dry season. These crops are grown not only for their consumption but also for sale. Some industrial crops are also grown for sale.

Besides agriculture, trade is also an important source of household income for people in the sub-area, especially for those who are living in the provincial towns and also for rural people bringing products to the market. According to report produced by the Ministry of Planning it can be concluded that 95 % of the sub-area is considered to be remote area.

Industrial activities mostly take place in the provincial towns or places not so far from the towns. The Pie-chart below shows the small proportion of the industry sector among the agricultural and economic activities of the Sub-area.

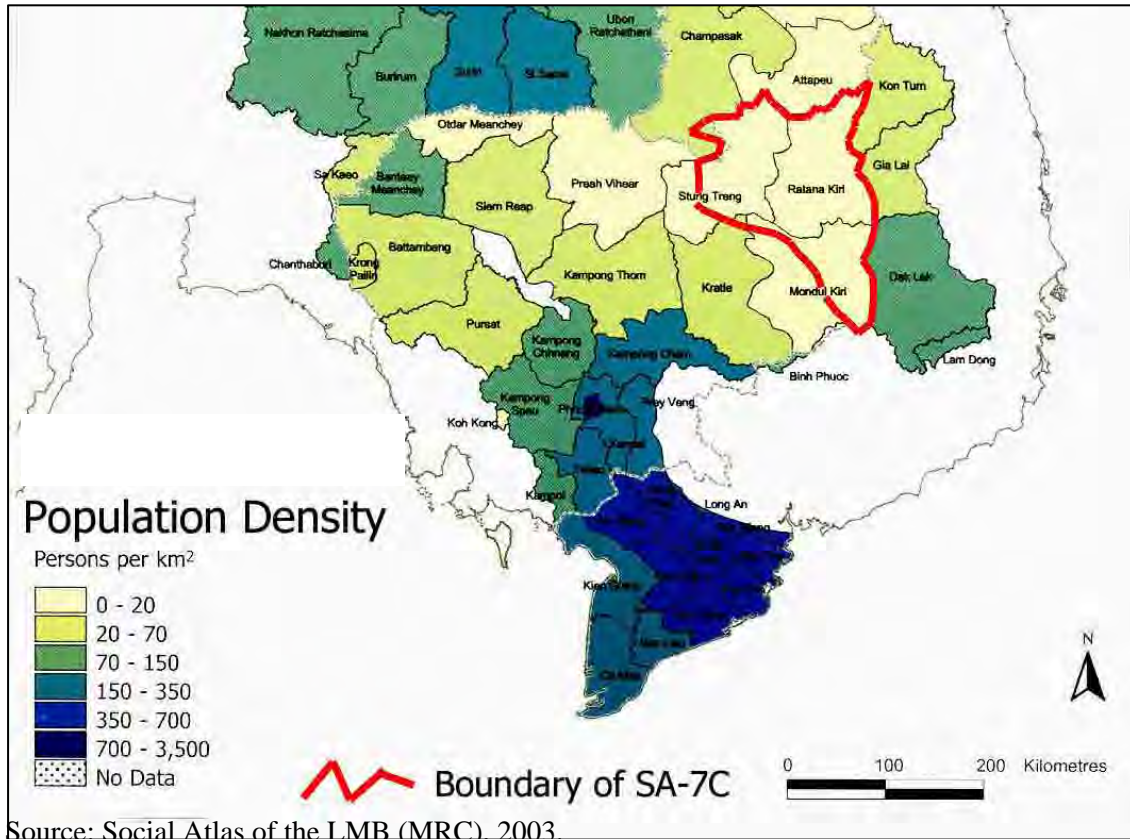


Figure 5: Population Density of Cambodian in 1998

The 7C Sub-area is considered as the least developed area in terms of economy and social conditions, compared to other areas in the country, despite high potential for agriculture development.

Table 2: Socio-economic Indicators by Province in the 7C Sub-area (2002)

Indicators	Stung Treng	Ratanakiri	Mondulkiri
Population by sex	91,795	110,764	40,194
Female	47,236	55,318	20,364
Male	44,559	55,446	19,830
Population by age			
0-17 years	39,834	59,290	21,060
18-64 years	42,504	46,297	17,342
Over 65 years	9,457	5,177	1,792

Indicators	Stung Treng	Ratanakiri	Mondulkiri
Illiteracy (%)	30-40	37	33.35
Ethnic group (%)	23	70	80
People live under poverty line (%)	30	Data not available	62
Access to clean water %	7-30	8-13	Data not available
Access to public electricity service %	7	Data not available	25
Occupation (%)			
Agriculture	80	89	76
Industry	2	1	3
Trade	13	--	1
Tourism	2.5	--	15
Other	2.5	10	5

Source: Provincial Report, 2002.

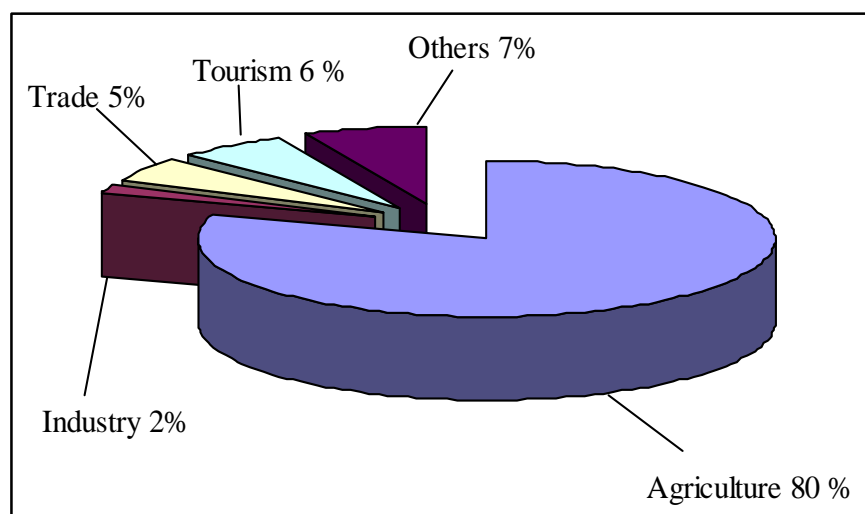


Figure 6: Occupation by Sector within the 7C Sub-area

4.2.3. People's Health



4.2.3.1. Access to Safe Water

The population living within the 7C Sub-area has the poorest access to safe water in Cambodia, and is among the lowest in the entire Lower Mekong Basin. Less than 20% of the population has access to safe water. The implication of this is the high incidence of intestinal diseases, including intestinal diseases.

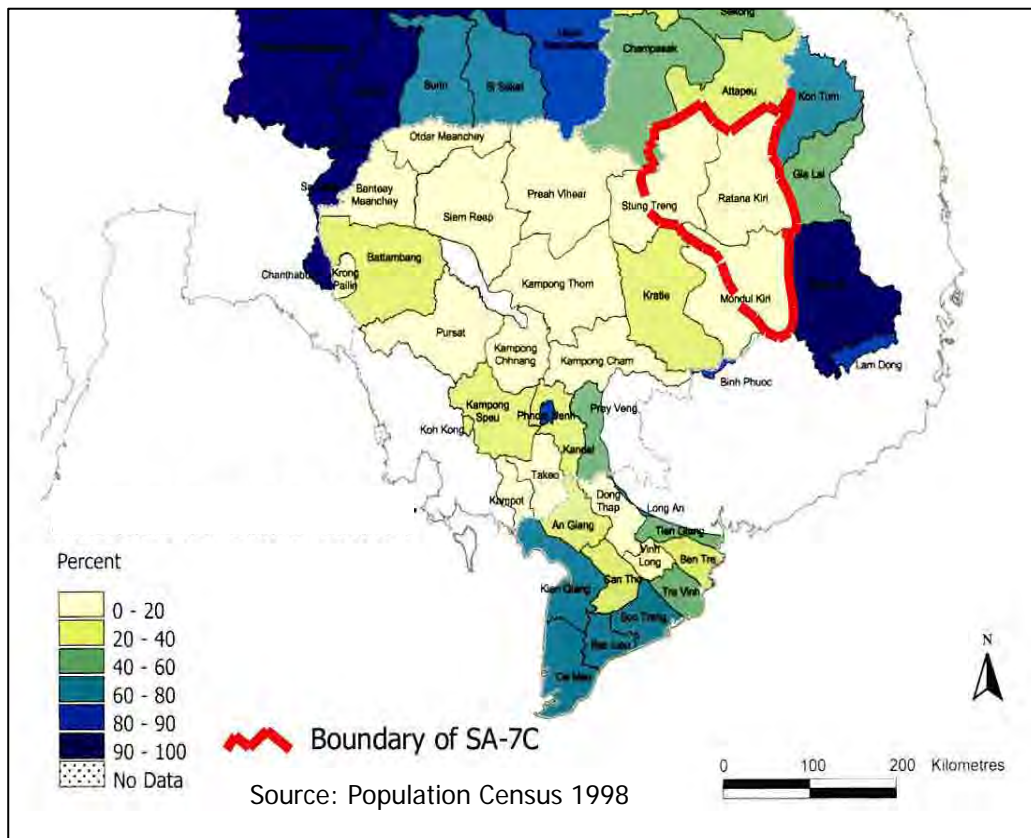
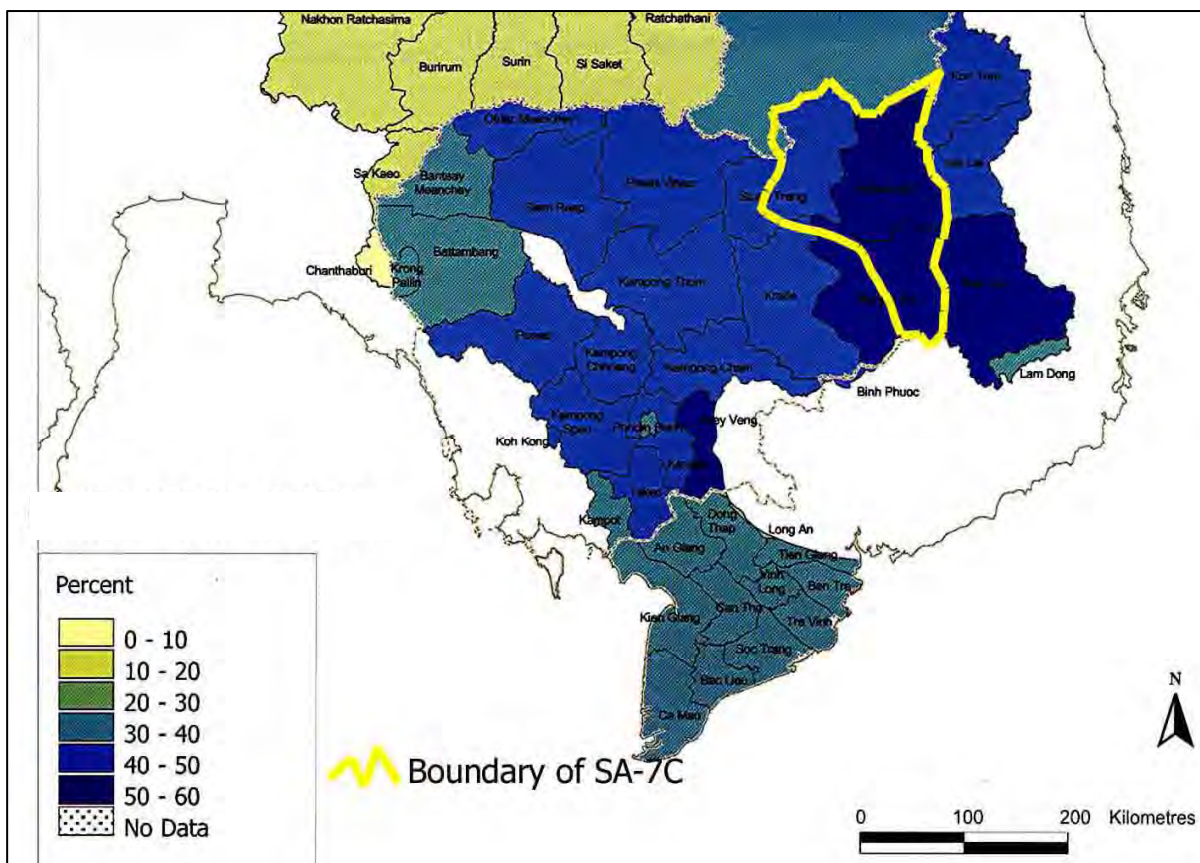


Figure 7: Proportion of Population with Access to Safe Water



Source: Health Survey, 2000.

Figure 9: Child Malnutrition

4.3. Water and Related Resources

Water resources analysis is a complex work which requires availability of comprehensive, accurate and updated scientific data. In contrast to the neighboring countries of the Lower Mekong Basin, Thailand and Vietnam, Cambodia is a country that crucially lack necessary data. For instance, according to N. Bonheur-2003, hydrological data related to the rivers of the Tonle Sap basin and river are available for only one hydrological year as collected by Carbonnel and Guiscafre (1962-63). With the support of the MRC, there have been some gauging stations installed in some rivers of the basin. In the below paragraph, attempt is made to provide a state of existing data that has been collected from various sources. Only fragmentary information has been gathered, thus possibility for serious and comprehensive analysis is limited.

According the BDP Inception Report (MRC, 2002j), water resources analysis should comprise three main components:

- Availability of water
- Demand of water
- Use of water

4.3.1. Availability of Water

This can be defined as the flow of water into a sub-area from upstream, plus the (surface and groundwater) resources generated by net rainfall in the sub-area, minus the ecological demand within the area at its downstream boundary. The availability changes slowly, from one decade to the next, due to medium-term climate variations, or due to constructions of reservoirs or diversions. The availability can be measured, and/or determined by numerical modeling, with an accuracy that is conditioned by the coverage and quality of the basic hydrological data.

4.3.1.1. Rainfall and Surface Water

Cambodia has access to substantial surface water resources. On average, the annual inflow from upstream countries is estimated at 410 km³ and the internally generated flow 90 km³ per year (MOWRAM, 2003). In Cambodia, the Mekong River flows from the North to the South, over a distance of about 480 km. Its drainage basin covers about 86% of the land area of the country. The Mekong River brings yearly floods of about 475km³, and before flowing downstream, inundates the lowlands and where the floodwaters enter partially the Great Lake and eventually flow down the Mekong and Bassac Rivers.

4.3.1.2. River Discharge

The discharge during the dry season period (April – May) in 2003 is shown in the table below. A study by JICA has indicated that the dry season flows in Cambodian floodplains are strongly affected by tidal fluctuation.

Table 3: Effects of Tidal Fluctuation to the Dry Season Flow

Station	Average Flow (m ³ /sec)	Range of Fluctuation (m ³ /sec)	Fluctuation Rate (percent)
Kampong Cham	1,600	100	6
Chrui Changvar	2,000	1,500	75
Neak Luong	3,000	3,000	100
Monivong Bridge	100	150	150

Source: WUP-JICA, 2004.

4.3.1.3. Groundwater

Groundwater is presently used for two main purposes: domestic and drinking water supply and irrigated agriculture. The groundwater resource within the country has been subject to a few investigations but has not been comprehensively studied to date such that serious analysis or conclusions can be drawn. Most provinces include significant areas where groundwater is used as the main source of domestic water supply. As of 2001, withdrawal of groundwater for domestic and drinking water supply was approximately 2,147 cubic meters per day (CNMC, 2003).

4.3.2. Water Demand and Use

According to Nielsen (2004), the water demand is the amount required for a given purpose. The demand can be based on the *present* or *future*, and it can be *actual* (i.e. related to an available infrastructure) or *potential* (assuming full infrastructural

development and no raw water shortage). The *serviceable* (part of the) demand is limited both by infrastructure and raw water availability.

A distinction can be made between *consumptive demand* (for households, industries and agriculture), and *non-consumptive demand* (for fisheries, navigation, and environmental preservation).

4.3.2.1. Domestic Water Use

Domestic water use includes water for normal household purposes, such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns and gardens. Domestic water use also includes drinking water and bathing water for livestock – this is an important issue for rural livelihoods

Increase of domestic demand is mainly based on the population growth. Assuming that the annual domestic demand is between 20 m³ and 100 m³, a total demand for domestic water is in the range of 286,000m³ per day and 1.4 million m³ per day. It is estimated that the domestic demand increased from 3.1m³/s to 3.3m³/s in 2002. The domestic water demand is shown in the below table.

Table 4: Domestic Water Demand

Population		Water Demand, m ³ /day	
1998	2002	1998	2002
4,930,320	5,198,981	271,168	285,944

4.3.2.2. Agriculture Use

Cambodia has inventoried 946 operating irrigation systems² which can service 256,120 ha of the 2 million ha wet season cultivated area. In the dry season, rice is grown on 225,000 ha and 143,490 ha of this are fully irrigated by receiving irrigation water from irrigation schemes. Hence, only 12% of the wet season rice is irrigable, the remainder being rainfed and just over half of the dry season crop is irrigated, the remainder being recession rice receiving supplementary irrigation from manually operated and diesel driven pumps. Very few of the irrigation schemes are capable of irrigating all year round.

Fully irrigated crops utilize approximately 10,000 m³/ha. Some irrigation engineers in Cambodia estimate that recession rice receives approximately 4,000 m³/ha of irrigated water.

The water consumption for rice is high compared to other crops. The total water consumption is dependent on crop type, stage of crop growth, soil type, irrigation method, and so on. The water consumption for different kinds of crops and for rice is presented in the table below.

² The inventory of irrigation systems in Cambodia is not comprehensive and it is likely that there are significantly more systems and larger potentially irrigated areas than this.

Table 5: Water Consumption within a Critical Period

Activity	Water Flow (l/sec/ha)	Water Requirement (m ³ /ha/month)	Crop Irrigation Life (month)	Critical Period Consumption (m ³ /ha)
Irrigated rice	0.8	2,074	3.5	7,258
Upland crops	0.6	1,555	4	6,221
Fruit trees	0.4	1,037	4	4,147

Source: MRC, 2003e.

Assuming that the water requirement during the critical period (February – May) for dry season irrigated rice and that for non-rice crops is approximately 0.8 l/sec/ha and 0.6 l/sec/ha respectively, hence the total water use for rice and non-rice crops is estimated at about 1,571 million m³/month and 509 million m³/month respectively.

On a nationwide basis, the LMB countries do not fully utilize their renewable water resources. Renewable water resources are equal to the total precipitation in the country minus evapo-transpiration. Cambodia and Laos use only 1% of their total renewable water resources for agriculture while Vietnam and Thailand use 5 and 20% respectively. Based on these figures, an average Mekong River flow of 460 km³ each year can service the irrigation requirements of all LMB countries 11 fold. An annual Mekong river flow can also service approximately 64 million ha of fully irrigated rice based on a consumption of 10,000 m³/ha (1 meter of water) per crop. This compares with the 1999/2000 area of 2 million ha of dry season cropping in the LMB watersheds.

Therefore, there is no shortage of water in the Mekong River to service agriculture in its watersheds if all water is captured and redistributed when required. This is, of course, not the case, with a majority of water flowing through to the ocean during the wet season when crops receive most of their water requirements directly from rainfall. Water shortages may occur (especially in the Mekong Delta) during the months of February to May when water flows in the Mekong River are at their lowest. Crop irrigation is the major consumer.

4.3.2.3. Ecological Demand

Ecological demand (of water) is a minimum stream flow or water level required for prevention of irreversible ecological degradation. The ecological demand varies from year to year and from place to place. The flow must be high in the wet season in order to maintain a healthy environment; for instance, fish species mainly rely on annual floods for their reproduction.

Some figures on water demand and use

Total water demand/capita = 150 m³ per capita per year

Share agriculture = 94%

Share Municipal and Industrial = 6%

Municipal and Industrial withdrawal 1990 = 78 million m³

Municipal and Industrial withdrawal 2020 = 187 million m³

(Source: Ringler, 2001 in MRC-BDP Planning Regional Sector Overview 2002)

Total water demand = 0.5 Bm³ per year

Internal water supply = 1,004 m³ per person

Water for domestic use = 5%

Water for industrial use = 1%

Water for agricultural use = 94%

These figures will change due to future development in the LMB that bring about changes in the river hydrology.

(source: CNMC, 2003)

4.3.3. Major Legal and Policy Documents pertaining to Watershed Management in Cambodia

- Land Law (endorsed in August 2001);
- Law on Commune Administration Management (endorsed in August 2000);
- Law in environmental protection and natural resource management (endorsed in November 1996);
- Forestry Law (already submitted to the Council of Ministers in July 2001, but has not yet passed);
- Sub-decree on forest concession management (signed by the Prime Minister in February 2002);
- Law on Water resources management (draft);
- National Water Resources Policy (endorsed by Council of Ministers in January 2004);
- Water Sector Roadmap (prepared by MOWRAM in July 2004);
- Decentralization and devolution Policy of the Ministry of Interior;
- 5 year socio-economic Development Plan (2001-2005); particularly relevant for poverty alleviation;
- Interim Poverty Reduction Strategy Paper;
- Agricultural Development Plan (2001-2005);
- Action Program for the Development of Agriculture in Cambodia (2001-2010;)
- Government Action Plan 2001, which includes a section specifically dealing with natural resources management;
- Draft Policy for Ethnic Minority People's Development, also called "Highland Policy" (Sept. 1997, not yet ratified by the Council of Ministers); and

- Forest Policy- currently being draft by a national working group.

4.3.4. Policy of Water Resources and Meteorology Development

To implement the programme of the Cambodia Royal Government and accelerate economic development, the Ministry of Water Resources and Meteorology has set four policies for social development and in particular poverty reduction, which are as follows:

- To increase the irrigated area of rice production from 16.6% to 20%, through water storage during the wet season for double crop production, with a view to increase job opportunities and income of the population in the rural areas.
- To take a leading role with regard to drainage, water conservation, water resources development to the benefit of the population by developing drainage systems and flood protection dikes.
- To study surface water and groundwater to ensure water quantity and quality management in an integrated manner and determine the balance between demand and water availability.
- To improve weather forecasts, hydrological forecasts and ensure the timely warning of natural disasters such as typhoons, floods and drought to the population in the whole country.

4.3.5. Government's Goals in the Water Resources Sector

1. To implement viable irrigation systems based on local cost recovery,
2. To develop hydropower, focusing on multipurpose projects
3. To increase the domestic technical capacity and databases needed for effective water resource management capacity.

Water resources management is addressed in section 11.9 in the current 5-year socio-economic development plan (2001-2005). Details are found in the separate policies and activity plans for each ministry, as presented in their respective 5-years plans and 3-years Public Investment Programs (PIPs).

The national targets for access to safe water are as follows:

- Rural population: from 29% in 2000 to 40% in 2005.
- Urban population: from 48% in 2000 to 87% in 2005.

4.3.6. Analysis

- Data gathered from diverse sources are fragmentary, inconsistent and vary widely from one source to another. This lack of capacity of the Cambodian institutions to produce accurate and reliable data on water resources (surface and groundwater) seriously impacts on any possibility to plan, manage and evaluate actions aiming at securing water availability for the population for better access to water and greater development opportunities, be they irrigated agriculture, fisheries, tourism, industry and/or navigation.

- Potential water availability is huge including groundwater, but the effective access of the population to water is limited because of weak management expertise of relevant institutions, lack of infrastructure and budget. Therefore, water is not available at when it is needed.
- Cambodia's challenge related to water is threefold; technological, institutional and social. Technologically, the main challenge is water control including flooding control and warning systems set up. The latest technologies based on satellite imagery and GIS are capable to assist man in forecasting and warning about some natural calamities and thus, to minimize their disastrous impacts on human activities. However, these technologies are expensive and require a corresponding level of technical capacity to be able to take advantage of them. Institutionally, there is a need to achieve the reforms so that competent human resources are employed and overlapping mandates between rival institutions reduced, for the sake of more efficient and effective water resource management and exploitation. Efforts in capacity building must continue and funds allocated to this task.
- Socially, the challenge is to enable equitable access to water resources to the population, especially the poorest and the rural inhabitants. Access to safe water should be nation-wide and a priority for further policy enforcement.
- The impressive panoply of existing laws, regulations and policies is conducive to rational and sustainable watersheds resources management on the condition that there is real and sufficient political willingness for enforcement.

4.4. Trends

4.4.1. Water Resources Threatened in Terms of Quality and Quantity

Many sectors rely on water resources, e.g. agriculture, fish production, biodiversity, water supply, sanitation, transport and hydropower. The current trend is a shortage of water supply in many areas, including domestic purposes. Serious competition for water is intensifying between fast growing population and irrigation development. In this basin, shortage may be provoked by over-use of water or more, because of lack of development of infrastructure. No serious pollution issue has been reported there.

Geo-hydraulic conflicts resulting from hydropower and dams construction by the riparian countries have already arisen in the near future, because both quality and quantity of water are affected. Hydropower involves dam building which requires water diversions. Conflict may arise between upstream countries and downstream countries because of water scarcity and/or unequal allocation. The most crucial is perhaps where a basically agricultural country risks losing the access to the water sources and thereby being deprived of the chance of achieving food security, poverty alleviation, and possible economic growth (Öjendal, 2000). Furthermore, aggressive and hostile capture could lead to tensions and conflicts through population movements, group identity conflicts, economic deprivation and/or civil strife (Ibid).

The trans-boundary implications of hydropower projects on water quality and quantity are numerous. Risks for riparian countries need to be objectively assessed.

The first risk of hydropower projects development in the upstream area of the Mekong River is the negative impact on the environment and society. Those risks have been duly identified as:

- Adverse impacts on the ecosystem (aquatic life, animals, birds, vegetation);
- Blocking of the flow of sediment;
- Negative impacts due to changing a river's flow pattern;
- Negative social impacts (resettlement, loss of livelihood);
- Loss of scenic landscapes (tourism potential);
- Negative impacts on water quality due to storage of water (eutrophication, lower temperatures for discharged water);
- Negative impacts to other users of water (navigation, fisheries);
- Problems during the construction period (noise, vibration, dust, traffic problems);
- When associated with irrigation, land Stalinization and water logging; and
- Danger from sudden and unexpected release of water from flood spilling or hydropower generation.

The second type of risk is geo-political, i.e. the inevitable dependence of countries who do not possess hydropower upon those who develop hydropower projects. Cambodia is particularly vulnerable because it will certainly depend more and more on Thailand, Laos and Vietnam for power supply. A cut-off of power supply by power producers would seriously impede any possibility for Cambodia to achieve its development goal and strategies, e.g. to alleviate poverty, to improve the population livelihood, to welcome further foreign investments, to sustain tourism development, etc.

4.4.2. Increase Degradation of Environment (The Examples of Forestry and Water Issues in Ratanakiri)

The forestry issue:

Unimpeded semi-legal and illegal logging is perhaps the biggest problem in Ratanakiri in the short to medium term. In its March 1998 report (for the dry season 1997/1998), Global Witness explains that permits to collect and export 12,865 illegal logs (27,000 cubic meters) from several provinces were officially issued at the Prime Minister level to Commanders in Military Region number 1 (Öjendal J. et al, 2001). Further documents state that only 12,500 cubic meters were to be taken from Ratanakiri. It is common knowledge in Ratanakiri, however, that the actual amounts may be as much as 200,000 cubic meters (Ibid, 2001).

The negative consequences of logging are manifold and the highland population suffers the most severe and direct consequences. The collection of Non-Timber Forest Products (NTFPs) is vital for food security because it provides both supplementary nutrition and products that can be sold. Where careless logging is practiced, discarded logs and litter are left behind which makes the lower levels of the forest too thick and clogs streams and rivers. Traveling through the area to collect products become difficult, aquatic resources are destroyed and fish migration is blocked. Biodiversity would ultimately be threatened

if logging were to continue at the same pace. Logging includes large increase of erosion, sedimentation of streams and rivers, changes in ground-rivers, habitat loss, and possible impact on microclimate. The forestry sector appears to be the most difficult one to regulate through decentralization. It is also the natural resource over which the national government is least willing to hand over power.

The water issue:

Water resources are ample in Ratanakiri: annual rainfall is around 2,000-3,000 mm (as compared to 1,200-1,500 mm in lowland Cambodia). Groundwater is generally available at a reasonable depth; there are year-round streams; wells erupt into the surface and a number of major rivers flow through the province (Himel, J & Nhem, S., 1997).

The water issue could be viewed at two different levels. The first is the micro level where water resources are used for individual villages and minor communities, including local streams and ponds and the infrastructure around them. The second is the provincial level, concerning overall water supplies and the major tributary rivers to the Mekong, such as the Se san and the Sre Pok, which, in a geographical sense define the living, agricultural and fishing conditions of the province (Öjendal J. et al, 2001).

The generally high availability of water resources in Ratanakiri constitutes one of its major advantages as an agricultural province. This feature has also prompted a number of actors to seek the possibility of increasing irrigated rice cultivation. The Khmer Rouge built a large number of irrigation schemes (approximately 60-70) in the province, as they did in the rest of Cambodia. The fairly balanced hydrological regime is under threat due to the exploitation of upland soils and forested areas, as Himel and Nhem already documented in 1996-97. Since then, large-scale logging and cash cropping as well as uncontrolled expansion of paddy cultivation, have continued with few environmental protection measures initiated. For example, coffee plantations are typically established on hillsides, depriving the area just below of a substantial part of the water supply (Ibid, 2001).

Turning to the macro water level, the theoretical hydropower potential in the Lower Mekong Basin is huge, but mainstream projects are environmentally and politically "impossible" due to the rising environmental awareness and the costs required for resettlement and impact on fisheries. Instead, hydropower sites have had to be sought away from the main stream and away from highly populated and politically sensitive areas. Ratanakiri, and indeed the highlands in the Cambodia-Laos-Vietnam triangle, fit these requirements. In addition, they have high elevation differences, which make them candidates for hydropower stations. On the Cambodian side, there are 3 major dams that have been proposed in the past for the Se San and two for the Sre Pok watershed, which might be pursued. On the Vietnamese side, further up in the Se San watershed, more hydropower stations are planned, while Yali Falls dam has already been completed.

The Yali Falls hydroelectric dam on the Se San River, particularly the Yali Falls dam, has become internationally noted because of the negative impacts on the river and more than

50,000 people living in Cambodia, downstream of Yali Falls. The Se San 3 project, presently under construction, will increase the severity of those impacts, as will the Pleikrong dam. None of the projects were the subject of social and environmental impact assessments that included consideration of downstream impacts in Ratanakiri and Stung Treng provinces, northeast Cambodia.

The Cambodian government has asked Vietnam to mitigate the damage caused by the Yali Falls dam, the first of six large hydroelectric dams planned and being built on Vietnam's stretch of the Se San River. Vietnam has so far not paid compensation for the deaths of Cambodian people drowned by the sudden releases of water from the Yali Falls, or for the economic losses of downstream communities. Vietnam has also refused to modify dam operations that could time water releases that would be similar to the natural flows of the Se San.

4.4.3. Water Land Encroachment and Speculation (Consequences on Environment and Livelihood of Indigenous Highlanders)

A growing population, due among other things to the improved health and security situation, is indeed one cause of increasing pressure on the land. But there are more important factors, such as the rapid and massive influx of lowlanders to Ratanakiri with highlanders being forced off their land or being taken advantaged. The history of violent conflict has also been a contribution factor. When people who had fled to Laos and Vietnam during the wars returned to Ratanakiri, they first lived in small camp like areas before moving to their traditional and large areas of swidden land. Highlanders definitely perceive lowlanders as a threat to their access to land for traditional livelihoods.

Land encroachment is one problem, but there are others still. Abuse of power is not restricted to the local or individual level. Agricultural concessions have been granted and land has been sold by the Ministry and government officials in Phnom Penh – sometimes providing local leaders with a share of profit, sometimes plainly undermining benevolent local leaders who lack the power or courage to go against deals made at the central level (Global Witness, 1996). Moreover, the cyclical nature of highland farming, in which large areas are left fallow for many years, has in many cases led to land lain fallow being taken by outsiders. The reasons for this have probably been a combination of their not being aware of the traditional system and of simply not respecting it (Öjendal J. et al, 2001). Currently, Cambodian law states that any land not being used belongs to the Government.

Another aspect is that land is becoming such an issue in the country as a whole that people with money realize that they can make a large profit if they buy and resell it or use it for large-scale plantations. This problem is therefore connected to the forestry issue. People obtain land covered with forest, cut down the trees – without worrying about sustainability or long-term consequences – because they know that they will then be able to use the land for agriculture. In addition, small and large-scale plantations are being established in the province at a fairly high pace (Colm, 1997). In fact, looking at a map at the cadastral office, it becomes clear that virtually the entire province is claimed by various plantation and forest concessions/interests. These claims are often made where indigenous peoples are already using the land.

Another, perhaps even more difficult, land problem is posed by the overall governance situation in the country. It is fairly common to find informal leaders whose power is based on a reputation for being knowledgeable and willing to work in people's best interest, but it can also be based on force (Hasselskog, 2000).

In Ratanakiri too, there are numerous accounts of dishonest individuals holding either formal or informal power – be it at village, commune, district or provincial level – selling community or family used land to outsiders or grabbing it for themselves, their families or their friends. Most ordinary villagers, who generally lack education, are unaware of their rights and lack the confidence to approach authorities that might facilitate a procedure of filing a complaint. There are also reports of officials asking for bribes and tricking illiterate people into placing their thumbprints on documents that deprive them of their land (Öjendal J. et al, 2001).

The environmental and socio-economic consequences of land grabbing are inevitable: because people are moving away from the low-intensity use of land, the soil is becoming less fertile, which means that yields will be lower, as will the level of food security. As a result, the weakening of the local culture may become a serious concern, despite the official discourse of promotion of minorities' culture.

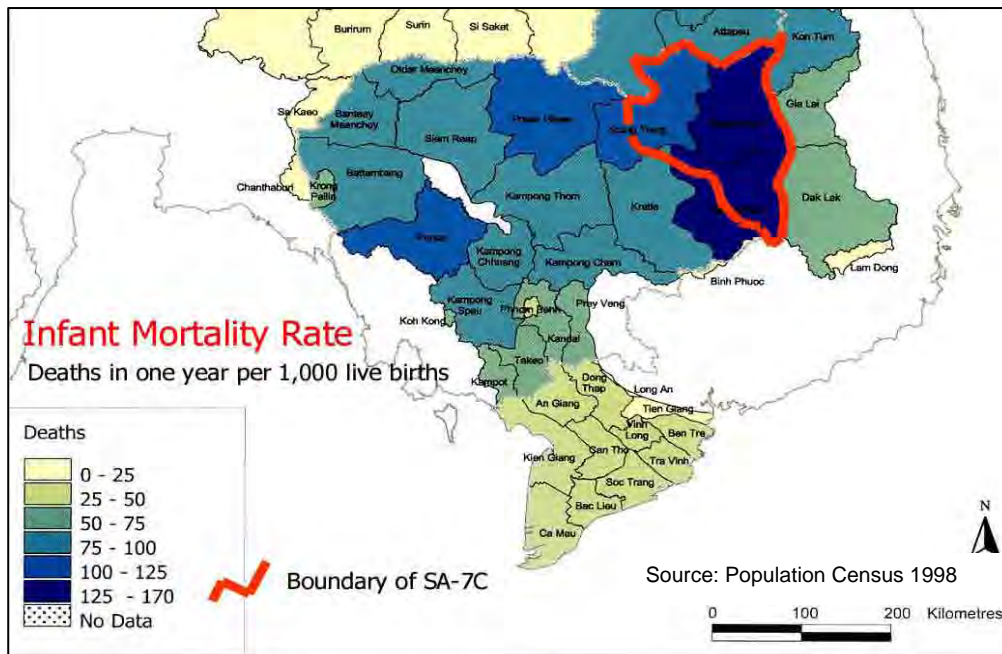
4.4.4. Intensification of Population Pressure through Migration



Development of tourism, infrastructure improvement and increased foreign investment are major factors encouraging migration from poor provinces towards urban areas where employment opportunities and facilities are created.

But urbanization is not really the problem here. It is more outsiders grabbing land for concessions, gaining good land along the roads and non-recognition of indigenous land rights plus the indigenous people not understanding the laws.

4.4.5. Aggravation of Vulnerability of the Poorest



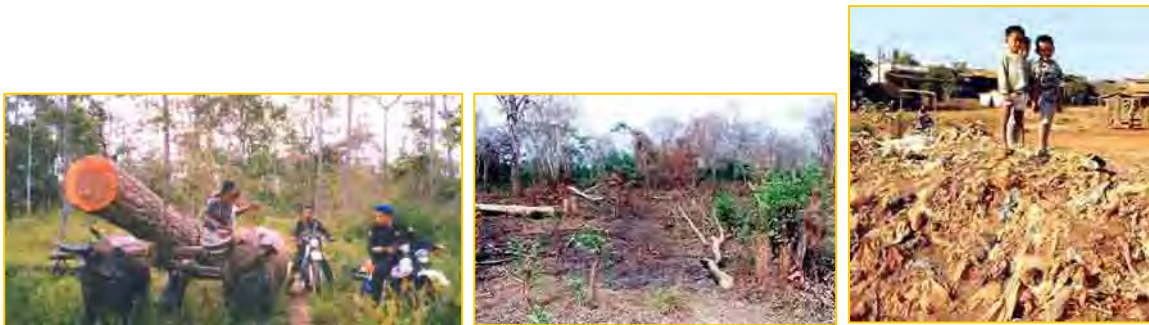
In Cambodia, half of the villages have between 40-60% of the households below the poverty line with a peak of 80% in some areas (MRC, 2003c). Many households have no land holdings and are entirely dependant on fishing and foraging, with access to fishing areas often under dispute. If conflict and instability are major causes of poverty, impoverishment originates from poor access to health and education services, lack of land ownership, women’s social deprivation and increasing vulnerability to natural calamities. Demographic pressure on the environment resulting in degradation is also a mechanism of impoverishment of the vulnerable in terms of limited access to resources. This trend is aggravated by the inadequacies of the governance system.

Vulnerability of the deprived population can be seen through many socio-economic disparities, e.g. the infant mortality. The 7C Sub-area, especially the provinces of Mondulkiri and Ratanakiri, has one of the highest rates of infant mortality with 100-170 deaths in one year per 1,000 live births. The factors influencing these rates include low birth weights, diseases such as diarrhea, dysentery and malaria; and poor access to adequate health services.

4.5. Tran-Boundary Issues

Identification and analysis of trans-boundary issues are crucial for planning and decision-making of the riparian Governments. The following are five key trans-boundary issues identified for the BDP of the 7C Sub-area.

4.5.1. Environmental Degradation



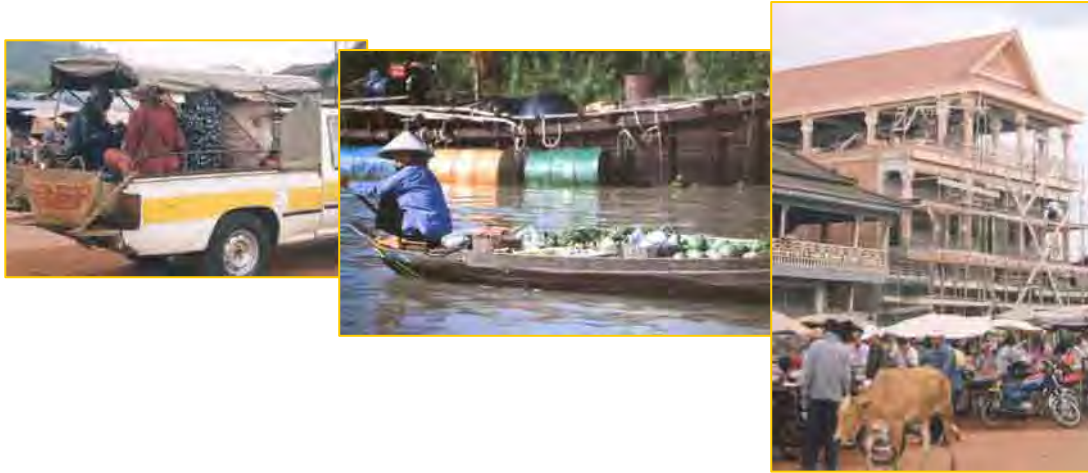
Deforestation impacts on the environment beyond the boundaries of the concerned country. The most direct environment consequences of deforestation are the depredation of the forest biota in the deforested area. Because forests are almost always more biologically diverse than the system with which they are replaced, this usually results in a local loss biodiversity, and potentially a reduction in global species diversity (MRC, 2003d).

The agricultural encroachment that follows deforestation often causes the loss of traditional land use rights and traditional conservation mechanisms. The changes threaten the ecological balance at large as well as the livelihood, or even the existence, of the indigenous peoples and their cultures (Himel & Nhem, 1997). As should be obvious, no single actor has the power to control the situation in a real sense. Instead, a multitude of various interests – ranging from local businessmen, to local and so local military, national level politicians, multinational companies and international development agencies – have approached the area with plans on how to tap its riches (Sam Ath Sith et al, 2002a).

Development workers who live in the area expect accelerated land grabbing, illegal logging, legal but disastrous logging, cash-crop farm establishments, and dam building in the near future. Some have come to the conclusion that in perhaps five years from now there will be virtually no primary forest left, apart from a few areas that have been either labeled protested or turned over for community management (e.g. Virachey National Park which covers a large part of northern Ratanakiri). The previous primary users, the

indigenous population, tend to be the one with the least chance of making their voices heard and having their rights protected. Already on a number of occasions, they have been pushed aside (Colm, 1997).

4.5.2. Population migration



Migration is another trans-boundary issue of concern in terms of social and geo-political implications. The search for employment is a major cause of migration. Seasonal and semi-permanent migration to urban areas provides important income for households in rural areas. Several different types of migration appear to be taking place at the same time, as suggested by national level data from Cambodia and Thailand. The largest movements are between rural areas. People relocated from densely populated rural areas to remote ones to seek new economic opportunities. Economic development in the Lower Mekong Basin, especially in urban centers, creates strong attraction for rural people because jobs are more numerous, better paid and services are more developed.

Human migration also facilitates propagation of diseases which bypass economic, political, administrative or international boundaries. For instance, the rapid spread of HIV/AIDS, SARS and some other epidemics, for e.g. Avian Fever, is increased by the population movement all around the world, regionally and internally as one of the effects of migration supported by tourism industry development and waterway and inland transportation rehabilitation.

4.5.3. Fishery Resources Management



Trans-boundary Factors Impacting on Fisheries Resources:

- Development of water resources, particularly dam and weir construction for hydroelectric power, result in drastic changes in water levels, increased turbidity and reduction in nutrient levels. Dams also impact upon water quality, affecting downstream total suspended solids and nutrient levels, especially total phosphorus and dissolved oxygen levels. Oxygen-consuming decomposition of organic material mainly occurs at the bottom, and the bottom water can become hypoxic or even anoxic if the reservoir is stratified. If oxygen-depleted bottom water is released from a dam, fish kills can occur downstream.
- The introduction of exotic fish species – if uncontrolled – represent a serious threat for biodiversity through hybridization, destruction of local species and competition for food and habitat. A good illustration of this is the introduction and the banning of freshwater species "Trey Chap" (*Pirania* sp.) from foreign countries for aquaculture purposes. Carnivorous and voracious, "Trey Chap" has caused significant damage to local species of fish.
- The increased and irrational use of chemical pesticides, herbicides and fertilizers in the agriculture sector is also causing harm to the fisheries habitat and aquatic eco-system, through eutrophication and water pollution by aggressive chemical molecules, some of which (e.g. DDT and Dieldrin) have been banned from use by WHO and other relevant international institutions, but not yet from production and commercialization.

4.5.4. Hydropower

4.5.4.1. Cambodia's Demand of Electrical Power

The country's demand of electrical power is projected to increase from 251 MW to 746 MW between 2000 and 2016. Previous feasibility study reveals potential hydropower in Pursat (3.5 MW) and Stung Sen (38 MW) (Bohneur, 2003).

4.5.4.2. Potential for Hydropower Development in the Mekong Basin

The total potential for feasible hydropower projects in the four Lower Mekong Basin countries is approximately 30,000 MW including 13,000 MW on the Mekong's Mainstream, and the remaining tributaries' potential (13,000 MW in Lao PDR's tributaries, 2,200 MW in Cambodia and 2,000 MW in Vietnam).

Table 6: List of Completed Hydropower Projects (10MW<)

Country	Name	Location	Capacity (MW)	Output (GWh/year)	Commissioning
China	Manwan	M	1,500	7,870	1993
	Dachaoshan	M	1,350	5,930	2001
Lao PDR	Nam Ngum	TR	150	900	1971-85
	Xeset	TR	45	150	1991
	Theun Hinboun	TR	210	1,645	1998
	Houay Ho	TR			
	Nam Leuk	TR	60	184	2000
Thailand	Sirindhorn	TR	36	115	1968
	Chulabhorn	TR	15	62	1971
	Ubolratana	TR	25	75	1966
	Pak Mun	TR	136	462	1997
Viet Nam	Dray Ling	TR	13	70	1995
	Yaly	TR	720	3,642	2000

Note: TR = Tributary, and M = Mainstream
Source: MRC, 2002g.

Only 5% (1,600 MW) of the Lower Mekong's hydropower potential have been developed, and all projects are on the tributaries, not on the mainstream. There is also huge hydro potential in the Upper Mekong Basin. In Yunnan Province of the People's Republic of China, total hydro potential is an estimated 23,000 MW, and two projects, totaling 2,850 MW, have already begun operating.

4.5.4.3. Analysis of Trans-boundary Implications of Hydropower Projects

Obligation of consultation between countries:

In signing the 1995 Agreement that established the MRC, member countries all agreed that before any hydro project can be built on the mainstream of the Mekong, all four member countries must agree. Furthermore, the 1995 Agreement obligates member countries to ensure that no harmful effects will occur downstream in neighboring countries. One problem is that China and Myanmar are not signatory to the MRC

Agreement: thus, China is building dams with a high storage capacity without consultation and participatory evaluation of impacts downstream, which puts downstream member countries in a position where they have to compensate for water capture carried out upstream without full understanding of the operations of the upstream dams or their likely impacts.



Figure 12: Completed Hydropower Projects in the Mekong Basin

Risks for riparian countries:

The first risk of hydropower projects development in the upstream area of the Mekong River is the negative impact on the environment and society. Those risks have been duly identified as:

- Adverse impacts on the ecosystem (aquatic life, animals, birds, vegetation);
- Blocking of the flow of sediment;
- Negative impacts due to changing a river's flow pattern;
- Negative social impacts (resettlement, loss of livelihood);
- Loss of scenic landscapes (tourism potential);
- Negative impacts on water quality due to storage of water (eutrophication, lower temperatures for discharged water);
- Negative impacts to other users of water (navigation, fisheries);
- Problems during the construction period (noise, vibration, dust, traffic problems); and
- When associated with irrigation, land Stalinization and water logging.

Geo-hydraulic conflicts:

Hydropower involves dam building which requires water diversions. Conflict may arise between upstream countries and downstream countries because of water scarcity and/or unequal allocation. The most crucial is perhaps where a basically agricultural country risks losing the access to the water sources and thereby being robbed of the chance of achieving food security, poverty alleviation, and possible economic growth (Öjendal, 2000). Furthermore, aggressive and hostile capture could lead to tensions and conflicts through population movements, group identity conflicts, economic deprivation and/or civil strife (Ibid).

Progress generated by Hydropower projects:

Quite a number of positive impacts of hydro projects deserve to be highlighted:

- Harnessing of a renewable natural resource;
- Reducing of the negative impacts that power generation has on the global environment (e.g. use of fossil fuels reduced, thus will lessen air and water pollution);
- Increasing the river's flow in the dry season, and reducing peak flow during the flood season;
- Increasing the availability of electrical power will stimulate economic development and improve people's living standards; and
- Revenues will be earned from the sale of power.

4.5.5. Soil and Water Conservation

The tenuous situation of most rural people stems from their difficult situation as subsistence rice farmers dependent on making a living from poor quality soils and uncertain and inconsistent rainfall. This is clearly identified usually by requests to solve the water problem with “irrigation”. Yet often the problem is not just water shortage but flooding due to poor drainage or pests associated with a drought period or low yields that prevent farmers from escaping the debt cycle caused by a failed crop.

A more holistic approach to these problems is to examine the situation within the framework of soil and water management and conservation. Cambodia was previously able to produce large surpluses of rice without major investments in irrigation reservoirs by utilizing local knowledge and resources and smaller investments to improve the rice cropping situation³. Many traditional techniques of soil and water control have been developed over the course of centuries of rice farming that involve flood spreading, water harvesting, storage, drainage, soil conservation through bunding and field leveling and improved crop management.

Numerous small-scale improvements in infrastructure are proven to work and contribute to the catchment’s response to rainfall thereby contributing to the reduction of downstream flooding and sedimentation. In addition, the better soil and water conservation improves the viability and performance of larger investments in the watershed and reduces pressure for populations to migrate from tenuous economic situations to put more pressure on important areas like the Tonle Sap flooded forest or overcrowding urban areas.

The overall water balance within the sub-basins can be greatly improved through widespread application of these techniques that have the corollary effect of increasing the absorption of rainfall and runoff into the soils and thereby increasing the quantity of groundwater available. The groundwater provides the base flow in the rivers during the dry season, and thereby contributes the necessary volume to maintain the situation in the Mekong Delta area downstream from increasing encroachment of seawater.

Through careful management of the watersheds to maintain and conserve local resources, the environmental situation throughout the basin is improved and the local people’s ability to respond to natural disasters is strengthened.

³ For example, during the “Sangkum Reastr Niyum” period of 1953-1969, a rural engineering department mobilized local people and leadership to work together on small-scale water resource projects appropriate to the village that gained good success for a relatively small investment.

CHAPTER 5: THE AGENDA FOR DEVELOPMENT

5.1. Key Development Objective

5.1.1. Needs and Opportunities

Needs	Likelihood to Happen	Importance Ranking
Access to electricity	2	3
Agro-industry development	2	2
Conserve fisheries critical habitats and spawning grounds	1	3
Construction of solid waste disposal sites and processing	4	5
Control riverbank erosion of tributaries	4	6
Control siltation of the tributaries	4	4
Development of agricultural research system	4	4
Development of aquaculture	5	6
Establishment of liquid waste treatment in urban towns	4	5
Expansion of clean water supply system	1	1
Food security	5	5
Improve concession management and land tenure for people	1	1
Improve national and provincial road network	3	2
Improve navigation channels and facilities along tributaries for river transport	1	2
Improvement of hygiene and sanitation	5	6
Improved land use and management	2	2
Increase international, regional and national tourism	1	1
Increase participation of women in leadership roles	1	1
Irrigation system rehabilitation and development	3	2
Manage and mitigate negative impacts from upstream dams on downstream people and locations	1	3
Market for agricultural products	4	1
Flood preparedness, warning systems and disaster relief	2	3
Promote human resources development	2	2
Protect flagship fisheries species for biodiversity and eco-tourism	2	2
Protect the flooded forest	2	3
Protection and improvement of tourism areas	1	2
Protection of national parks and sloped forest lands, natural forest	1	1
Reduce illegal fishing methods and over-fishing	1	2
Strengthen institutional education	2	3

Opportunities	Likelihood to Happen	Importance Ranking
Agricultural development communities (forestry, fisheries and water use)	3	3
Conserve unique biodiversity and domesticate species with commercial potential	3	1
Create development regions, heritage promotion and other development programs	5	5
Develop aquaculture to increase fish production	5	7
Develop fee charging system for irrigation	6	5
Develop pumped irrigation systems from rivers	4	2
Develop urban and rural water supply	4	6
Establish hydropower dams	1	1
Develop micro-hydro projects and expand electricity distribution network and connect to regional grids	6	3
Expand and improve irrigation systems particularly for fruit and industrial crops	3	3
Expansion of road networks and establish markets for agricultural produce	2	2
Implement infrastructure and information systems for agricultural markets	4	4
Improve and enforce laws and procedures	4	3
Improve Government policies and strategies	4	2
Improve human resources in techniques and technical areas	3	2
Improve watershed management with emphasis on forest management and improved land use practices	4	1
Increase diversification of crops to take advantage of different climate, soils and large land availability	3	1
Increase local and international investments	4	2
Increase off-farm income and job opportunities	4	2
Increase people's participation	4	2
Increase rice and agricultural production yields as well as quality	2	1
Increased eco-tourism to national parks, animal habitats, and natural tourism centers (Yeak Loam Lake, dolphins, nature tours, waterfalls)	1	2
Maintain and increase support of donors (national and international), NGOs and private sector	3	3
Mining development of gold, gems, granite, marble, minerals	4	4
Promote micro-credit services	3	3
Smallholder livestock development	2	2
Strengthen human resources	3	1
Value-added processing of high value wood products by SMEs and cottage industry	3	2
Value-added processing of agricultural products by SMEs and cottage industry	5	3

5.1.2. Concerns and Risks (20 years)

Concerns and Risks	Likelihood to Happen	Importance Ranking
Changes of nature and river	1	4
Decline of biodiversity and protected areas	1	2
Drought affecting agricultural production and food security	2	3
Efficiency of law execution is low	2	3
Human resources management system is not yet well managed	2	4
Hydrological impacts of upstream tributary dams	1	1
Illegal fishing methods	2	4
Illegal migration into the area	2	2
Information system for natural resource and market management is weak	2	6
Issues of waste management (gas, liquid and solid wastes)	2	5
Lack of budget	2	3
Lack of data and study on hydraulic systems	3	4
Lack of human resources	1	2
Lack of investment	3	2
Lack of means and equipment	4	3
Lack of measure to address transboundary impacts	3	3
Lack of rural infrastructure	3	2
Limited public participation	3	3
Limited technology and techniques	3	4
Loss of flooded forest	5	5
Low level of education, knowledge and skills	2	3
Natural disasters such as climate change, drought, bank erosion and decreasing water quality	2	3
Overlap of responsibilities of institutions	4	4
People migration	2	3
Poor concession management for forestry and other uses	1	2
Protection of deep pools for dolphin and fish habitats	2	3
Protection of indigenous people's culture and traditions	2	2
Public health problems, drugs, women and child trafficking	3	2
Rapid and large changes in land use	2	2
Rights of people to use land and gain title	4	3
River banks continue to erode and river course changes	3	4
Transboundary impacts from hydropower schemes in neighboring countries causing flooding, affecting habitats, people's tradition, health and livelihoods, fisheries, infrastructure and agriculture	1	1
Water pollution	2	3

5.1.3. Trends

Trends	Likelihood to Happen	Importance Ranking
ASEAN open borders policy leads to increased interaction with neighboring countries	2	1
Changes of water flow regimes due to hydropower dams construction	2	1
Decrease of areas of natural forest due to the expansion of farming and concessions	2	1
Demographic pressure	2	3
Development of Agro-Industry	3	2
Expansion of clean water supply service for urban and rural population	3	1
Extinction of some fish varieties	2	2
Groundwater table lowered	6	4
Increase of sedimentation in rivers, streams, and canals	3	3
Increased interest in protection of borders	4	3
Increasing concessions and conflicts with local people	5	2
Increasing diversification of cropping	2	1
Increasing erosion of soil, and siltation of water resources	3	3
Increasing hydropower dam construction upstream on Mekong River and tributaries in Cambodia or upper countries?	4	2
Increasing number of tourists (national, regional and international) for eco- and cultural tourism	2	1
Increasing of transport through road and airway	1	1
Increasing of transport through waterway,	7	4
Increasing water use for irrigation due to the expansion of irrigated land	3	2
Land ownership conflict	4	4
Loss of ethnic traditions and culture	2	3
Migration of outsiders into the sub-area increasing	3	2
Poverty reduction due to economic growth and job availability	4	2
Pressure on natural resources use and their degradation	2	1
Reduction of Mekong River dolphin numbers	3	1
Strengthening fisheries community	3	2
Strengthening water user community and agricultural development community	3	2

5.1.4. Ongoing Planned Interventions

Interventions (Implementers and Donors)	Likelihood to Happen	Importance Ranking
ASEAN Open Border Policy (RGC-ASEAN)	1	2
Cambodia Roadmap for Water Sector (MOWRAM-ADB)	2	2
Economic Cooperation Strategy between Cambodia, Lao, Myanmar and Thailand, namely (RGC): <ul style="list-style-type: none"> – trade and investment facilitation – agricultural and industrial cooperation – transport linkages – tourism cooperation – human resources development 	2	1
First and Second East-West Economic Corridor (RGC-ASEAN)	2	2
Forest Crime Monitoring Project (MAFF-WB)	2	3
Greater Mekong Sub-region Programmes for tourism, navigation, agriculture and watershed management (RGC-ADB)	1	1
Improvement on Regulation and Management Framework of the Freshwater Fisheries (MAFF-ADB)	1	1
Japanese Support to Mekong Region Development in the identified "Three Pillars of Concrete Actions" (RGC-JICA): Enhancing economic cooperation; Promoting trade and investment; and Strengthening consultation and coordination	1	2
Land Registration and Commune Delineation (LMAP, Commune Council Development Program, MLMUPC-ADB, WB)	2	2
Natural Resources and Environmental Management Programme (RGC-DANIDA)	1	1
New Fisheries Law (MAFF-ADB)	2	2
Provincial and Peri-Urban Water Supply Project (MIME-ADB)	1	3
Seila Programme (RGC-UNOPS, WB)	2	2
Cambodia-Lao Emerald Triangle Tourism Cooperation	2	1
Water Strategies (MOWRAM-ADB)	2	2
Wildlife and Conservation Projects (MoE-WWF/WCS/FFI)	1	1

5.1.5. Preliminary Objectives (5-10 years)

Preliminary Sub-area Objectives 5-10 Years	Likelihood to Happen	Importance Ranking
Address food security for 80-100% of the people	3	1
Address impacts from upstream tributary dams through cooperative management, community preparedness and sharing of information	3	2
Environmental awareness and education and link to eco-tourism to generate economic growth and jobs	4	4
Rehabilitate 60-70% of existing irrigation systems	3	3
Improved flood and drought management	2	2
Improve concession management and land use, rights to land	4	5
Improve navigation and ports to increase waterways transport	2	3
Increase diversification of farming and development of markets	2	2
Develop small-scale hydropower for 12 locations	3	2
Start building network of electricity transmission lines linked to regional grid	2	3
Prepare and implement management plan for protected areas and national parks and critical upper watersheds	3	3
Promote economic sector and attract industrial production to create more jobs	2	3
Promote social and cultural development	2	1
Promote the establishment of agricultural development community and water user community	2	2
Protect and conserve deep pools and dolphin habitats/numbers	2	3
Protect indigenous culture and traditions and promote tourism	1	2
Rehabilitate national and provincial road network to increase traffic and reduce transport and travel costs and time	3	3
Sustainable natural resources use and management	3	2
Train human resources knowledge and skill to attract private investors	3	2

5.1.6. Preliminary Objectives (20 years)

Preliminary Sub-area Objectives 20 Years	Likelihood to Happen	Importance Ranking
Develop agro-industry for exportation	3	5
Develop border regions and open market opportunities with the neighboring countries, particularly with the riparian countries of the GMS	2	3
Ensured water supply for the entire urban and rural population	3	3
Control bank erosion along critical river sections	4	3
Develop 3 new irrigation schemes and rehabilitate remaining existing irrigation schemes	3	2
Limited exposure to flood and drought problems	1	1
Improve navigation and ports to increase waterways transport	1	1
Improved upland farming systems: land-water-forest and crops	3	1
Expand electricity transmission network and connect to regional grid. and prepare feasibility study for large-scale hydropower/irrigation project	1	1
Prepare feasibility study for large-scale hydropower/irrigation project	3	3
Integrated forest management	5	5
Prepare and implement management plan for protected areas and national parks and critical upper watersheds	3	2
Promote environmental, cultural and agro-tourism between Cambodia, Laos and Vietnam along the Mekong River	3	2
Promote infrastructure development, science and economic research for development	3	1
Promote social and cultural development	4	4
Promote the establishment of agricultural development community and water user community	2	1
Protect and maintain the traditions and culture of minorities	3	4
Rehabilitate national and provincial road network to increase traffic and reduce transport and travel costs and time	2	1
Sustainable natural resources use and management	4	4
Train human resources knowledge and skill to attract private investors	3	3
Water resources management	3	3
Develop eco-tourism	3	2
Develop agro-tourism	3	2
Expand development of small scale animal production	3	2
Develop upland farming	3	2
Integrated watershed management, including reforestation	2	2

5.1.7. Conclusion

With an area of 21,055 Km², the 7C Sub-area is located in the northeastern part of Cambodia encompassing partly or entirely three provinces, namely Monduliri (50%), Ratanakiri (100%) and Stung Treng (62%). In terms of district coverage, the Sub-area is composed of 16 districts, thus representing approximately 11.5% of the total area of Cambodia or 1.25% of the total population. In a country where the elevation is low in the big majority, the 7C Sub-area forms the highest part of Cambodia with a maximum of 500 meters above the sea.

The 7C Sub-area is characterized by a very low population density (0-20 persons per Km²) only and mainly inhabited by eight ethnic highland groups who are Krung, Tampoun, Jarai, Kachak, Kavet, Brao, Lun and Phnong. There are also lowland Lao as well as a number of Chinese and Vietnamese, who mainly live in population centers along the very few major roads.

The 7C Sub-area is considered as the least developed area in terms of economy and social conditions, compared to other areas in the country, despite high potential for agriculture. Poor access to safe water implies high incidence of intestinal diseases and high rate of infant mortality among the population. Poverty is endemic. As a result, the population of the 7C Sub-area faces the one of highest proportion of children underweight for age (malnutrition) in Cambodia and throughout the Lower Mekong Basin, with a rate of 40 up to 60 percent.

The water resources analysis is a complex work which requires availability of comprehensive, accurate and updated scientific data. Unfortunately and in contrast to the neighboring countries of the Lower Mekong Basin, Thailand and Vietnam, Cambodia is a country that crucially lack necessary data.

Water resources are threatened in terms of quality and quantity. Many sectors rely on water resources, e.g. agriculture, fish production, biodiversity, water supply, sanitation, transport and hydropower. The current trend is a shortage of water supply in many areas, including domestic purposes. Serious competition for water is intensifying between fast growing population and irrigation development. In this basin, shortage may be provoked by over-use of water or more, because of lack of development of infrastructure. No serious pollution issue has been reported there.

The water issue could be viewed at two different levels. The first is the micro level where water resources are used for individual villages and minor communities, including local streams and ponds and the infrastructure around them. The second is the provincial level, concerning overall water supplies and the major tributary rivers to the Mekong, such as the Se san and the Sre Pok, which, in a geographical sense define the living, agricultural and fishing conditions of the province.

The generally high availability of water resources in Ratanakiri constitutes one of its major advantages as an agricultural province. This feature has also prompted a number of actors to seek the possibility of increasing irrigated rice cultivation. Land encroachment

and speculation provoke harmful consequences on environment and livelihood of indigenous highlanders.

Development of tourism, infrastructure improvement and increased foreign investment are major factors encouraging migration from poor provinces towards urban areas where employment opportunities and facilities are created. But urbanization is not really the problem here. It is more outsiders grabbing land for concessions, gaining good land along the roads and non-recognition of indigenous land rights plus the indigenous people not understanding the laws.

Main constraints have been identified as lack of flood preparedness and early warning systems, inexorable pressure on the eco-system of biodiversity, destructive effects of poverty on environment, weak local governance skills and decision-making power and weakly sustainable resource management and development policy.

After discussing on the cross-cutting and trans-boundary issues, are listed the preliminary development objectives that have been proposed by the working group for 5-10 years and 20 years.

5.2. Identification of Assets

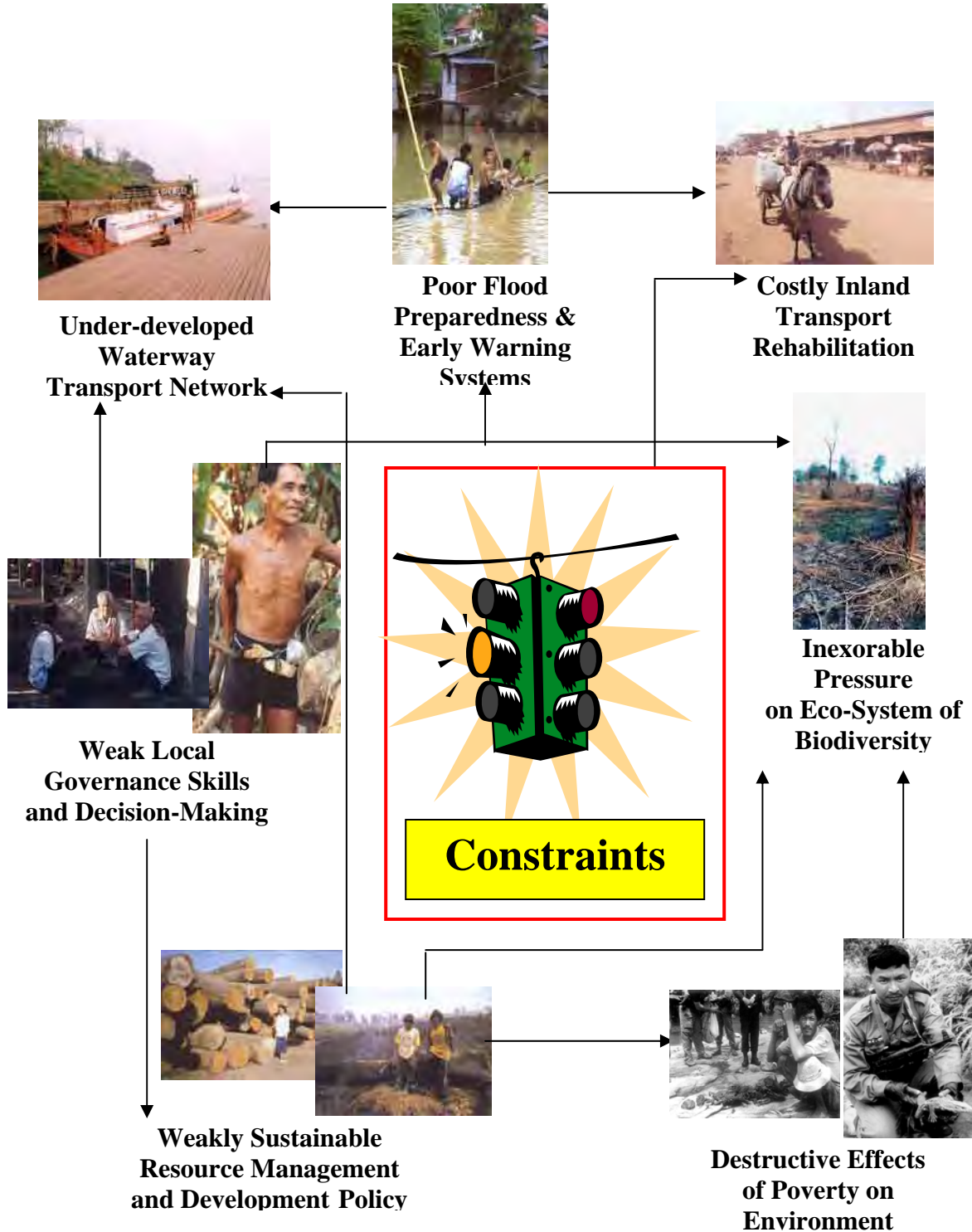
Assets can be defined as resources – both natural and manmade – as well as opportunities which rational exploitation is able to provide economic and social benefits to all layers of the society.

The 7C Sub-area is known to be one of the richest parts of Cambodia's territory in terms of natural resources and therefore provides opportunities for development in the sub-area. Assets of the sub-area identified by SAWG and agencies involved during data and information collection, meeting and Forums are as follows:

- **River, canals, streams, lakes, ponds:** water resources, fisheries, hydro-power, endangered fish, fish habitat, irrigation, household water consumption
- **Ground water**
- **Waterfalls:** natural waterfalls
- **Valleys**
- **Fish pools/habitats and fish breeding eco-system**
- **Dolphin pools/habitats:** Dolphins, fish, riverine habitats, tourism sites and resorts both cultural and natural
- **Wetlands:** permanent wetland, biodiversity
- **Agricultural land:** rice, diversified crops, agro-industrial crops (rubber, cotton, etc.), and food security
- **Protected areas:**

- National Park: forests, natural tourism, forests, all kinds of wild - - animals/
study on tourism resorts, animal habitats;
- Animal habitat areas: all kinds of wild animals, unique habitats, natural
tourism, tourism resorts both natural and cultural, landscape, cultural
heritages;
- Natural lakes/ponds: biodiversity, fish habitat; and
- Mountains.
- **Forest and flooded forest:** quality timbers, forest by-products, animal habitat,
endangered birds, fish habitat
- **Waterway transport networks:** transportation, custom
- **Mines:** gold, gem, granite, marble, bauxite
- **Culture:** historical resorts and centers
- **Indigenous highland cultures**
- **Climate**

5.3. Constraints



5.4. Risks of Intervention

Concerns and Priorities	Opportunities and Constraints	Interventions	Risks of intervention
<p>Forestry issue: Unimpeded semi-legal and illegal logging is perhaps the biggest problem in Ratanakiri in the short to medium term.</p>	<p>Presence of biodiversity ecosystem is of interest for funding agencies.</p>	<p>To prepare feasibility studies and project proposals for funding and submit to interested donors.</p>	<p>Dependence upon aid agencies and banking institutions</p>
	<p>Presence of indigenous highlanders whose traditions and culture are of interest</p>	<p>To map and delineate which areas are to be preserved as ancestor forestry and which are allowed to be developed and to follow-up the exploitation of concessions.</p>	<p>Over-exploitation</p>
	<p>Strong conflict of interests. Weak local governance.</p>	<p>The forestry sector appears to be the most difficult one to regulate through decentralization. It is also the natural resource over which the national government is least willing to hand over power.</p>	<p>To appeal to the highest powers to prevail upon them to reduce these activities and support the preservation of the remaining area. Another option is to publicize the problem so that public support is gained and pressure placed on these interests.</p>
<p>Industrial and anarchic exploitation are main causes of the depredation.</p>	<p>Enforcement of regulatory framework is challenged by impunity and highly profitable practices.</p>	<p>Capacity building and awareness raising on the issue.</p>	<p>Long process....</p>
<p>Decline of fishery resources is of great concern. The introduction of exotic fish species – if uncontrolled – represent a serious</p>	<p>Weak legal framework in Fishery Resources management and development.</p>	<p>To strengthen legal framework in fisheries resource management.</p>	<p>The long process does not fit with immediate individual interest.</p>

Concerns and Priorities	Opportunities and Constraints	Interventions	Risks of intervention
<p>threat for biodiversity through hybridization, destruction of local species and competition for food and habitat. A good illustration of this is the introduction and the banning of freshwater species "Trey Chap" (Pirania sp.) from foreign countries for aquaculture purposes. Carnivorous and voracious, "Trey Chap" has caused significant damage to local species of fish.</p>	<p>Weak local governance. Lack of government resources to conduct research and assessment and recommend adequate measures.</p> <p>Overlapping mandate of acting institutions.</p>	<p>To build capacity through "learning by doing", thus this intervention could best be combined with the intervention requesting assistance from the outside aid agencies as a means of addressing the core issues in a capacity-building and participatory manner.</p> <p>Capacity building and awareness raising on the issue. Others who might be targeted include those who are damaging the resources as a whole, such as China (dam building on the upper Lancang /Mekong), those engaging in destructive fishing practices such as using illegal gears and explosive /electrical fishing.</p> <p>It is best to formulate the problem and idea to solve it prior to approaching aid agencies in order to maintain more input and control of the solution.</p> <p>To clarify respective mandates.</p> <p>Political appeals and campaigning: Appealing to the highest authorities appears to have an impact on returning control of some resources to the local people. This is often brought about through a campaign both through the media and other methods to raise public awareness and bring pressure on the authorities for change.</p>	<p>Dependence on aid agencies.</p> <p>Conflict of interests.</p>

Concerns and Priorities	Opportunities and Constraints	Interventions	Risks of intervention
<p>There is an immediate need for <i>poverty alleviation</i> so that pressure on environment and fishery resources can be regulated and relieved.</p>	<p>Tourism industry development will create a number of job opportunities. However how many of those opportunities are provided to the poorest people is the real question, because the poorest don't live where tourists tend to go for the most part. They are in a subsistence economy so don't produce things that tourists are interested in buying. They are the least trained and adapted to enter the service industry so are least likely to gain jobs from the tourist sector.</p> <p>Road infrastructure improvement Facilitate investments. Impacts on the poor remain to be assessed, but the expected results are to bring opportunities for the poor to access education and health services markets for their produce and to get to places where they can find seasonal jobs, knowledge and information.</p> <p>A number of unqualified migrants.</p>	<p>To strategize tourism development plan to attract investment so that job opportunities are effectively enhanced.</p> <p>To train and educate young people through non-formal education programme.</p>	<p>Pressure on environment and social side-effects.</p> <p>Trained skills do not fit with labor market.</p>

Concerns and Priorities	Opportunities and Constraints	Interventions	Risks of intervention
<p>Wildlife endangered by animal trafficking: Demand rising from neighboring and western countries increase pressure on local wildlife trade. Traditional medicine market encourages traders to capture wild animals in the reserve zone.</p>	<p>Weak provincial development policy and strategies.</p> <p>Difficulty in land law enforcement. Low salary/income.</p> <p>Attractive biodiversity and endemism of fauna for research on preservation of endangered species.</p> <p>High potential in funding opportunities for preservation of fauna and environmental /ecological research. Impunity and collusion of powerful actors.</p>	<p>To promote private sector investment through transparency, incentives and access to cheap and sufficient credit.</p> <p>To protect women from sex industry through law enforcement.</p> <p>To design appropriate research programme in partnership with funding agencies.</p> <p>To develop research programme that fit with international concern.</p> <p>To enforce relevant government policy and strategies relevant to core zone protection. To continue ongoing campaigns against trafficking in wildlife and cultural property.</p>	<p>Long process....</p> <p>Low absorption capacity and scientific skills of local researchers.</p> <p>Idem</p> <p>Conflict of interests.</p>

5.5. Cross-Cutting Issues

5.5.1. Environment



- The commercial logging sector is characterized by active logging, often carried out on a cross-border basis. The demand for wood in Thailand and Vietnam is a major factor driving logging in Cambodia and Lao PDR.

- Commercial forestry activity is often carried out on an unsustainable scale, with government regulatory controls sometime unable to prevent overexploitation.
- Increasing run off in logged areas can result in erosion, turbidity and sedimentation.

Table 7: Deforestation Rate in Lower Mekong Countries

Area	Deforestation Rate, %
Cambodia	0.50
Lao PDR	0.58
Thailand	0.40
Viet Nam	0.73
LMB	0.53

Source: MRC, 2003d.

5.5.2. Population Pressure



Demographic pressure seriously impacts on resources exploitation which destructive practices impede equitable sharing of benefits. The population pressure on environment, by jeopardizing natural resources sustainability, is a major factor of aggravation of poverty for future generation.

The Sub-area is being experiencing intensive positive migration during the past decade. Comparison between the density map and the migration map clearly reveals that while the Sub-area has the lowest population density in the country (0-20 persons per Km²), it is one the region that has been receiving the highest proportion of migrants (3 up to 10% of population was not living in the three provinces of the Sub-area as 5 years earlier).

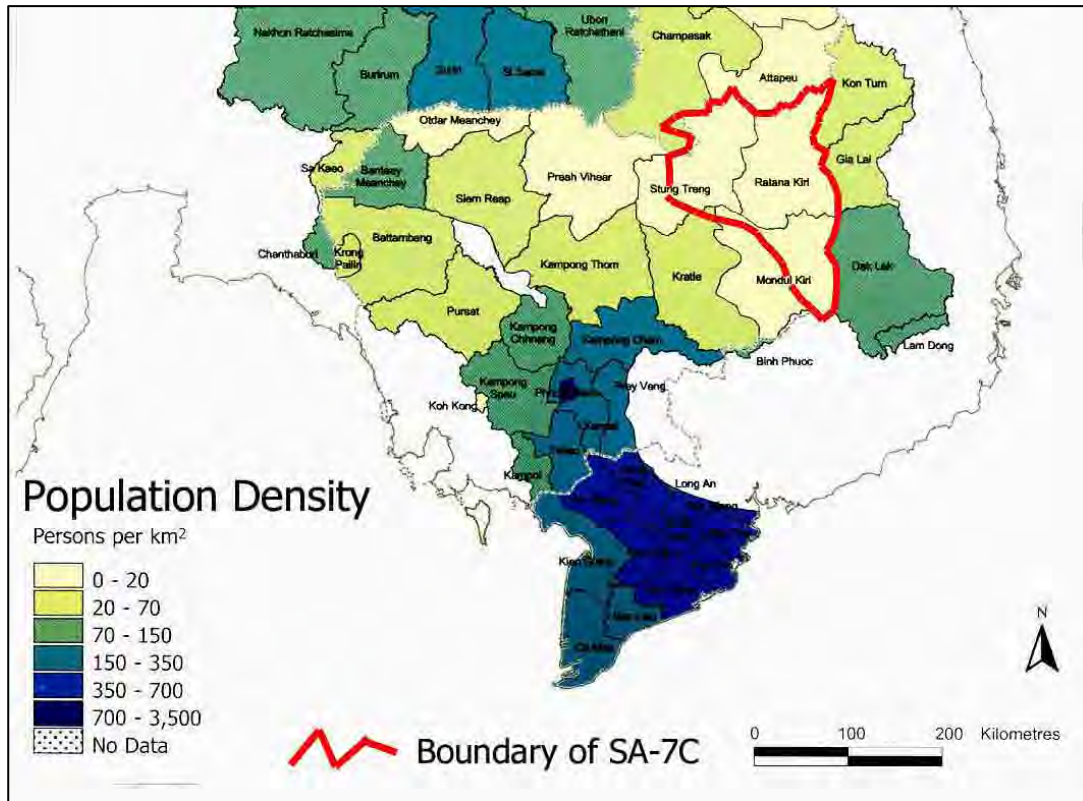


Figure 13: Population Density in the 7C Sub-area

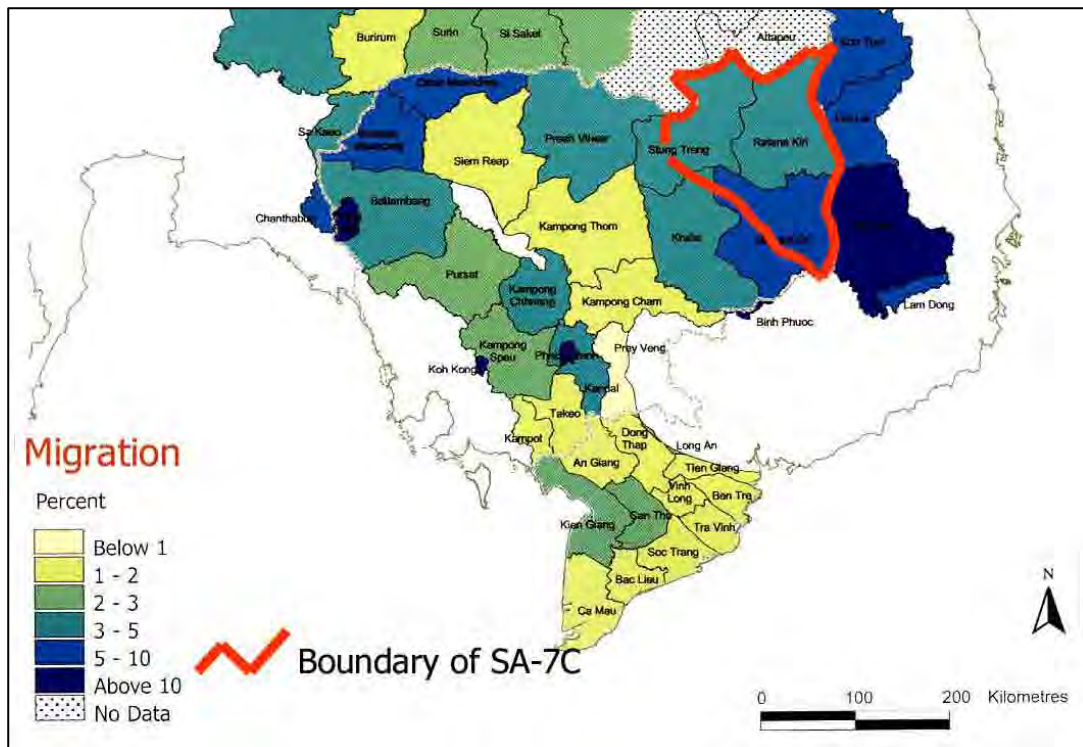


Figure 14: Proportion of Population not living in the Same Province as 5 Years Earlier

5.5.3. Gender and Natural Resources Management



In Cambodia, women compose 65.9% of the economically active population and 54% of skilled agricultural actors and fishery workers (MRC, 2003d). No demographic data related to gender distribution is available in the 7C Sub-area.

Women are vulnerable to deficient health care, HIV/AIDS, human trafficking and domestic violence. Women literacy rate is 61.1% compared to 82.9% for men. Women have limited long-lasting employment opportunities.

In the 7C Sub-area, different genders have control and access to different kinds of natural resources. While women gather forest products and fetch water, men hunt wildlife, cut trees and collect bigger pieces of wood for building houses and making coffins, among other things. It is imperative that the differing needs men and women might have when it comes to natural resources and their management are taken into account in decision-making – and also when choosing and assigning decision-makers. Understanding gender aspects in a given area, and in a specific sector such as forestry or water resource management, provides the basis for determining the nature of the knowledge and the skills needed by those who make decisions in these matters. This will then have positive impact on local welfare and, in the long run, fulfill the national development objectives. Gender roles and relations can never be taken as granted, but have to be constantly re-investigated. This is especially true in Ratanakiri, given the diverse, growing, and changing composition of the population. The issue has been recognized by CAREERE/Seila, although the inclusion of women is extra-difficult due to their heavy "traditional" workload, and therefore difficult to remedy (Sam Ath Sith et al, 2002a).

5.5.4. Human Resources Development



Human resource development is one of the fundamental of the country's development. The creation of employment opportunities needs to be strongly supported by availability of well-trained people able to provide quality services.

Outside of Phnom-Penh, fewer than 20 percent of people of secondary school are enrolled in school. Most young people are working by this age, and the network of secondary school age is very sparse throughout much of the country. The average distance from a village to the nearest lower secondary school is estimated at 27 km, too far for daily travel (MOP, 1999).

Educated people often find that there are no jobs available for their skills due to the slow development of the private sector economy. This leads to frustration and loss of the resource as the people are not able to gain the experience needed to provide the benefit from their education.

The education system is not geared towards the needs of the employers. The rote learning method employed does not engender the analytical skills looked for by outside investors.

Post-secondary educational institutions of international standard and recognition do not exist within Cambodia. Students graduating from these institutions are too few to fill the large need for their quality of services.

Government staff with ability and training are often overworked; many leave for the private sector once trained resulting in a “brain drain”. There is often no clear delineation between the public and private sector jobs of these staff with resultant confusion of roles, conflict of interest and lack of continuity in both sectors.

5.5.5. Public Participation



Public participation at all the levels, central, provincial, district and commune is a key factor of success in the context of decentralization. The many different aspects of civil society including the private sector need to be encouraged to join within the processes that are currently dominated by development agencies and government.

Gender is a major factor in public participation – as previously outlined in Issue #3 - women’s voices are seldom heard, particularly in comparison to their proportion of the population and workforce.

Participation is a key element in the success of all development – it allows design to incorporate local knowledge and concerns, people to gain ownership and makes long-term management and maintenance sustainable.

CHAPTER 6: STAKEHOLDERS AND DIALOGUE

Institutional capacity throughout the Royal Government of Cambodia (especially at the provincial, district and commune levels) is limited, because of the loss of almost an entire generation of people during the civil war, the poor public evaluation sector, low salaries in the public service, run-down infrastructure, and other factors. To address this problem, the Government is implementing a variety of measures in administrative and governance reform. Capacity building is another concern with physical facilities and equipment, ongoing funding for operational expenses and human resources development required in MOWRAM, other water-related institutions, and the civil service as a whole. The RGC seeks a greater level of private sector and/or beneficiary involvement in water services provision (water supply, sanitation, hydropower, irrigation).

Given the difficult situation with respect to human resources and the identified widespread weakness in the concerned government agencies, a number of different efforts are required to gradually address these deficiencies. A key factor in overcoming the constraints is identifying them clearly. Some of these issues are discussed below.

6.1. The Cambodian Water Policy and Strategies

6.1.1. The Draft Water Sector Roadmap for Cambodia

Interesting initiatives to address the various water sector issues exist. For instance, a Draft Water Sector Roadmap for Cambodia has been presented by the Government to ADB and discussed in a consultation meeting on April 7th 2003. The roadmap summarizes the RGC's goals for the water sector in Cambodia and provides a basis for setting priorities and planning investment and development assistance. It also reviews the context provided by national goals for poverty reduction and socio-economic development. It provides an overview of the sector, and considers the issues and constraints that are faced. Finally it summarizes recent, current and planned activities and investment by international funding agencies. The road map does not actually define a single direction to go, but indicates the possible routes to many destinations, and the obstacles that must be overcome.

6.1.1.1. Sector Issues and Constraints

The key issues and constraints in the water sector have been classified in various ways by recent analyses, such as the National Water Sector Profile (MOWRAM, 2001). In this roadmap, issues are grouped into the following topics:

- Legislation and policy
- Institutional arrangements
- Institutional capacity
- Providing data and information
- Managing irrigation and drainage systems and other water-related infrastructure
- Mitigating the impacts of water-related hazards
- Managing competition for water and deteriorating water quality

- Conserving aquatic ecosystems and fisheries
- Managing international water resources
- Managing the coastal zone
- Financing water resources development and management

6.1.1.2. Summary of Issues and Constraints⁴

Legislation and policy

There is not at present a coherent body of water-related law, regulatory instruments, or policy. A draft Law on Water resources Management (WRM) is before the National Assembly, and a National Water Resources Policy was passed by the Council of Ministers in January 2004. Several sub-sectoral policies are at various stages of development or approval. Implementation of laws is generally weak, although advances are being made, e.g. in administering water pollution-related provisions of the Law on Environmental Protection and Natural Resources Management. The MOWRAM needs to develop the institutional capacity to administer the Law on WRM if/when it is passed.

Institutional arrangements

Several RGC line ministries have responsibilities for different aspects of water resources exploitation, while the CNMC deals with Cambodia's responsibilities under the Mekong Agreement. The MOWRAM was established in 1999 with a mandate to manage the Nation's water resources, but has directed its attention primarily towards irrigation and drainage (I&D). Inter-agency relationships tend to be competitive and uncooperative, although MOWRAM has reached formal agreements with several other ministries to delineate responsibilities. The RGC is devolving responsibilities to provincial and more local levels, which will require allocation of increased financial and trained human resources, to lessen reliance on non-governmental support. Institutional arrangements for managing I&D works are reasonably well-defined, with some lack of clarity regarding relative responsibilities of MOWRAM, MRD and MAFF for water management for agriculture. However, water management cannot be sustained because of limited government resources.

Institutional-Community capacity

Institutional capacity throughout the RGC (especially at sub-national levels) is limited, because of previously discussed problems in human resources development and management. The successful development of PPWSA as a public corporation is a good example of what is possible, and the RGC seeks a greater level of private sector and/or recruitment programme will be required, at both central and provincial/district levels, in areas such as water resources management, law enforcement, support for community groups, etc. This will assist the Ministry to evolve from a primarily construction and

⁴ Excerpt with some edits from: the Draft ADB "Roadmap" for the Cambodian Water Sector. Draft report on MRC participation in the ADB meeting on the Water Sector "Roadmap" for Cambodia, April 7th 2003.

operation agency, to one that is able fully to carry out its mandate in water resources planning, management and regulation.

Providing data and information

The capacity of MOWRAM and other RGC agencies to provide the data and information required for design of water-related infrastructure, development and management of water resources, and management of extreme events (droughts and floods) is limited, although participation in international programmes in the dissemination of data and information about water resources and use (quantity and quality; surface water and groundwater), river basin characteristics, weather and climate is needed, in terms of a coordinated water and climate information strategy. Exchange of existing information among RGC institutions is not always efficient, because of a lack of awareness of what is available, a lack of formal mechanisms for obtaining access, and possessiveness regarding information assets. As a result, the heavy investment by international funding agencies in natural resources information has not been fully effective. International agencies have also contributed to inefficiency through duplication of work, poor planning and failure to address structural problems that lead to un-sustained data collection.

6.1.2. The National Water Policy

The National Water policy was passed by the Council of Ministers in January 2004. The National Water Resources Policy includes policies on exchange of data and information. Mechanisms and willingness to implement these policies will be required.

6.2. Analysis

If lack of human resources in terms of quantity and quality is recognized as the major factors of the institutional capacity weakness, a number of socio-political factors also impede national institutions from properly enforce existing laws and regulations. In this context, there are many limitations in the improvement of data accuracy, sustained collection of the needed long-term records and data reliability, since statistics and figures generated by various institutions lack of consistency and comprehensiveness. Time, steady efforts, political willingness and success of public reform are prerequisites for change of mindset and behavior.

PART III

*Sub-area Scenarios and
Development Strategies
(Forum #2)*

CHAPTER 7: SCENARIOS AND ELEMENTS BY SECTOR

This chapter presents the results of the process to develop and refine the scenario elements (trends, risks, interventions) as undertaken by the Se San/Sre Pok/Se Kong Sub-area Working Group with the assistance of the Cambodian National Mekong Committee Basin Development Plan Team.

The chapter was prepared for the participants of the 2nd Stakeholder Forum for the Se San/Sre Pok/Se Kong Sub-area in order that the work could be reviewed by a wide range of stakeholders and to provide background on the basis for the development options, scenarios, strategies, and interventions that would be finalized during the forum.

7.1. Scenarios and Elements by Sector

7.1.1. Irrigated Agriculture

Needs

- Agro-industry development
- Development of agricultural research system
- Food security
- Upland farming improvement and sustainability
- Improved land use and management
- Irrigation system rehabilitation and development
- Market for agricultural products

Opportunities

- Agricultural development communities (forestry, fisheries and water use)
- Develop fee charging system for irrigation
- Develop pumped irrigation systems from rivers
- Expand and improve irrigation systems particularly for fruit and industrial crops
- Implement infrastructure and information systems for agricultural markets
- Increase diversification of crops to take advantage of different climate, soils and large land availability
- Increase rice and agricultural production yields as well as quality
- Promote micro-credit services
- Smallholder livestock development
- Value-added processing of agricultural products by SMEs and cottage industry

Concerns and Risks

- Drought affecting agricultural production and food security

- Lack of data and study on hydraulic systems
- Lack of rural infrastructure

Trends

- Development of Agro-Industry
- Increasing diversification of cropping
- Increasing water use for irrigation due to the expansion of irrigated land
- Poverty reduction due to economic growth and job availability
- Strengthening water user community and agricultural development community

Interventions (Implementers and Donors)

- Cambodia Roadmap for Water Sector (MOWRAM-ADB)
- Forest Crime Monitoring Project (MAFF-WB)
- Greater Mekong Sub-region Programmes for tourism, navigation, agriculture and watershed management (RGC-ADB)
- Water Strategies (MOWRAM-ADB)

Preliminary Sub-area Objectives (5-10 years)

- Address food security for 80-100% of the people
- Rehabilitate 60-70% of existing irrigation systems
- Increase diversification of farming and development of markets
- Promote the establishment of agricultural development community and water user community
- Protect and conserve deep pools and fisheries habitats/numbers

Preliminary Sub-area Objectives (20 years)

- Develop agro-industry for exportation
- Develop 3 new irrigation schemes and rehabilitate remaining existing irrigation schemes
- Limited exposure to flood and drought problems
- Improved upland farming systems: land-water-forest and crops
- Expand electricity transmission network and connect to regional grid. and prepare feasibility study for large-scale hydropower/irrigation project
- Prepare feasibility study for large-scale hydropower/irrigation project
- Promote the establishment of agricultural development community and water user community
- Water resources management
- Develop agro-tourism
- Expand development of small scale animal production
- Develop upland farming

Information Gaps/Needs

- Agricultural crop types and yields
- Hydrology and meteorology including rainfall-runoff relationships
- Land suitability and soils maps
- Land use and cover maps
- Plantation areas and plans
- Surface water resources and water infrastructure maps

Trans-boundary Issues

- Imbalance of water use
- Issues of cooperation on natural resources use and management
- Sharing and exchange of good farming practices and techniques

7.1.2. Watershed Management and Natural Resources

Needs

- Control riverbank erosion of tributaries
- Control siltation of the tributaries
- Improve concession management and land tenure for people
- Improved land use and management
- Manage and mitigate negative impacts from upstream dams on downstream people and locations
- Protect the flooded forest
- Protection and improvement of tourism areas
- Protection of national parks and sloped forest lands, natural forest

Opportunities

- Conserve unique biodiversity and domesticate species with commercial potential
- Improve watershed management with emphasis on forest management and improved land use practices
- Increase diversification of crops to take advantage of different climate, soils and large land availability
- Mining development of gold, gems, granite, marble, minerals

Concerns and Risks

- Changes of nature and river
- Decline of biodiversity and protected areas
- Hydrological impacts of upstream tributary dams
- Lack of data and study on hydraulic systems

- Loss of flooded forest
- Natural disasters such as climate change, drought, bank erosion and decreasing water quality
- Poor concession management for forestry and other uses
- Protection of deep pools for fisheries and fish habitats
- Rapid and large changes in land use
- River banks continue to erode and river course changes
- Trans-boundary impacts from hydropower schemes in neighboring countries causing flooding, affecting habitats, people's tradition, health and livelihoods, fisheries, infrastructure and agriculture

Trends

- Decrease of areas of natural forest due to the expansion of farming and concessions
- Increase of sedimentation in rivers, streams, and canals
- Increasing concessions and conflicts with local people
- Increasing erosion of soil, and siltation of water resources
- Pressure on natural resources use and their degradation

Interventions (Implementers and Donors)

- Cambodia Roadmap for Water Sector (MOWRAM-ADB)
- Forest Crime Monitoring Project (MAFF-WB)
- Greater Mekong Sub-region Programmes for tourism, navigation, agriculture and watershed management (RGC-ADB)
- Improvement on Regulation and Management Framework of the Freshwater Fisheries (MAFF-ADB)
- Natural Resources and Environmental Management Programme (RGC-DANIDA)
- Water Strategies (MOWRAM-ADB)
- Wildlife and Conservation Projects (MoE-WWF/WCS/FFI)

Preliminary Sub-area Objectives (5-10 years)

- Address impacts from upstream tributary dams through cooperative management, community preparedness and sharing of information
- Improve concession management and land use, rights to land
- Prepare and implement management plan for protected areas and national parks and critical upper watersheds
- Protect and conserve deep pools and fisheries habitats/numbers
- Sustainable natural resources use and management

Preliminary Sub-area Objectives (20 years)

- Improved upland farming systems: land-water-forest and crops

- Integrated forest management
- Prepare and implement management plan for protected areas and national parks and critical upper watersheds
- Promote environmental, cultural and agro-tourism between Cambodia, Laos and Vietnam along the Mekong River
- Sustainable natural resources use and management
- Water resources management
- Develop upland farming
- Integrated watershed management, including reforestation

Information Gaps/Needs

- Concession areas and agreements
- Detailed elevation maps
- Flooded forest locations and condition
- Forest cover maps
- Geological maps
- Hydrology and meteorology including rainfall-runoff relationships
- Land suitability and soils maps
- Land use and cover maps
- Plantation areas and plans
- Village Locations, Socio-Economics, Ethnicity Maps

Trans-boundary Issues

- Construction and operation of dams in neighboring countries leads to the changes of natural flow, biodiversity and problems for downstream communities
- Imbalance of water use
- Issues of cooperation on natural resources use and management
- Protection of upper watershed forests

7.1.3. Fisheries

Needs

- Conserve fisheries critical habitats and spawning grounds
- Development of aquaculture
- Protect flagship fisheries species for biodiversity and eco-tourism
- Reduce illegal fishing methods and over-fishing

Opportunity

- Develop aquaculture to increase fish production

Concerns and Risks

- Illegal fishing methods
- Protection of deep pools for fisheries and fish habitats

Trends

- Extinction of some fish varieties
- Reduction of Mekong River fisheries numbers
- Strengthening fisheries community

Interventions (Implementers and Donors)

- Improvement on Regulation and Management Framework of the Freshwater Fisheries (MAFF-ADB)
- New Fisheries Law (MAFF-ADB)

Preliminary Sub-area Objectives (5-10 years)

- Address food security for 80-100% of the people
- Protect and conserve deep pools and fisheries habitats/numbers

Information Gaps/Needs

- Fisheries migratory pathways, species, lots, yields, deep pools
- Flooded forest locations and condition

Trans-boundary Issue

- Flagship species habitat and migratory pathways conservation

7.1.4. Water Supply, Waste Management and Sanitation

Needs

- Construction of solid waste disposal sites and processing
- Establishment of liquid waste treatment in urban towns
- Expansion of clean water supply system
- Improvement of hygiene and sanitation

Opportunity

- Develop urban and rural water supply

Concerns and Risks

- Issues of waste management (gas, liquid and solid wastes)
- Lack of rural infrastructure
- Public health problems, drugs, women and child trafficking
- Water pollution

Trends

- Expansion of clean water supply service for urban and rural population
- Groundwater table lowered
- Strengthening water user community and agricultural development community

Interventions (Implementers and Donors)

- Cambodia Roadmap for Water Sector (MOWRAM-ADB)
- Provincial and Peri-Urban Water Supply Project (MIME-ADB)
- Water Strategies (MOWRAM-ADB)

Preliminary Sub-area Objectives (20 years)

- Ensured water supply for the entire urban and rural population
- Water resources management

Information Gaps/Needs

- Geological maps
- Groundwater hydrology – quantities, depths and quality, arsenic contamination
- Hydrology and meteorology including rainfall-runoff relationships
- Surface water resources and water infrastructure maps

7.1.5. Flood and Drought Control and Management

Needs

- Control riverbank erosion of tributaries
- Irrigation system rehabilitation and development
- Manage and mitigate negative impacts from upstream dams on downstream people and locations
- Flood preparedness, warning systems and disaster relief

Opportunities

- Develop fee charging system for irrigation
- Develop pumped irrigation systems from rivers
- Expand and improve irrigation systems particularly for fruit and industrial crops

Concerns and Risks

- Changes of nature and river
- Drought affecting agricultural production and food security
- Hydrological impacts of upstream tributary dams
- Natural disasters such as climate change, drought, bank erosion and decreasing water quality
- River banks continue to erode and river course changes

Trends

- Changes of water flow regimes due to hydropower dams construction
- Increase of sedimentation in rivers, streams, and canals
- Increasing water use for irrigation due to the expansion of irrigated land

Interventions (Implementers and Donors)

- Cambodia Roadmap for Water Sector (MOWRAM-ADB)
- Water Strategies (MOWRAM-ADB)

Preliminary Sub-area Objectives (5-10 years)

- Address impacts from upstream tributary dams through cooperative management, community preparedness and sharing of information
- Rehabilitate 60-70% of existing irrigation systems
- Improved flood and drought management

Preliminary Sub-area Objectives (20 years)

- Control bank erosion along critical river sections
- Develop 3 new irrigation schemes and rehabilitate remaining existing irrigation schemes
- Limited exposure to flood and drought problems
- Water resources management

Information Gaps/Needs

- Hydrology and meteorology including rainfall-runoff relationships
- Surface water resources and water infrastructure maps

Trans-boundary Issues

- Construction and operation of dams in neighboring countries leads to the changes of natural flow, biodiversity and problems for downstream communities
- Imbalance of water use

7.1.6. Navigation and Transportation

Needs

- Control riverbank erosion of tributaries
- Control siltation of the tributaries
- Improve national and provincial road network
- Improve navigation channels and facilities along tributaries for river transport

Opportunity

- Expansion of road networks and establish markets for agricultural produce

Concerns and Risks

- Lack of rural infrastructure
- River banks continue to erode and river course changes

Trends

- Increase of sedimentation in rivers, streams, and canals
- Increasing erosion of soil, and siltation of water resources
- Increasing of transport through road and airway
- Increasing of transport through waterway,

Interventions (Implementers and Donors)

- First and Second East-West Economic Corridor (RGC-ASEAN)
- Forest Crime Monitoring Project (MAFF-WB)
- Greater Mekong Sub-region Programmes for tourism, navigation, agriculture and watershed management (RGC-ADB)
- Cambodia-Lao Emerald Triangle Tourism Cooperation

Preliminary Sub-area Objectives (5-10 years)

- Improve navigation and ports to increase waterways transport
- Rehabilitate national and provincial road network to increase traffic and reduce transport and travel costs and time

Preliminary Sub-area Objectives (20 years)

- Control bank erosion along critical river sections
- Improve navigation and ports to increase waterways transport
- Rehabilitate national and provincial road network to increase traffic and reduce transport and travel costs and time

Information Gap/Need

- Surface water resources and water infrastructure maps

7.1.7. Tourism

Needs

- Increase international, regional and national tourism
- Protect flagship fisheries species for biodiversity and eco-tourism
- Protection and improvement of tourism areas

Opportunities

- Create development regions, heritage promotion and other development programs
- Increased eco-tourism to national parks, animal habitats, and natural tourism centers (Yeak Loam Lake, fisheries, nature tours, waterfalls)

Concern and Risk

- Protection of indigenous people's culture and traditions

Trends

- Increasing number of tourists (national, regional and international) for eco- and cultural tourism
- Loss of ethnic traditions and culture

Interventions (Implementers and Donors)

- Greater Mekong Sub-region Programmes for tourism, navigation, agriculture and watershed management (RGC-ADB)

- Cambodia-Lao Emerald Triangle Tourism Cooperation

Preliminary Sub-area Objectives (5-10 Years)

- Environmental awareness and education and link to eco-tourism to generate economic growth and jobs
- Protect indigenous culture and traditions and promote tourism

Preliminary Sub-area Objectives (20 Years)

- Prepare and implement management plan for protected areas and national parks and critical upper watersheds
- Promote environmental, cultural and agro-tourism between Cambodia, Laos and Vietnam along the Mekong River
- Promote social and cultural development
- Protect and maintain the traditions and culture of minorities
- Develop eco-tourism
- Develop agro-tourism

Information Gap/Need

- Village Locations, Socio-Economics, Ethnicity Maps

Trans-Boundary Issue

- Flagship species habitat and migratory pathways conservation

7.1.8. Hydropower

Needs

- Access to electricity
- Manage and mitigate negative impacts from upstream dams on downstream people and locations

Opportunities

- Establish hydropower dams
- Develop micro-hydro projects and expand electricity distribution network and connect to regional grids

Concerns and Risks

- Hydrological impacts of upstream tributary dams

- Trans-boundary impacts from hydropower schemes in neighboring countries causing flooding, affecting habitats, people's tradition, health and livelihoods, fisheries, infrastructure and agriculture

Trends

- Changes of water flow regimes due to hydropower dams construction
- Increasing hydropower dam construction upstream on Mekong River and tributaries in Cambodia or upper countries?

Interventions (Implementers and Donors)

- Cambodia Roadmap for Water Sector (MOWRAM-ADB)
- Water Strategies (MOWRAM-ADB)

Preliminary Sub-area Objectives (5-10 Years)

- Address impacts from upstream tributary dams through cooperative management, community preparedness and sharing of information
- Develop small-scale hydropower for 12 locations
- Start building network of electricity transmission lines linked to regional grid

Preliminary Sub-area Objectives (20 Years)

- Expand electricity transmission network and connect to regional grid. and prepare feasibility study for large-scale hydropower/irrigation project
- Prepare feasibility study for large-scale hydropower/irrigation project
- Water resources management

Information Gaps/Needs

- Detailed elevation maps
- Hydrology and meteorology including rainfall-runoff relationships
- Surface water resources and water infrastructure maps

Trans-Boundary Issue

- Construction and operation of dams in neighboring countries leads to the changes of natural flow, biodiversity, problems for downstream communities

7.2. Scenarios and Elements by Cross-Cutting Issues

7.2.1. Environment and Natural Resources Use and Management

Needs

- Conserve fisheries critical habitats and spawning grounds
- Improve concession management and land tenure for people
- Improved land use and management
- Protect flagship fisheries species for biodiversity and eco-tourism
- Protect the flooded forest
- Protection and improvement of tourism areas
- Protection of national parks and sloped forest lands, natural forest
- Reduce illegal fishing methods and over-fishing

Opportunities

- Conserve unique biodiversity and domesticate species with commercial potential
- Improve and enforce laws and procedures
- Improve Government policies and strategies
- Improve watershed management with emphasis on forest management and improved land use practices
- Mining development of gold, gems, granite, marble, minerals
- Value-added processing of high value wood products by SMEs and cottage industry

Concerns and Risks

- Changes of nature and river
- Decline of biodiversity and protected areas
- Efficiency of law execution is low
- Illegal fishing methods
- Illegal migration into the area
- Lack of budget
- Lack of data and study on hydraulic systems
- Loss of flooded forest
- Overlap of responsibilities of institutions
- People migration
- Poor concession management for forestry and other uses
- Protection of deep pools for fisheries and fish habitats
- Rapid and large changes in land use
- Rights of people to use land and gain title

Trends

- Changes of water flow regimes due to hydropower dams construction
- Decrease of areas of natural forest due to the expansion of farming and concessions
- Demographic pressure
- Increased interest in protection of borders
- Increasing concessions and conflicts with local people
- Increasing erosion of soil, and siltation of water resources
- Land ownership conflict
- Migration of outsiders into the sub-area increasing
- Pressure on natural resources use and their degradation
- Reduction of Mekong River fisheries numbers
- Strengthening fisheries community

Interventions (Implementers and Donors)

- Forest Crime Monitoring Project (MAFF-WB)
- Land Registration and Commune Delineation (LMAP, Commune Council Development Program, MLMUPC-ADB, WB)
- Natural Resources and Environmental Management Programme (RGC-DANIDA)
- New Fisheries Law (MAFF-ADB)
- Seila Programme (RGC-UNOPS, WB)
- Wildlife and Conservation Projects (MoE-WWF/WCS/FFI)

Preliminary Sub-area Objectives (5-10 Years)

- Address impacts from upstream tributary dams through cooperative management, community preparedness and sharing of information
- Improve concession management and land use, rights to land
- Prepare and implement management plan for protected areas and national parks and critical upper watersheds
- Promote social and cultural development
- Protect and conserve deep pools and fisheries habitats/numbers
- Protect indigenous culture and traditions and promote tourism
- Sustainable natural resources use and management

Preliminary Sub-area Objectives (20 Years)

- Improved upland farming systems: land-water-forest and crops
- Expand electricity transmission network and connect to regional grid. and prepare feasibility study for large-scale hydropower/irrigation project
- Integrated forest management
- Prepare and implement management plan for protected areas and national parks and critical upper watersheds

- Promote environmental, cultural and agro-tourism between Cambodia, Laos and Vietnam along the Mekong River
- Sustainable natural resources use and management
- Develop eco-tourism
- Develop upland farming
- Integrated watershed management, including reforestation

Information Gaps/Needs

- Concession areas and agreements
- Forest cover maps
- Geological maps
- Groundwater hydrology – quantities, depths and quality, arsenic contamination
- Land suitability and soils maps
- Land use and cover maps
- Plantation areas and plans
- Surface water resources and water infrastructure maps
- Village Locations, Socio-Economics, Ethnicity Maps

Trans-Boundary Issues

- Construction and operation of dams in neighboring countries leads to the changes of natural flow, biodiversity and problems for downstream communities
- Flagship species habitat and migratory pathways conservation
- Imbalance of water use
- Issues of cooperation on natural resources use and management
- Protection of upper watershed forests
- Trans-boundary migration and population movements

7.2.2. Private Sector and Markets

Needs

- Agro-industry development
- Market for agricultural products

Opportunities

- Agricultural development communities (forestry, fisheries and water use)
- Create development regions, heritage promotion and other development programs
- Develop fee charging system for irrigation
- Expand and improve irrigation systems particularly for fruit and industrial crops
- Expansion of road networks and establish markets for agricultural produce
- Implement infrastructure and information systems for agricultural markets

- Increase local and international investments
- Increase off-farm income and job opportunities
- Increase rice and agricultural production yields as well as quality
- Maintain and increase support of donors (national and international), NGOs and private sector
- Mining development of gold, gems, granite, marble, minerals
- Promote micro-credit services
- Value-added processing of high value wood products by SMEs and cottage industry
- Value-added processing of agricultural products by SMEs and cottage industry

Concerns and Risks

- Information system for natural resource and market management is weak
- Lack of budget
- Lack of investment
- Lack of means and equipment
- Rights of people to use land and gain title

Trends

- ASEAN open borders policy leads to increased interaction with neighboring countries
- Development of Agro-Industry
- Increasing diversification of cropping
- Increasing number of tourists (national, regional and international) for eco- and cultural tourism
- Increasing of transport through road and airway
- Poverty reduction due to economic growth and job availability

Interventions (Implementers and Donors)

- ASEAN Open Border Policy (RGC-ASEAN)
- Cambodia Roadmap for Water Sector (MOWRAM-ADB)
- Economic Cooperation Strategy between Cambodia, Lao, Myanmar and Thailand, namely (RGC):
 - trade and investment facilitation
 - agricultural and industrial cooperation
 - transport linkages
 - tourism cooperation
 - human resources development
- First and Second East-West Economic Corridor (RGC-ASEAN)
- Japanese Support to Mekong Region Development in the identified "Three Pillars of Concrete Actions" (RGC-JICA):
 - Enhancing economic cooperation;

- Promoting trade and investment; and
- Strengthening consultation and coordination

Preliminary Sub-area Objectives (5-10 Years)

- Environmental awareness and education and link to eco-tourism to generate economic growth and jobs
- Increase diversification of farming and development of markets
- Promote economic sector and attract industrial production to create more jobs
- Rehabilitate national and provincial road network to increase traffic and reduce transport and travel costs and time
- Train human resources knowledge and skill to attract private investors

Preliminary Sub-area Objectives (20 Years)

- Develop agro-industry for exportation
- Develop border regions and open market opportunities with the neighboring countries, particularly with the riparian countries of the GMS
- Rehabilitate national and provincial road network to increase traffic and reduce transport and travel costs and time
- Train human resources knowledge and skill to attract private investors
- Expand development of small scale animal production

Trans-Boundary Issue

- Cross-boundary small scale trade

7.2.3. Capacity Building and Human Resources Development

Needs

- Development of agricultural research system
- Promote human resources development
- Strengthen institutional education

Opportunities

- Agricultural development communities (forestry, fisheries and water use)
- Improve and enforce laws and procedures
- Improve Government policies and strategies
- Improve human resources in techniques and technical areas
- Maintain and increase support of donors (national and international), NGOs and private sector
- Promote micro-credit services
- Strengthen human resources

Concerns and Risks

- Efficiency of law execution is low
- Human resources management system is not yet well managed
- Information system for natural resource and market management is weak
- Lack of budget
- Lack of data and study on hydraulic systems
- Lack of human resources
- Lack of investment
- Lack of means and equipment
- Limited technology and techniques
- Low level of education, knowledge and skills
- Overlap of responsibilities of institutions
- People migration
- Protection of indigenous people's culture and traditions
- Public health problems, drugs, women and child trafficking
- Rights of people to use land and gain title

Trends

- ASEAN open borders policy leads to increased interaction with neighboring countries
- Demographic pressure
- Land ownership conflict
- Migration of outsiders into the sub-area increasing
- Poverty reduction due to economic growth and job availability
- Strengthening water user community and agricultural development community

Interventions (Implementers and Donors)

- Japanese Support to Mekong Region Development in the identified "Three Pillars of Concrete Actions" (RGC-JICA):
 - Enhancing economic cooperation;
 - Promoting trade and investment; and
 - Strengthening consultation and coordination
- Land Registration and Commune Delineation (LMAP, Commune Council Development Program, MLMUPC-ADB, WB)
- Seila Programme (RGC-UNOPS, WB)

Preliminary Sub-area Objectives (5-10 Years)

- Environmental awareness and education and link to eco-tourism to generate economic growth and jobs
- Promote economic sector and attract industrial production to create more jobs

- Promote social and cultural development
- Promote the establishment of agricultural development community and water user community
- Protect indigenous culture and traditions and promote tourism
- Train human resources knowledge and skill to attract private investors

Preliminary Sub-area Objectives (20 Years)

- Develop border regions and open market opportunities with the neighboring countries, particularly with the riparian countries of the GMS
- Promote infrastructure development, science and economic research for development
- Promote social and cultural development
- Promote the establishment of agricultural development community and water user community
- Protect and maintain the traditions and culture of minorities
- Train human resources knowledge and skill to attract private investors

Information Gaps/Needs

- Development agency plans and ongoing projects
- Village Locations, Socio-Economics, Ethnicity Maps

Trans-Boundary Issues

- Sharing and exchange of good farming practices and techniques
- Trans-boundary migration and population movements

7.2.4. Stakeholder Participation

Needs

- Increase participation of women in leadership roles
- Promote human resources development

Opportunities

- Agricultural development communities (forestry, fisheries and water use)
- Increase people's participation
- Maintain and increase support of donors (national and international), NGOs and private sector
- Strengthen human resources

Concerns and Risks

- Illegal migration into the area
- Limited public participation
- People migration
- Protection of indigenous people's culture and traditions
- Public health problems, drugs, women and child trafficking
- Rapid and large changes in land use
- Rights of people to use land and gain title

Trends

- Demographic pressure
- Increasing concessions and conflicts with local people
- Land ownership conflict
- Loss of ethnic traditions and culture
- Migration of outsiders into the sub-area increasing
- Strengthening fisheries community
- Strengthening water user community and agricultural development community

Interventions (Implementers and Donors)

- Land Registration and Commune Delineation (LMAP, Commune Council Development Program, MLMUPC-ADB, WB)
- Seila Programme (RGC-UNOPS, WB)

Preliminary Sub-area Objectives (5-10 Years)

- Improve concession management and land use, rights to land
- Prepare and implement management plan for protected areas and national parks and critical upper watersheds
- Promote social and cultural development
- Promote the establishment of agricultural development community and water user community
- Protect indigenous culture and traditions and promote tourism

Preliminary Sub-area Objectives (20 Years)

- Promote social and cultural development
- Promote the establishment of agricultural development community and water user community
- Protect and maintain the traditions and culture of minorities
- Train human resources knowledge and skill to attract private investors

Information Gap/Need

- Village Locations, Socio-Economics, Ethnicity Maps

Trans-Boundary Issue

- Trans-boundary migration and population movements

7.2.5. Trans-boundary Issues

Need

- Manage and mitigate negative impacts from upstream dams on downstream people and locations

Concerns and Risks

- Changes of nature and river
- Illegal migration into the area
- Lack of measure to address trans-boundary impacts
- Trans-boundary impacts from hydropower schemes in neighboring countries causing flooding, affecting habitats, people's tradition, health and livelihoods, fisheries, infrastructure and agriculture
- Water pollution

Trends

- ASEAN open borders policy leads to increased interaction with neighboring countries
- Changes of water flow regimes due to hydropower dams construction
- Increased interest in protection of borders
- Increasing hydropower dam construction upstream on Mekong River and tributaries in Cambodia or upper countries?
- Increasing number of tourists (national, regional and international) for eco- and cultural tourism
- Increasing of transport through waterway,

Interventions (Implementers and Donors)

- ASEAN Open Border Policy (RGC-ASEAN)
- Economic Cooperation Strategy between Cambodia, Lao, Myanmar and Thailand, namely (RGC):
 - trade and investment facilitation
 - agricultural and industrial cooperation

- transport linkages
- tourism cooperation
- human resources development
- First and Second East-West Economic Corridor (RGC-ASEAN)
- Cambodia-Lao Emerald Triangle Tourism Cooperation

Preliminary Sub-area Objective (5-10 Years)

- Address impacts from upstream tributary dams through cooperative management, community preparedness and sharing of information

Preliminary Sub-area Objectives (20 Years)

- Develop agro-industry for exportation
- Develop border regions and open market opportunities with the neighboring countries, particularly with the riparian countries of the GMS
- Promote environmental, cultural and agro-tourism between Cambodia, Laos and Vietnam along the Mekong River

Trans-Boundary Issues

- Construction and operation of dams in neighboring countries leads to the changes of natural flow, biodiversity and problems for downstream communities
- Cross-boundary small scale trade
- Imbalance of water use
- Issues of cooperation on natural resources use and management

CHAPTER 8: SUB-AREA DEVELOPMENT OBJECTIVES

8.1. Introduction

This chapter presents the results of the process to develop and refine the development objectives as undertaken by the Se San/Sre Pok/Se Kong Sub-area Working Group with the assistance of the Cambodian National Mekong Committee Basin Development Plan Team.

The chapter was prepared for the participants of the 2nd *Stakeholder Forum* for the Se San/Sre Pok/Se Kong Sub-area in order that the work could be reviewed by a wide range of stakeholders, augmented and refined, and finalized for submission within the overall program of the Basin Development Plan.

The chapter takes as its starting point the preliminary development objectives as developed and presented in chapter 7: *Scenario Elements, Se San/Sre Pok/Se Kong Sub-area*. A two-step process is then presented whereby the preliminary development objectives are categorized and then reorganized in related groups. These groups provide an overall development objective with some sub-objectives and specific targets to be achieved within the 5- to 10-year and 20-year timeframes.

The results are then used as the basis for preparing strategies to achieve the development objectives as presented in chapter 9: *Strategies, Se San/Sre Pok/Se Kong Sub-area*.

Finally, the objectives were consolidated, refined and subsequently improved by incorporating all comments and suggestions made by the participants during the 2nd *Stakeholder Forum* for the Se San/Sre Pok/Se Kong Sub-area as presented in this chapter.

8.2. Organization and Grouping of Development Objectives

Development Objective 1: Ensure basic food security and safety in lowland and upland areas in order to enable poor farmers to integrate into the market economy.

- Sub-Objective 1.1: Reduced crop failure risk and increased rice and other crop yields in order to meet the poorest people's basic grain security requirements in riverine and lowland areas.
- Sub-Objective 1.2: Increased food production in upland areas with increased cropping intensity, sustainable farming system practices and improved land use.
- Sub-Objective 1.3: Increased irrigated and drained areas by constructing small-scale irrigation structures, upgrading and rehabilitating existing water reservoirs and drainage systems.

- Sub-Objective 1.4: Improved and increased smallholder livestock, natural capture fisheries are conserved in the form of habitats and migration routes, handicrafts and other income generating and smallholder savings activities.
- Sub-Objective 1.5: Farmer organizations for irrigation, community forestry, agriculture, credit and marketing are expanded and strengthened.
- Sub-Objective 1.6: Land tenure secured for people and concession management improved to protect indigenous rights and provide sustainable livelihoods for local farmers.
- Sub-Objective 1.7: Increase rice cultivation to 3 times per year.

Specific Targets:

5-10 Years	20 Years
70% food security	100% food security
60-70% of existing irrigation systems rehabilitated	Remaining existing irrigation systems rehabilitated and 3 new systems developed
2.0-3.0 tons/ha rice crop average	3.5 tons/ha rice crop average
3,000 ha irrigation areas increased	15,000 ha irrigation area increased
50% of irrigation systems establish registered FWUC	100% of irrigation systems establish registered FWUC
25% increase in irrigation efficiency	75% increase in irrigation efficiency
2 cattle, 5 poultry/family	4 cattle, 10 poultry/family
Sustain average natural catch of last 5 years	Sustain average natural catch of last 5 years
25% increase in upland food production	50% increase in upland food production and diversity
Market number and size doubles	Bank branch facilities at Commune level
One cooperative farmer organization and/or one sectoral (fishery or forestry) community per commune established and autonomous	One cooperative farmer organization and/or one sectoral (fishery or forestry) community per village established and autonomous

Development Objective 2: Increase agricultural production, ensured quality and standard, diversity and value-added products for markets.

- Sub-Objective 2.1: Improved cropping patterns, post-harvest technology and management.
- Sub-Objective 2.2: Improved agricultural production quantity and quality and range of products for domestic, regional and international export markets.
- Sub-Objective 2.3: Diversified agricultural production with industrial crops and vegetables and promoted value-added agro-processing industry.
- Sub-Objective 2.4: Sustainable upland farming systems including permanent culture and improved information system for agro-business and marketing network development for domestic, regional and international markets.

Specific Targets:

5-10 Years	20 Years
25% increase in grain production	50% increase in agricultural production
Domestic markets contain all locally produced grains and vegetables	Regional markets contain 25% Cambodian produces
\$5 million exports to Thailand/Laos/Vietnam	\$10 million exports to Thailand/Laos/Vietnam
25% increase in industrial crop production	70% increase in industrial crop production
\$5 million investment in agro-industry	\$10 million investment in agro-industry

Development Objective 3: Protect and conserve deep pools and brood stocks and their migratory routes and habitats.

- Sub-Objective 3.1: A better understanding among concerned Government and Supporting Agencies of interacting factors that affect management of deep pools and other habitats is achieved.
- Sub-Objective 3.2: Successful awareness-raising among local people about the importance of stopping illegal fishing methods and conservation of deep pools, and brood stocks for local livelihood and national economy.
- Sub-Objective 3.3: Conservation measures are successfully introduced and implemented at the local level with the participation of local community.

Sub-Objective 3.4: Increase in size and number of fish caught in rivers.

Specific Targets:

5-10 Years	20 Years
Policy agreement with provinces and ministries to take specific measures to conserve habitat and fisheries	Local community fully participated in the conservation process; and 30% increase in bloodstock numbers and habitat
Conservation staff identified and funded	Conservation agencies fully equipped and operational in partnership donor agencies
Illegal fishing nets and explosive/electricity fishing reduced 50%	Illegal fishing nets and explosive/electricity fishing rarely seen
10% increase in dolphin and bloodstock numbers and average fish catch by weight	30% increase in average fish size in catch

Development Objective 4: Sustainable and sound natural resource uses and environmental management and best practices established at all levels.

Sub-Objective 4.1: Promoted integrated watershed management and maintained seasonal flow regime for all tributaries and equitable utilization and sustainable management of natural resources.

Sub-Objective 4.2: Wildlife sanctuaries and protected areas conserved and managed successfully and sloped lands and critical upper watershed protected from cutting and erosion.

Sub-Objective 4.3: Effective and sufficient legal and regulatory framework for natural resources and environment management in place and reinforced especially for concession management.

Sub-Objective 4.4: Sustainability of environment quality and the biodiversities will be preserved through the enhancement of public participation in environmental protection.

Specific Targets:

5-10 Years	20 Years
Current forest cover maintained	10% increase in forest cover
2 community forestry projects established	10 community forestry projects established
50% of sub-catchments have management committees established and conservation	70% of sub-catchments have management committees established and 50% are

5-10 Years	20 Years
pilot projects implemented	functioning effectively
50% of Protected Areas/National Parks and critical upper catchments have management plan and organization in place	100% of Protected Areas/National Parks and critical upper catchments have management plan and organization in place
75% of concessions rationalized in participatory manner and operated with due consideration for local usufruct rights and generation of jobs for local people	100% of concessions rationalized in participatory manner and operated with due consideration for local usufruct rights and generation of jobs for local people
Successful conservation pilot projects for uplands, soil and water management and floodplain protection implemented	Pilot approaches implemented over 50% of catchments

Development Objective 5: Promote tourism development as a driving force for economic growth and opportunity for off-farm income generating for local people.

- Sub-Objective 5.1: Increased cultural and agricultural tourism provides income and security for indigenous minorities and contributes to their livelihoods and preservation of traditions and heritage.
- Sub-Objective 5.2: Increased eco-tourism, particularly focusing on the pristine rivers, national parks and forests, as a means of promoting conservation and livelihoods for local communities.
- Sub-Objective 5.3: Environmental and cultural awareness and education expanded to sustain tourism market and attractions.
- Sub-Objective 5.4: Improved service delivery, infrastructure and other associated tourism amenities in order to secure longer and more comfortable stays of visitors and higher local economic benefits from tourism and ensuring security and safety.

Specific Targets:

5-10 Years	20 Years
2 major cultural tourism sites developed	Overall regional cultural tourism network developed and linked with neighboring countries
0.2 million tourists/year	1.5 million tourists/year
Average stay 3-4 days	Average stay 5-7 days
2 major eco-tourism sites developed	5 major eco-tourism sites developed
1 agro-tourism pilot areas developed	3 major agro-tourism sites developed

Development Objective 6: Improve the utilization and management of water resources and soil.

- Sub-Objective 6.1: Trans-boundary impacts from upstream hydropower schemes mitigated and managed while mechanisms are in place for participation of, feedback from and notification to downstream people on upstream project operations.
- Sub-Objective 6.2: Secured domestic and drinking water supply for rural and urban areas while addressing solid and liquid waste disposal and sanitation problems.
- Sub-Objective 6.3: Micro-hydropower infrastructure projects piloted and feasibility study for large-scale hydropower project completed.
- Sub-Objective 6.4: Se San, Sre Pok and Se Kong River bank erosion and siltation reduced.
- Sub-Objective 6.5: Groundwater resources explored and increased use for domestic and industrial water supply and expanded irrigation.
- Sub-Objective 6.6: Efficient use and cost recovery for both domestic and industrial water supply and irrigation.

Specific Targets:

5-10 Years	20 Years
62% access to safe water in rural areas	90% access to safe water in rural areas
80% access to safe water in urban areas	100% access to safe water in urban areas
54% improved sanitation in rural areas	80% improved sanitation in rural areas
74% improved sanitation in urban areas	95% improved sanitation in urban areas
70% urban wastewater treatment	100% urban wastewater treatment
Trans-boundary committee established to coordinate between upstream and downstream people affected by Se San River hydropower projects	Trans-boundary committee working well and meeting regularly with downstream needs taken into account and downstream users informed of flow changes coming
Hydro-meteorological data collection, mapping and studies completed in 50% of catchments	Hydro-meteorological database established and regularly operated, catchments studies and mapping completed for all catchments
5 micro-hydropower projects completed successfully and feasibility study for grid connection completed	20 micro-hydropower projects completed successfully and electricity grid connected to neighboring countries
1 large-scale hydropower project feasibility study completed	Funding obtained for large-scale hydropower project
Flood preparedness and warning systems established in pilot areas	Flood preparedness and warning systems established in all affected areas

Development Objective 7: Strengthen Human Resources Development and Management and Institutional Capacity

- Sub-Objective 7.1: Increased and equipped local communities with skills and techniques in farming, trading and processing of agricultural produce.
- Sub-Objective 7.2: Improved practical technical staff ability available at national and provincial levels for natural resources and environmental management, conservation and planning.
- Sub-Objective 7.3: Increased awareness of natural resource use and management and participation by local communities.
- Sub-Objective 7.4: Increased participation of women in leadership roles within all natural resource development and management activities and ensured active participation of local authorities, institutions, civil societies for effective and sustainable project implementation.
- Sub-Objective 7.5: Improved government policies, strategies, transparency and law enforcement.
- Sub-Objective 7.6: Increased private sector investment and numbers of Small and Medium Enterprises (SMEs), access to credit, reduction of export of raw materials and increase in value-added processing.
- Sub-Objective 7.7: Strengthened and expanded the partnership between the public and private sector in development with ensured economic and social efficiency and sustainability, particularly in tourism sector.
- Sub-Objective 7.8: Enhanced firm cooperation between the public and private sectors, and between country and country and strengthened cooperation in addressing the trans-boundary issues.

Specific Targets:

These are cross-cutting issues that are difficult to measure and monitor. They will be addressed by integrating human resources development and management into all project activities.

CHAPTER 9: SUB-AREA DEVELOPMENT STRATEGIES BY SECTOR

9.1. Introduction

This chapter presents the results of the process to develop and refine the strategies for achieving the development objectives as undertaken by the Se San/Sre Pok/Se Kong Sub-area Working Group with the assistance of the Cambodian National Mekong Committee Basin Development Plan Team.

The chapter was prepared for the participants of the 2nd *Stakeholder Forum* for the Se San/Sre Pok/Se Kong Sub-area in order that the work could be reviewed by a wide range of stakeholders, augmented and refined, and finalized for submission within the overall program of the Basin Development Plan.

This chapter takes as its starting point the development objectives as presented in the chapter 8: *Development Objectives, Se San/Sre Pok/Se Kong Sub-area*. A three-step process was undertaken. First, the individual sub-objectives were examined as the basis for preparing “brainstormed” strategies that would address the goals. Next, these strategies were grouped together on the basis of sectors and cross-cutting issues. The results of these first two processes are contained in the tables in the chapter 7: *Scenario Elements, Se San/Sre Pok/Se Kong Sub-area*. Finally, the strategies were consolidated, refined and subsequently improved by incorporating all comments and suggestions made by the participants during the 2nd *Stakeholder Forum* for the Se San/Sre Pok/Se Kong Sub-area, as presented in this chapter.

The sectors and cross-cutting issues are as follows:

- A. Irrigated Agriculture
- B. Fisheries/Aquaculture
- C. Watershed Management
- D. Tourism and Recreation
- E. Water Supply, Waste Management and Sanitation
- F. Hydropower
- G. Navigation and Transport
- H. Flood and Drought Control and Management
- I. Trans-Boundary Issues
- J. Private Sector and Markets
- K. Capacity Building and Human Resources Development
- L. Stakeholder Participation
- M. Institutional and Legal Issues

The results are then used as the basis for preparing interventions and project ideas as presented in the chapter 10: *Project Interventions and Ideas, Se San/Sre Pok/Se Kong Sub-area*.

9.2. Development of Strategies by Sector/Sub-Sector

A. *Irrigated Agriculture*

Address basic environmental constraints, intensify and diversify agriculture to achieve food security and to supply domestic, regional and international markets:

- Rehabilitate irrigation systems and construct pump irrigation systems in valleys, floodplains and near rivers to enable reliable wet season rice cropping and more diverse dry season cropping while providing extension to promote improved soil-water and tillage management, improved seeds and varieties, credit, formation of Farmer Water User Communities for management of operation and maintenance and post-processing techniques.
- Establish a research-extension and development programme for sustainable upland farming systems including mainstreaming environmental issues in agriculture, improved animal health and production, promotion of landscape farming including permaculture and intercropping, green manuring, soil and water conservation and post-processing techniques through government budget, loan and grant funds, Food-For-Work (FFW) and community association efforts.
- Promote private sector investment and cooperation in areas of comparative advantage through certification of organic farming, training in handicrafts production and quality assurance and quality control, cheap credit, export promotion and tariff reduction, incentives and security for investors, transparency, and designation of agricultural production zones.

B. *Fisheries/Aquaculture*

Conserve deep pools and brood stocks through habitat protection, improved fishing practice, law enforcement, and awareness-raising and consensus building among stakeholders:

- Undertake participatory research with fishers and relevant government agencies to understand the issues and threats, design management, mitigation and monitoring measures and implement them to conserve deep pools and reduce illegal fishing practices.
- Research into critical issues of natural capture fisheries and identification of important habitats and migration routes, community-based management of their conservation and educational campaign on non-destructive fishing methods.
- Cooperation, study and information sharing between riparian nations and sub-catchments to address critical natural fisheries issues of habitat, migration, water quality and flow regimes.
- Strengthen the policy application and law enforcement effectively to control illegal fishing, increased awareness, education and cooperation, and strengthen and increase the community fisheries.

C. Watershed Management

Implement integrated watershed management to improve soil and water conservation, preserve biological resources, allocate water resources between competing uses, coordinate involved organizations and assist in conflict resolution and planning:

- Establish a pilot project in a watershed to develop and demonstrate a framework for cooperation among concerned agencies that incorporates bottom-up, participatory processes through the decentralization policy of the government in order to address critical resource problems of water demand and protection of important natural resources.
- Strengthen the management of Protected Areas and National Parks and to conduct a participatory land use planning and management, integrated rural development, generation of revenues through eco-tourism and recognition of local and indigenous land rights.
- Conduct environmental impact assessment (EIA) in all projects or development activities in the watershed and manage important watersheds through community and improvement of forest management and concession land with a clear delineation of the protected forests, natural protection areas, boundary of forest area, agricultural land area.
- Gain strong senior policy support and a legal framework for protected areas, national parks, critical watershed management, sloped land protection, community forestry and improved concession management.

Promote improved and sustainable agriculture in upland areas for cropping, livestock/animal feed/fodder management, animal health and production, rural credit, permaculture, intercropping, integrated farming, and harvesting and post-processing techniques via government agencies and the private sector:

- Provide agricultural extension and support services for farmers through government agencies and the private sector.
- Promote private sector interventions base upon existing potentialities and comparative advantages through incentives to agro-industry and SMEs, tariff reduction, security for investors, transparency, and designation of agro-industrial zones, linking tourism and local farmers, contract farming, "buy local" campaigns, and regional market research and link.

D. Tourism and Recreation

Expand cultural and agro- and eco-tourism and increase the benefits to and role of local communities in the business:

- Increase the market and quality of tourism through international and regional promotion and linkages including particularly through ASEAN and GMS networks, restoration and development of sites, revitalized local social and cultural events and festivals and improved physical infrastructure, security and accessibility to the sites.

- Community-based management of tourism for preservation and conservation of traditions and sites, development of agro-tourism and production of handicrafts, food and services for both domestic and foreign tourist markets.
- Improve the delivery of tourist services by encouraging local communities and the private sector to work together for better provision of services by providing good and reliable information, accommodations, catering and transportation and by linking visitors to villages and promotion of site-specific local handicrafts.
- Awareness raising for communities to understand the importance of tourism and environment and to encourage them to maintain their traditional culture and practices.
- Expand cooperation in tourist sector with countries in the region to ensure safety, order and effectiveness.
- Develop and protect culture and identification of the ethnic minority.

E. Water Supply, Waste Management and Sanitation

Improve rural and urban water supply and sanitation and solid and liquid waste management through increased investment in rural areas and privatization and cost recovery in urban areas:

- Increase investment in rural water supply including water use education and sanitation to efficiently use rainwater, surface water and groundwater to improve public health.
- Ensure the quantity and quality of rural water supply through monitoring and evaluation of water sources, increasing investment in water points and protection of the resource base.
- Develop urban water supply through private sector financing and cost recovery by users.
- Develop a Master Plan for Solid and Liquid Waste Management including technical and zoning considerations, a legal framework for water quality and waste disposal, and an enforcement mechanism.

F. Hydropower

Promote small-scale energy development while studying the potential for large-scale hydropower projects:

- Promote and develop provincial and rural electrification schemes through private involvement or funding for fossil fuel generation, micro-hydropower and renewal energy such as solar energy in remote areas with ensured participation of the local communities and cost recovery.
- Explore possibility for small, medium and large scale hydropower development and select hydropower projects with the best potential for feasibility study with

multipurpose uses including irrigation and flood control, and construct if feasible while addressing negative social and environmental impacts.

- Cooperate with other ASEAN member countries to extend the Regional Power Grid through transmission lines throughout the entire country, especially the remote areas

G. Navigation and Transportation

Promote private and public sector investment in inland transportation in both urban and rural areas through studies, construction and maintenance of economically advantageous transport networks and facilities:

- Expansion and maintenance of national roads, waterway and airport facilities.
- Improve riverbank protection and soil erosion reduction for rivers and streams.
- Increase and develop ports through construction and dredging.

H. Flood Control and Management

Implement structural and non-structural measures for flood management and bank erosion control to provide protection from and preparedness for flooding events:

- Implement structural and non-structural flood management measures including reducing bank erosion through protection works and re-vegetation, improving downstream drainage and channeling floodwaters to address drought problems where possible and implementation of early warning systems and flood information dissemination networks.
- Cooperation and exchange of information with the other Mekong River Basin countries in order to reduce the harmful effects of floods while maintaining the benefits for agriculture and soils, addressing overall watershed degradation and erosion, sedimentation and drought.
- Work with affected communities on non-structural flood management to provide protection against flood disasters and planning and preparedness to deal with floods.

9.3. Development of Strategies by Cross-Cutting Issues

I. Trans-boundary Issues

Enhance cooperation within and between the countries in the region through bilateral or multilateral cooperation among the MRC members:

- Undertake joint studies, identification and analysis of existing and potential trans-boundary issues (sources, causes and impacts) between sub-areas and at basin-wide with broad involvement of different stakeholders at both local and national levels.

- Jointly address the trans-boundary issues through implementation of joint projects/programmes and base upon cooperation spirit, national sovereignty, and mutual benefits.
- Identify a cooperation framework and mechanism to address trans-boundary issues through joint implementation of common projects/programmes in order to enhance and determine cooperation agenda.

J. *Private Sector and Markets*

Promote and encourage increased private sector involvement in the rural economy particularly agro-business and support farmers to gain best advantage from the investment:

- Provide incentives and an enabling environment (rule of law, security, and safety) to agro-industry and small and medium enterprises (SMEs) to work with farmers in rural areas and develop markets for agricultural produce and value-added products.
- Establish firm foundation for investment by improving regulations and laws, reducing registration requirements and costs, decreasing informal payments, availability of credit with low interest, rural banking, mobilization of savings, training of entrepreneurs, and providing local access to up-to-date market information.
- Support farmers through farmer associations, providing information and technology, identification and promotion of comparative advantages and niche markets and regulation/mediation of private sector.

K. *Capacity Building and Human Resources Development*

Strengthen human resources development and management and increase institutional capacity building through public and private sector initiatives:

- Improve quality and long-term impact of all project implementation through adoption of standards and appropriate technologies, increasing capacity by integrating “learning-by-doing” and on-the-job training in all project activities, incorporating research into regular project work and selecting consultants with demonstrated ability to work closely with national staff.
- Improve human resources development and management including identifying training needs, delineation of roles and responsibilities of staff, providing incentives, improving job placement and decentralizing trained and capable staff to provinces.
- Promote skills training programmes through cooperation between the Ministry of Labor and training and education institutes targeting small and medium enterprises and farming enterprises.
- Encourage students to focus on natural science and technology.

L. Stakeholder Participation

Broaden and deepen participation of different stakeholders in the entire process of all project executions particularly among less represented people:

- Increase level of participation in all project work through adoption of community-based natural resource management, ensuring local ownership and rights for common resources, encouraging local leadership and responsibility, awareness raising, education and promotion of good practices.
- Actively promote participation of women and indigenous minorities and involvement of women and indigenous minorities in leadership roles throughout project activity.

M. Institutional and Legal Issues

Address foundation for development through improving institutions, legal framework, and awareness raising:

- Review current rules, standards and regulations, roles and responsibilities and eliminate overlap and conflicts.
- Promote good management and conservation practice through media, education and training at local and national level, publicizing laws, exchanging experience with other countries and encouraging students to focus on natural science and technology.
- Identify key research issues and prioritize, with an emphasis on building upon local knowledge and link with regional and international institutions for knowledge sharing, training and funding including academic exchanges.

CHAPTER 10: PROJECT IDEAS/INTERVENTION

10.1. Introduction

This chapter presents the results of the process to develop and refine the project interventions and ideas as undertaken by the Se San/Sre Pok/Se Kong Sub-area Working Group with the assistance of the Cambodian National Mekong Committee Basin Development Plan Team.

The chapter is prepared for the participants of the 2nd *Stakeholder Forum* for the Se San/Sre Pok/Se Kong Sub-area in order that the work could be reviewed by a wide range of stakeholders, augmented and refined, and finalized for submission within the overall program of the Basin Development Plan. This chapter takes as its starting point the strategies as presented in the chapter 9: *Strategies, Se San/Sre Pok/Se Kong Sub-area*. A two-step process follows where the first step examined the grouped strategies by sector and possible general project ideas were prepared as preliminary project ideas and interventions. In order to maximize the number of ideas, individual provinces are also going to submit additional ideas to form a Long-list from which to work.

The last step is to form a Short-list by taking out the project ideas that are not within the mandate of the BDP (i.e., trans-boundary, water-related and of regional significance) and better detail the remaining ideas to make them viable and unique in the context of the sub-area. In the prepared project ideas and interventions, sometimes a project will include elements from other groups, such as agriculture and irrigation while cross-cutting issues should be generally addressed within all project ideas.

The Project Ideas and Interventions presented are suggestions from the CNMC Development Plan Team that could form a basis for discussion during the 2nd *Stakeholder Forum*. Finally, the Project Ideas and Interventions have been improved by incorporating all comments and suggestions made by the participants during the 2nd *Stakeholder Forum* for the Se San/Sre Pok/Se Kong Sub-area, as presented in this chapter.

10.2. Project Ideas/Interventions by Sector/Sub-Sector

A. *Irrigated Agriculture*

A.1. *Valleys and Riverine Irrigated Agricultural Production* Project including rehabilitation of existing irrigation schemes next to major rivers and in small valleys to increase production and stabilize situation of highland people, including construction of schemes and pump irrigation following the participatory process, improved quality seed and inputs, increased rice production, cash cropping of high value vegetable, fruit, grain and industrial crops, farmer cooperatives and farmer water user community formation, organic farming training, certification and marketing, post-harvest processing, linking to private sector and high-value livestock production.

A.2. Highland People's Poverty Reduction and Agricultural Stabilization Project including mainstreaming environmental issues in agriculture, improved animal health and production, promotion of landscape farming including permaculture and intercropping, green manuring, soil and water conservation and post-processing techniques through government budget, loan and grant funds, Food-For-Work (FFW) and community association efforts.

B. Fisheries/Aquaculture

B.1. Deep Pools and Fisheries Conservation Project including community-based participatory natural resource management, awareness raising and promotion of good practice, preparation of policy and laws against illegal fishing and support for enforcement of rules and improved regulations.

B.2. Project on Breeding of Local Fish Species and Release Back to the River by establishing fish breeding centers, train the community, students at school, and the beneficiaries.

C. Watershed Management

C.1. Se San River Hydropower and Downstream Flow Management Project including optimization of the operation of upstream dams taking into consideration of downstream needs, extension of electricity grid for downstream users, flood and surge warning system and preparedness, and research of impacts of upstream dams on downstream fisheries and livelihoods and their mitigation.

C.2. Pilot Integrated Watershed Management Project in Se San/Se Kong/Sre Pok Sub-area, including mapping of land use change, trends and resources, upland agriculture improvement, indigenous peoples' land use rights protection, agricultural extension, domestication of forest vegetables and other non-timber forest products, rural roads, livestock/animal feed/fodder management, animal health and production, rural credit, permaculture, intercropping, integrated farming, and harvesting and post-processing techniques via government agencies and the private sector.

D. Tourism and Recreation

D.1. Cultural, Agricultural and Eco-Tourism Project to link to the ASEAN and GMS tourist networks and promote the local attractions such as Virachey National Park, Yeak Loam Lake, waterfalls and the unique minority cultures, in order to improve the lives of the local communities, protect indigenous culture, and provide opportunities for community-based protected areas management and handicrafts, food and service income serving tourists.

D.2. Capacity Building for Tourism Development

E. Water Supply, Waste Management and Sanitation

E.1. Rural Water Supply, Use and Sanitation Project to increase availability of safe water sources in rural areas using groundwater, surface water and rainwater, improve facility maintenance, increase awareness of sanitation issues, install toilets with appropriate technology and improve waste disposal.

E.2. Urban Water Supply Privatization Project to establish the water treatment and distribution systems in the major urban areas by contract out private interests paid for by urban users.

E.3. Urban Water Supply and Waste Disposal Privatization Project to rehabilitate the water treatment and distribution systems in the major urban areas and contract out sewage and solid waste treatment to private interests paid for by urban users.

F. Hydropower

F.1. Exploration, study and data collection for prioritization of large-scale hydropower potential sites in the Se San, Sre Pok and Se Kong Rivers including completion of one feasibility study.

F.2. Micro-hydropower and electrical grid extension project including construction of 12 project locations and connection of electrical transmission network to existing projects in Vietnam and Laos.

G. Navigation and Transportation

G.1. Studies and research on expansion of other river, stream and canal transports in order to rehabilitate and construct transport networks, to provide greater accessibility for far flung areas to transports their agricultural produces, and prioritize projects for implementation.

G.2. Rehabilitation, maintenance and expansion of sub-area and provincial secondary and tertiary road networks including (i) the preparation of technical studies to assess requirements and priorities for new linking roads with neighboring countries; and (ii) the establishment of road-bridge maintenance organizations.

H. Flood and Drought Control and Management

H.1. Studies and research on traditional techniques and implement pilot projects to demonstrate their utility.

H.2. Examination and Application of Successful Techniques and Engineering Structures in other countries such as flood and drought controlling and management and improved water management.

H.3. Feasibility study and construction of an agro-meteorological center for data and information sharing within the Lower Mekong Basin (LMB) and the Greater Mekong Region (GMS).

10.3. Project Ideas/Interventions by Cross-Cutting Issues

I. Trans-boundary Issues

I.1. River bank protection and maintenance project in the Sub-area with joint implementation the sub-area of Vietnam and Lao PDR.

I.2. Joint undertaking of studies, identification and analysis of existing trans-boundary issues (sources, causes and impacts) between neighboring country sub-areas (SA-7L and SA-7V) with broad involvement of different stakeholders at both local and national levels.

I.3. Joint implementation of identified projects/programmes to mitigate negative impacts such as flooding, affecting habitats, people's tradition, health and livelihoods, fisheries, infrastructure and agriculture from upstream dams on downstream people and locations.

I.4. Conservation of the river ecology project in order to maintain the hydrological flow, biodiversity especially the Mekong Dolphins and other significant fish species

K. Private Sector and Markets

K.1. Foundation for market support and development project including research and market study to identify comparative advantage, international and regional marketing promotional material development, and study on appropriate credit and tax incentives for domestic private sector targeted to Small and Medium Enterprises (SMEs). Develop local markets in the sub-area.

L. Stakeholder Participation and Capacity Building

L.1. Mekong River Basin Key Issues awareness raising, training and educational project including media campaign to target specific practices or issues of importance, education campaign in schools, training and advocacy for senior officials on water management, ecology and gender, conferences and workshops on basin-wide issues and participatory research for community-based natural resource management.

L.2. Human Resource Development and Management (HRD/HRM) Project including training and active promotion of women in leadership roles, preparation of HRD/HRM strategy and plan, links to regional and international institutes, internship programme for students, and roundtable forum for interagency cooperation to work towards rationalization of roles and responsibilities.

L.3. Development of Information and Dissemination System and Environmental Public Forums in the sub-area.

CHAPTER 11: PROPOSED PROJECT IDEAS

These projects are distilled from the process of Scenario and Strategy Development within the Basin Development Plan of the Cambodian National Mekong Committee. While a great many different project ideas have been generated through this work, particularly by the Sub-area Working Groups and during the 2nd Stakeholder's Forums, it must be noted that most of these ideas are not appropriate for the criteria of the Basin Development Plan. These main criteria require that project interventions are: (i) water-related; and (ii) trans-boundary or of regional significance. However, the projects that have pure national implications would also be prepared in PIN Format they will not be presented to the MRC Secretariat so it is the sole responsibility of the National Mekong Committee and respective Line Ministries in seeking financial assistance for implementation.

There is a strong need to refine the list so that it includes only those projects that meet the main criteria and which are likely to be of the most interest to the Mekong River Commission. This will provide the best likelihood that the project ideas from Cambodia will be prioritized and accepted on the long-list and then selected for the short-list and ultimately implemented.

This chapter presents a number of project ideas for each of the Sub-area as well as some ideas that could be implemented across Sub-area that meet the criteria for inclusion in the long-list of projects for the BDP. This list is by no means comprehensive and there is a good chance that additional projects could be identified and added to this list. It is prepared to facilitate submission of a more refined and relevant final list of ideas for Cambodia to the BDP.

The following is the list of development projects proposed by the Se San/Sre Pok/Se Kong sub-area Working Group and other External Stakeholders as the results of the Second Stakeholder Forum, which need to be included in the long-list of the MRC-BDP programme of the 4 countries (Cambodia, Laos, Thailand and Vietnam).

This list still opens and waits for other development projects, which will be proposed by the sub-area working groups and other stakeholders after completion of Forum 2. To propose these development projects, requesters have to prepare their own projects using Pro-forma (PIN) prepared by MRC-BDP Team for preparing the long-list.

The Se San/Sre Pok/Se Kong Sub-area contains more upland areas than any other in Cambodia, including a rich variety of plant and animal species and diverse highland cultures. The protection of these critical upper watersheds and the people who live there is the most pressing issue for the Sub-area, along with the already observed problems in managing the flow of the Se San River due to the hydropower projects upstream.

The challenge in the Se San/Sre Pok/Se Kong Sub-area is to ensure sustainable land use in the upper catchments while taking advantage of the opportunities that will come with improved access to the area.

Ratanakiri, Mondulhiri and Stung Treng Provinces

Project 1:

Date:	September 2004
Raised by:	Provincial Departments of Agriculture, Forestry and Fishery
Working title:	Valleys and Riverine Irrigated Agricultural Production Project
Development objectives:	Ensure basic food security and safety in lowland areas and increase agricultural production with ensured quality and standard, diversity and value-added products for markets.
Background and justification:	<p>The 7C area is characterized by a diversity of geo-morphological features ranging from high mountains to lowland river floodplains and many forms in-between. Within the lowlands “niche” includes the riverine lowlands including floodplains and alluvial plains next to the larger rivers of the Se San, Sre Pok and Se Kong Rivers, and the small stream valleys scattered within the interior hills and plateaus.</p> <p>These locations offer great opportunity for agricultural development as they generally contain both good quality soils suitable for rice and other agricultural production as well as existing infrastructure (dykes and canals) and banded fields from the time of the Khmer Rouge. The location near streams and rivers ensures a source of water for distribution through gravity as well as pumping.</p> <p>While potential for these areas exists, they have been largely unutilized, mostly because the local highland people prefer to farm their traditional upland agriculture and sifting cultivations. However, the pressure on the uplands and the increasing influx into the area from population pressure has made this farming system no longer viable and alternatives must be sought. At the same time, outsiders (often lowland culture) are increasingly moving into these areas and claiming the good land for their use, threatening the highland people with the loss of these resources in the future.</p> <p>This project would work to stabilize the farming systems and cultures of the highland peoples located near the viable riverine and valley irrigation systems. It would include recognition of their property rights and promotion of improved farming practices so that the highland people can gain a stable location and income that reduces pressures on the uplands. It would include diversification of products for domestic, regional and international export markets and post-harvest processing and value-added activities. It would address cultural aspects of managing the change to a new system and work to maintain the unique traditions and heritage of the</p>

	<p>people in the areas.</p> <p>The project would directly impact upon downstream water quantity and quality as it would affect the most fragile and important upper watershed areas within Cambodia. It would also assist the farmers on these rivers where upstream hydropower development has caused significant negative impacts to manage their new situation. It is therefore a trans-boundary project with regional significance as the lessons learned could be applied to similar project areas in Laos and would assist in the managing of upstream project development in Vietnam and Laos.</p>
Strategic relationship:	The project would be related to the MRC Agriculture, Irrigation, Forestry Programme (AIFP), Environmental Programme and Water Utilization Programme (WUP)
Priority:	High
Expected outputs:	<p>(i) Increased economic and food production in the remote areas with consequent improvements in food security and economy for the vulnerable highland people.</p> <p>(ii) Reduced pressure on fragile upland areas with consequent conservation of biodiversity and reduced soil erosion, sedimentation and an improved hydrological cycle.</p> <p>(iii) Maintenance of the unique and vulnerable highland communities and a sustainable model for their development during a time of great change.</p>
Time frame:	7 years
Cost sharing:	<p>National contribution (in kind): 1,000,000 US\$</p> <p>External fund required: 9,000,000 US\$</p> <p>Total cost: 10,000,000 US\$</p>
Location map for project:	Available for detailed project proposal

Project 2:

Date:	September 2004
Raised by:	Provincial Departments of Industry, Mine and Energy, and of Rural Development
Working title:	Rural Water Supply, Use and Sanitation Project
Development objectives:	Improve the utilization and management of water resources and strengthen human resources development.
Background and justification:	<p>Public health in the 7C Sub-area is a structural issue that undermines development efforts in all other sectors. When local people become ill, most of their savings are lost and they go into a cycle of debt that they cannot recover from. This results in a multitude of effects, including degradation of natural resources as they try to recover any income they can without consideration of long-term impacts. Having no good quality source of water and poor hygiene is the major cause of disease in these areas, and addressing the issue would support the foundation from which development can occur.</p> <p>Water supply in these remote and sloped areas is not as simple as elsewhere – groundwater resources are often limited, and alternative methods need to be considered. Even if a viable source of water is found, improper use through poor sanitation practices both for water use, cooking and human waste disposal can negate the benefits.</p> <p>The project would focus on developing a holistic and appropriate approach to rural water supply and sanitation problems. It would include demonstrating alternatives such as rainwater collection and ceramic filtration of source water in addition to development of good quality groundwater sources where possible. It would have a strong water use education component to train farmers and children on good hygienic practice and proper food preparation and storage. It would promote private sector initiatives to maintain facilities and develop a market for products to provide preventive health benefits.</p> <p>The project would have regional importance as it would address an underlying cause of much of the poverty in the region that leads to environmental degradation.</p>
Strategic relationship:	The project would be related to the MRC Water Resources Programme; Environmental Programme and Water Utilization Programme (WUP)
Priority:	High
Expected outputs:	<ul style="list-style-type: none"> (i) A number of water points and new appropriate technologies introduced to provide safe water for rural populations along with trained technical staff to extend the technology. (ii) A campaign of public health messages and trainings to address the myths and poor practices commonly followed at village level that lead to illness. (iii) A reduction in infant and maternal mortality, an increase in

	household economic situation and a consequent improvement in land use.
Time frame:	7 years
Cost sharing:	National contribution (in kind): 400,000 US\$ External fund required: 3,600,000 US\$ Total cost: 4,000,000 US\$
Location map for project:	Available for detailed project proposal

Project 3:

Date:	September 2004
Raised by:	Provincial Departments of Agriculture, Forestry and Fishery
Working title:	Integrated Agro-Forestry Development Programme in Upland Areas
Development objectives:	Ensure basic food security and safety in upland areas in order to enable poor farmers to integrate into the market economy and promote sustainable and sound natural resource uses and environmental management.
Background and justification:	<p>The highland peoples are among the poorest in the Mekong River basin, and their traditional way of life is under great stress. This includes particularly their swidden agricultural systems, also known as “slash and burn”, which is of particular concern to resource managers now that the population density cannot sustain the system as in the past.</p> <p>Technical options are needed to be developed to demonstrate viable approaches for agro-forestry in these upland areas. This will allow permanent culture to be established on the vulnerable slopes of the hills and thereby reduce soil erosion and increase water conservation while at the same time providing the necessary economic benefits to the farmers who maintain the land. This will also increase the amount of land able to be set aside for conservation to maintain the biodiversity of the area.</p> <p>The project would include research on potential systems that have developed in other regional projects so as to select the options for piloting that have the highest likelihood for success. These options would then be implemented in close cooperation with selected communities to learn lessons and demonstrate successful approaches that could be multiplied beyond the pilot site on a wider scale.</p> <p>The project would contribute to upper watershed management and conservation as well as the stabilization of the lifestyles and cultures of the indigenous peoples in the uplands. It would positively impact on the water quality and quantity downstream and provide lessons and approaches that could be applied in similar situations in neighbouring countries. Therefore it qualifies as having a trans-boundary and regional significance.</p>
Strategic relationship:	The project would be related to the MRC Agriculture, Irrigation, Forestry Programme (AIFP), Environmental Programme and Water Utilization Programme (WUP)
Priority:	High
Expected outputs:	<ul style="list-style-type: none"> (i) A compendium of regional development options and projects that have been applied in the uplands with highland people for reference and to use as a resource base for field visits extension and study. (ii) A series of pilot projects working with local communities to develop agro-forestry systems that are successful

	<p>economically and technically and can be disseminated more widely to other similar situations and communities.</p> <p>(iii) Project locations with sustainable permaculture in the uplands where slopes are most vulnerable so that soil erosion and flooding are reduced.</p>
Time frame:	7 years
Cost sharing:	<p>National contribution (in kind): 100,000 US\$</p> <p>External fund required: 900,000 US\$</p> <p>Total cost: 1,000,000 US\$</p>
Location map for project:	Available for detailed project proposal

Project 4:

Date:	27 th September 2004
Raised by:	Provincial Departments of Industry, Mines and Energy
Working title:	Exploration, Study and Data Collection for Prioritization of Large-Scale Hydropower Sites in the Se San, Sre Pok and Se Kong Rivers.
Development objectives:	<ul style="list-style-type: none"> (i) To ensure the increasing demand for affordable electric energy in the country is met with minimal negative impacts on the environment and local people, thereby promoting national economic growth, development of rural economy towards the improvement of rural living standards and improved infrastructure for agricultural, industrial and tourism development; and (ii) Potential hydropower resources of the Mekong river basin in Cambodian are developed according to true least-cost planning, fully considering environmental and social impacts.
Background and justification:	<p>Cambodia is currently dependent on fossil-fuel generation for much of its electricity generation. Electricity is a basic need that provides light for children to study, power for computers to operate and small- and medium enterprises to operate and allows irrigation of nearby farmland. As with most countries, Cambodian government authorities are concerned that they maintain control over their own power generation rather than depend on others, while there are opportunities to gain revenue to sell electricity to the more developed neighbours.</p> <p>For these reasons and others, there is a strongly held belief in the need for establishment of large-scale hydropower in Cambodia. It is understood that the process to prepare feasibility studies and get to the point where investors are found is a very long one – however, if the first steps are not taken, the destination will never be reached. Studies of the potential have been done at a basic level in the 1960's and 1980's but need to be updated to the present with a more current and realistic environmental, economic and social perspective. This will provide the additional benefit of increasing the database of hydrological and meteorological information on the Sub-area that will positively impact future irrigation and other infrastructure development.</p> <p>This project would include a compilation and review of the previous studies, data and proposals from the past. It would include preliminary discussions and forums with the local people near the sites, and a prioritization to identify the hydropower possibility most likely to succeed. It would prepare detailed terms of reference for a feasibility study including establishment of stations for long-term data collection and environmental and social assessment. It would include tendering and implementation of the feasibility study by a qualified and experienced international consortium, with the results used to determine the project potential</p>

	and direction. The project would have trans-boundary impact as the large scale would affect downstream flows and be affected by upstream operations.
Strategic relationship:	The project would be related to the MRC Hydropower Programme. National power generating authorities of Cambodia in collaboration with the CNMC and MRC, Cambodia Energy Sector Strategy (MIME)
Priority:	High
Expected outputs:	(i) A feasibility study for large-scale hydropower projects; and (ii) for the Sre Pok basin in Cambodia, it has been estimated that the potential capacity of could be 2,000 MW, and with this amount, all population in the province and some part of areas in Lao PDR and Vietnam would have access to the energy supply, which would help to promote small-scale industry, handicrafts, tourist sectors, and agricultural production in the growth triangle area.
Time frame:	3 years
Cost sharing:	National contribution (in kind): 300,000 US\$ External fund required: 2,700,000 US Total cost: 3,000,000 US
Location map for project:	Available for detailed project proposal

Project 5:

Date:	November 2004
Raised by:	Provincial Departments of Tourisms
Working title:	Development and Promotion of Cultural and Eco- Tourisms
Development objectives:	<p>Promote tourism development as a driving force for economic growth and opportunity for off-farm income generation for local people.</p> <p>To improve the standards of living of local people by creating a conducive atmosphere and providing an opportunity for additional off-farm income generation through the environmental and cultural awareness and education and infrastructure/facility improvement expanded to sustain tourism market and attractions.</p>
Background and justification:	<p>The Northeast, particularly the 7C Sub-area, is a relatively unspoiled and unknown area with a high potential for tourism stemming from its rich natural resources, beautiful scenery and unique highland people. Tourism is a means by which value can be gained from conservation rather than exploitation of natural resources, and can thereby serve as an engine for both economic growth and environmental improvement and stability. Already the region is seeing the beginning of development of a burgeoning tourist market, consisting mostly of low-budget tourists interested in eco- and cultural tourism as well as regional and Cambodian tourists who are interested in exploring this very different region.</p> <p>While tourism can provide benefits, it can also result in over-exploitation if managed poorly, with resulting problems of deforestation, pollution and loss of cultural and biological resources. Experience has shown the need for proper management in order that tourism can benefit the local people, to ensure that negative impacts are minimized, and to build capacity for sustaining the market over the long term.</p> <p>The project would link into the regional initiatives of the “Emerald Triangle” and ASEAN/GMS by promoting as part of a package the interesting features of the 7C Sub-area within a larger circuit of attractions. It would include a strong capacity-building and training component including awareness-raising and education to ensure that the negative impacts are small and locally-based jobs are created. The project would highlight and accentuate the benefits to be gained from environmental conservation and focus on improving the livelihoods of the people living near the forests so that they gain income and benefits from conservation.</p> <p>The project would be of regional and trans-boundary importance due to the connection with the adjacent Laos and Vietnam Sub-areas and the potential for the project to allow linking of regional conservation and natural resource management efforts in a coordinated manner.</p>
Strategic relationship:	The project would be related to the Tourism Programme,

	Navigation Programme, MRC; Fisheries Programme; MRC Environment Programme
Priority:	High
Expected outputs:	<ul style="list-style-type: none"> (i) A regional entity charged with coordination and training for tourism linking concerned line agencies and those of neighboring countries and liaising with the Emerald Triangle and other initiatives; (ii) A number of trained guides, a local hospitality industry, and a growing awareness and pride of the unique and interesting cultural and natural features of the sub-area; and (iii) Increased economic growth, jobs and agricultural and handicrafts markets for local people in this isolated area with otherwise limited outlets.
Time frame:	5 years
Cost sharing:	National contribution (in kind): 200,000 US\$ External fund required: 1,800,000 US Total cost: 2,000,000 US
Location map for project:	Available for detailed project proposal

Ratanakiri and Stung Treng Provinces

Project 6:

Date:	September 2004
Raised by:	Provincial Departments of Water Resources and Meteorology and Provincial Departments of Industry, Mine and Energy
Working title:	Downstream Flow Management Study for the Se San River Hydropower
Development objectives:	Improve the utilization and management of water and water related resources
Background and justification:	<p>The construction of the Yali Falls Dam in Vietnam on the Se San River has caused numerous impacts downstream, yet the feasibility studies and designs did not extend more than a few kilometres away from the headwork. Additional dams on the river are under construction, and these too will affect flows. These projects offer a chance to optimize the operation of the cascading series of dams on the Se San River in such a way as to consider and reduce the impacts on downstream users and learn from the experience so that the lessons can be applied to the China Dams.</p> <p>The project includes participatory appraisal of the impacts of the operation of the dam on the downstream users that includes the operators of the upstream Yali Falls Dam. The water requirements and problems identified would then form the basis for an improved dam operation plan that would be tested for optimization with feedback from the downstream users. A flood warning system would be set up to ensure that in the event of a major and unexpected release of water from upstream, the downstream people would have sufficient warning so that damages are minimized. The project would extend the electricity network from the upstream dams into the Sub-area so that benefits from the upstream development could be gained downstream and the downstream people would become customers and stakeholders of the dam operators.</p> <p>This project is a trans-boundary project that would provide a working example and lessons learned that could be applied to planning, design and operation of all hydropower dams in the Mekong River basin.</p>
Strategic relationship:	The project would be related to the MRC Water Utilization Programme (WUP), Environmental Programme (EP), Flood Management and Mitigation Programme (FMMP) and other related sectoral programme, i.e., Hydropower
Priority:	High
Expected outputs:	<ul style="list-style-type: none"> (i) The project would produce an optimized management plan that better incorporates the concerns and needs of the downstream users while still providing the benefits for which the dam was designed; (ii) A flood warning system would be developed and tested to better ensure the safety of those downstream from unexpected

	<p>or large releases of water from the dam;</p> <p>(iii) Access to electricity would improve the lives of the people and provide basic infrastructure and potential for value added processing and other possibilities; and</p> <p>(iv) Lessons learned from the project would feed into the ongoing discussions at the Mekong River Commission with China and other upstream users who are considering or implementing the construction of hydropower dams.</p>
Time frame:	3 years
Cost sharing:	<p>National contribution (in kind): 100,000 US\$</p> <p>External fund required: 900,000 US\$</p> <p>Total cost: 1,000,000 US\$</p>
Location map for project:	N/A

Project 7:

Date:	November 2004
Raised by:	Provincial Forestry Administration and Provincial Water Resources Departments
Working title:	Pilot Integrated Watershed Management Project in the Se San, Sre Pok and Se Kong Sub-area
Development objectives:	The project is aiming to promote sustainable integrated watershed management practices in order to ensure the long-term sustainability of natural resource utilization and environmental sustenance as well as to preserve some of the global most significant biodiversity in the sub-basin.
Background and justification:	<p>The Se San River watershed includes several areas of great importance, including particularly the Virachey National Park. There are a variety of problems facing the area, particularly conserving the National Park while maintaining sustainable livelihoods for the people living there and around there. On the left bank, the watershed includes most of the developed area of Ratanakiri Province, where resource conflicts are increasing and coming into light as the population pressure from the indigenous people, an influx of outsiders and investors and concessions compete for the limited land and water resources. The river is also heavily affected by upstream hydropower projects in Vietnam that result in an artificial flow regime that is managed without consultation or consideration of the needs of the people downstream.</p> <p>The Sre Pok and Se Kong Rivers are located in areas that are not as developed, but which are experiencing a rapid influx of investors from the outside who are making large changes to the land use on previously undisturbed soils. This will impact upon the forest cover, biodiversity, soil erosion and hydrology of the area with consequent changes in the water quality and flow in the river systems downstream.</p> <p>In both these cases, a watershed management project would be a way to start the process of overall basin-wide planning and consideration of natural resource management factors in the development process. This would allow a forum for participation that can bring into play the hopes and desires of the local residents, the larger scale plans of concession managers as well as the technical expertise of concerned line agencies and development objectives of the provincial and national governments.</p> <p>The projects would establish pilot watershed management entities that would prepare detailed land use maps of the areas and work with the government to establish conservation zones and development zones, analyze the likely impacts of different land use changes, promote sustainable agriculture and infrastructure development, link the people to markets to address their livelihood</p>

	<p>needs and provide a forum for discussion and coordination. It would work towards addressing the need for improved concession management and increasing employment and productivity of state concessions.</p> <p>The project would be of regional significance as well as address trans-boundary issues as the pilot projects would feed practical experience into basin-wide watershed management initiatives while addressing the local concerns in these important sub-areas.</p>
Strategic relationship:	Agriculture, Irrigation and Forestry Program (AIFP) of MRC Environment Program (EP) of MRC and Forestry Administration of Cambodia
Priority:	High
Expected outputs:	<ul style="list-style-type: none"> (i) The project would address the critical natural resource issues in this important sub-basin while developing understanding and tools that could be widely applied throughout Cambodia, Northeast Thailand and Laos for watershed management; and (ii) The watershed management project would provide a nexus for natural resources management in the context of the rapid growth. It would include mapping the area to high detail including analysis of change over time to provide context and a base for examining natural resource and cultural management issues. It would include research on soils and forest cover, upland agriculture and potential use and a forum for managing conflicts between concessionaires and local people. It would seek to develop a universal zoning plan for the watershed that would provide the much-needed framework for managing development and maintaining the natural resources that underpin the area's growth.
Time frame:	5 years
Cost sharing:	<p>National contribution (in kind): 100,000 US\$</p> <p>External fund required: 1,400,000 US</p> <p>Total cost: 1,500,000 US</p>
Location map for project:	Available for detailed project proposal

Ratanakiri and Mondulakiri Provinces

Project 8:

Date:	September 2004
Raised by:	Provincial Departments of Agriculture, Forestry and Fisheries
Working title:	Highland People's Poverty Reduction and Agricultural Stabilization Project
Development objective:	Ensure basic food security and sustainable and sound natural resources use and environmental management.
Background and justification:	<p>The highland peoples are among the poorest in the Mekong River basin, and their traditional way of life is under great stress. This includes particularly their swidden agricultural systems, also known as “slash and burn”, which is of particular concern to resource managers now that the population density cannot sustain the system as in the past. Much work on addressing the issues of poverty and stabilizing the agriculture of the highland people has been done in China and many lessons can be learned and applied in Ratanakiri and Mondulakiri to preserve the uplands and thereby improve the watershed and natural resource protection of the Mekong River Basin.</p> <p>Any project must be based upon addressing the basic needs of the highland people resident in the area, then assisting them to take advantage of their opportunities so they can move into the market economy. The project would include a range of activities including improved animal health and production, permaculture and intercropping, green manuring, soil and water conservation, education, health services and cultural preservation activities. The project would include mapping of land use change, trends and resources and protection of indigenous peoples' rights to land, agricultural extension and improvement of concession management.</p> <p>The project would directly impact upon downstream water quantity and quality, as it would affect the most fragile and important upper watershed areas within Cambodia. It is therefore a trans-boundary project with regional significance as the lessons learned could be applied to similar project areas in Laos.</p>
Strategic relationship:	The project would be related to the MRC Agriculture, Irrigation, Forestry Programme (AIFP), Environmental Programme and Water Utilization Programme (WUP)
Priority:	High
Expected outputs:	<ul style="list-style-type: none"> (i) Improved livelihoods and land use in the upper watersheds including protected areas; (ii) Methods to address the poverty of the highland people that is directly linked to environmental degradation and poor catchments response to rainfall with downstream impacts; and (iii) Improved knowledge of upper catchments conditions and stabilization methods.

Time frame:	7 years
Cost sharing:	National contribution (in kind): 2,000,000 US\$ External fund required: 8,000,000 US\$ Total cost: 10,000,000 US\$
Location map	N/A

Project 9:

Date:	September 2004
Raised by:	Provincial Departments of Agriculture, Forestry and Fisheries and of Environment
Working title:	Deep Pools and Fisheries Conservation and Management Project
Development objectives:	This project is aiming at enhancing economic, social and cultural significance of the Mekong natural fish resources through the protection and conservation of deep pools and brood stocks and their migratory routes and their habitats and ensures sustainable development and utilization of the resources.
Background and justification:	<p>The tributary streams and rivers of the Mekong River provide much of the habitat and breeding ground for the rich fisheries that the majority of the population depend upon for their major protein source. Of particular importance are the deep pools where a plethora of species live and breed throughout the year. In addition, there are numerous varieties of unique fish and aquatic animals that have developed further upstream in the smaller streams connected to the major rivers.</p> <p>These deep pools and brood stocks have not been well documented or understood despite their importance in the food chain and for the livelihoods of the people. Illegal fishing of the deep pools provides short-term gain for the few fishers doing it at the expense of the resource and the many fishers downstream. The migratory routes and habitats of the fisheries are also not sufficiently understood, and therefore conservation and preservation measures cannot be designed to ensure their sustainability.</p> <p>The project would research, locate and map the migratory pathways, habitats, deep pools and breeding grounds of the various fisheries within the 7C sub-area to better understand the resource and select management interventions. Interventions would include rules establishment and enforcement for deep pools and fisheries to eliminate the illegal fishing methods that damage the resource and conserve critical areas from fishing. It would provide research on methods to sustain migratory routes and quantify their importance. It would provide much-needed information on the different variety of brood stock fisheries in the sub-area and its importance to the Mekong River system as a whole. It would include research into the potential for breeding local fish species for release into the river system.</p> <p>The project would include community-based participatory natural resource management, awareness raising and promotion of good practice, preparation of policy and laws against illegal fishing and support for enforcement of rules and improved regulations. It would include promotion of eco-tourism and other possible tourist sites in the region. It would include production of locally produced handicrafts and foods to market to tourists and training</p>

	<p>of local guides to increase local revenue generation from the tourists.</p> <p>The project has a trans-boundary impact as the protection of the deep pools and brood stock species impacts upon the fisheries resource throughout the Mekong River basin.</p>
Strategic relationship:	The project would be related to the MRC Fisheries Programme and Environment Programme, and must fit seamlessly into parallel national fisheries programmes of MAFF
Priority:	High
Expected outputs:	<ul style="list-style-type: none"> (i) Broader and deeper understanding of the fisheries resource and its relationship to the tributary rivers of the Se San, Sre Pok and Se Kong Rivers, and the importance of these rivers to the health of the fisheries in the mainstream Mekong River; (ii) Understanding of local fisheries species and methods for their propagation so that that breeding programs can increase stock; and (iii) Deep pools, habitats and migratory pathways conservation through rules establishment and enforcement in combination with community-based natural resource management.
Time frame:	7 years
Cost sharing:	<p>National contribution (in kind): 700,000 US\$</p> <p>External fund required: 6,300,000 US\$</p> <p>Total cost: 7,000,000 US\$</p>
Location map for project:	Available for detailed project proposal

Project 10:

Date:	September 2004
Raised by:	Provincial Departments of Industry, Mines and Energy
Working title:	Small-Scale Hydropower Development Project in Lumpat district (O-Sealeng) and in Koh Nhek district (O-Chbar)
Development objectives:	The project is aiming to provide population living in the sub-area with reliable electricity supply, which is a key factor in the rehabilitation and development of rural economy toward the improvement of living standard and an important infrastructure requirement for tourism, agricultural and small-scale industrial development in the areas with minimal negative impacts on the environment and local people.
Background and justification:	<p>These areas where the water is available for the entire year the small-scale hydropower development is very sanctify. The micro hydropower potentials in the area have not been thoroughly studies, evaluated and developed.</p> <p>Small-scale hydropower stations require less capital for investment but provide great benefits to the rural populace. They will be ideal for small rural communities. If a small-scale hydropower capability exists in the vicinity of a village, it should be exploited for providing supply.</p>
Strategic relationship:	The project would be related to the MRC Hydropower Programme. National power generating authorities of Cambodia in collaboration with the CNMC and MRC, Cambodia Energy Sector Strategy (MIME)
Priority:	High
Expected outputs:	The project may have a total installed capacity of 40 KW and 5 MW, respectively. With this capacity, approximately 60 percent (1,300 families) of population in the two districts will access to the energy supply, which would help to promote small-scale industry, handicrafts, tourist sectors, and agricultural production.
Time frame:	5 years
Cost sharing:	<p>National contribution (in kind): 600,000 US\$</p> <p>External fund required: 2,500,000 US\$</p> <p>Total cost: 3,100,000 US\$</p>
Location map for project:	Available for detailed project proposal

Project 11:

Date:	September 2004
Raised by:	Provincial Departments of Industry, Mines and Energy
Working title:	Alternative Energy – Micro-hydropower and the Extension of the Electricity Grid into the Se San, Sre Pok and Se Kong Sub-area
Development objectives:	The project is aiming to provide population living in the sub-area with reliable electricity supply, which is a key factor in the rehabilitation and development of rural economy toward the improvement of living standard and an important infrastructure requirement for tourism, agricultural and small-scale industrial development in the areas with minimal negative impacts on the environment and local people.
Background and justification:	<p>Large-scale hydropower projects require a long preparation period and funding for these projects has become increasingly difficult to find given the worldwide sensitivity to large dams. This happens at a time when electricity has become indispensable as a basic resource to improve the quality of life and education and provide the foundation for the economy and growth of the private sector. In order to bridge this gap, alternative sources of energy must be investigated both separately and as a component of larger downstream investments.</p> <p>The 7C Sub-area is one of the few in Cambodia that has the topography necessary to harness smaller water resources to produce electricity. “Micro-hydropower” has become increasingly popular among donors as it provides the needed electricity without the environmental and social concerns commonly associated with large dams.</p> <p>Extension of the electricity network or “grid” would allow Cambodia to tap into the large investments made already in neighbouring countries to generate electricity, and thereby provide access to the resource without the complications of dam construction and operation. The construction of the grid would furthermore contribute to the likelihood of a successful implementation of a large-scale hydropower dam project in the future as the distribution costs would be already taken care of if the grid existed. In addition, it would make the Cambodian people the clients of the upstream hydropower producers, thereby giving them a benefit and stake in their use, and therefore more consideration from the operators.</p> <p>For these reasons, the alternative energy project would be supportable to provide the needed energy for the rural and urban areas while harnessing the existing resources within the region without major negative impacts. It would include study of the locations where the topography and hydrology are suitable for micro-hydropower generation and analysis of the costs and benefits for same. It would include the economic analysis of the grid extension and consideration of the best locations for future</p>

	<p>development of a national grid in the region.</p> <p>The project would be of trans-boundary significance since it would take advantage of and link the grid to the hydropower projects of neighbouring countries.</p>
Strategic relationship:	The project would be related to the MRC Hydropower Programme and Environment Programme. National power generating authorities of Cambodia in collaboration with the CNMC and MRC, Cambodia Energy Sector Strategy (MIME)
Priority:	High
Expected outputs:	<p>(i) A feasibility study for micro-hydropower use in the Sub-area, and if feasible, some pilot schemes developed to demonstrate methods of implementation; and</p> <p>(ii) A feasibility study for extension of the grid for submission to investors.</p>
Time frame:	3 years
Cost sharing:	<p>National contribution (in kind): 100,000 US\$</p> <p>External fund required: 900,000 US\$</p> <p>Total cost: 1,000,000 US\$</p>
Location map for project:	Available for detailed project proposal

CHAPTER 12: GLOSSARY

Acid soils (or sulphur acid soils): Soils that have been rendered acid due to formation of sulphuric acid by oxygenation of pyrite (natural iron sulphide, FeS₂), often due to human interference (lowering of the groundwater table by drainage, or excavation of ponds for aquaculture). Such soils are unsuited for cultivation, effluents leaking from such areas can be poisonous to fish (because acid can dissolve aluminium), and the process can be practically irreversible.

Alluvial: Formed by river sediments. An alluvial river flows in a landscape formed by its own sediments.

Analysis (of hydrological data): Processing, involving a sometimes comprehensive transformation and interpretation, in order to arrive at some desired knowledge. Data analysis is often carried out stage-wise and in different contexts: On-line processing in the field, off-line processing, further synthesis for model input, etc. In general, data analysis involves both hidden and explicit assumptions about the relation between primary data and final results. (As one example, a flow rate in a river can be calculated assuming that the current measurements were made simultaneously, even if they took a whole day). Such assumptions can affect both the accuracy and the validity of the results. A suitable quality is supported by an adequate transparency of the analysis.

Aquaculture: Cultivation, aiming at commercial production, of aquatic plants or animals, such as fish, prawns, shellfish, etc.

Aquaculture: Cultivation, aiming at commercial production, of aquatic plants or animals, such as fish, prawns, shellfish, etc.

Basic minimum needs: These can comprise food and water, shelter, primary education, vital health care, and personal integrity.

Biodiversity: The number of species (of plant and animals) that actually live in an area (or biotope) where they belong. Agenda 21 (Chapter 17.7) states about coastal biodiversity: 'Coastal States, with the support of international organizations, upon request, should undertake measures to maintain biological diversity and productivity of marine species and habitats under national jurisdiction. Inter alia, these measures might include: surveys of marine biodiversity, inventories of endangered species and critical coastal and marine habitats; establishment and management of protected areas; and support of scientific research and dissemination of its results'.

Brackish water: A mixture of sea water and freshwater, found at places where inland waters discharge into the sea: River mouths, fjords, estuaries, lagoons, inland seas, etc. The salinity will be higher than nil, but lower than the ocean salinity of 35 PPT.

Stratification is common in brackish areas, and the salinity will often vary highly, both in time and place.

Catchment (or drainage area): An area (delineated by a watershed) that drains through a specific river cross-section.

Development objective (or overall objective, or development goal, or mission): A desired future situation, which is supported by a plan (or programme or project) that is targeted towards it. The plan (or programme or project) cannot in itself assure achievement of the development objective - this is subject to a number of assumptions on related developments that are outside the control of the plan (or programme or project). Some authors recommend that only one development objective be applied from case to case, and that it be specified in time, space and quantity. See also immediate objective.

Discharge: Net flow or net sediment transport through a fixed cross-section of a river.

Dispersion: Mass transport determined by the transverse current velocity gradient and the concentration gradient (and always in the direction of the concentration gradient).

Driving force: A circumstance that has a major (positive or negative) influence on pursuance of a set of planning goals. It can be physical, climatic, economic, social or political, and can appear as a trend, a cycle, or an event. A driving force cannot be fully controlled by the participants in the planning process. It can be unpredictable, or not well understood, or even unknown.

Dublin Principles (from International Conference of Water and the Environment, Dublin 1992): (1) Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment; (2) water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels; (3) women play a central role in the provision, management and safeguarding of water; (4) water has an economic value in all its competing uses and should be recognized as an economic good.

Ecological demand of stream flow: The minimum stream flow required for prevention of irreversible ecological degradation. This value varies over the year and from one place to another. To maintain a healthy environment, the flow must be higher in the wet season than in the dry season, because many aquatic species have annual cycles that reflect their natural habitat. Sometimes, the water-level is critical, rather than the flow rate.

Endemic: Occurring only in one specific geographical area (for example one country, one river basin, or one island).

Eutrophication: Excessive supply of nutrients, resulting in a high primary production. Eutrophication can have negative ecological effects, such as large fluctuations of dissolved oxygen between night and day, or damage to benthic vegetation due to shading by algae.

Flow: Volume transport per time unit (for example through a cross-section of a river).

Frequency: Number of cycles (or units or events) per unit time.

Gauging: Measuring at a fixed point; a gauge is a measuring device (e.g. for water-level or pressure).

Gross domestic product (GDP): the total output of goods and services for final use produced by an economy, by both residents and non-residents, regardless of the allocation to domestic and foreign claims. It does not include deductions for depreciation of physical capital or depletion and degradation of natural resources.

Immediate objective: The intended situation that is achieved as the direct result of orderly implementation of a plan (or programme or project). The immediate objective is the result of a number of outputs, which, between them, are necessary and adequate for achieving the immediate objective. Some authors recommend a maximum of 3 immediate objectives, and that these are specified in time, space, quantity, quality and target group. See also development objective.

Integrated farming: An area-intensive and labor-intensive combination of different parallel productions, like a fish pond, paddy, fruit trees, livestock, cash crops and vegetables. Integrated farming can give yields that highly exceed monoculture yields.

Integrated Water Resources Management (as defined by Global Water Partnership): A process which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

Opportunity costs: The cost difference between one course of action and another (better) course of action. In a wider sense, the implications of one course of action relative to alternative strategies. In development projects, the opportunity costs can reflect the time lag from when a new technology emerges and until it becomes available to the target group. There is often an opportunity cost related to doing nothing.

Photosynthesis: The primary production (by plants, algae and some bacteria) of simple carbohydrates (such as sugar), normally from (inorganic) carbon dioxide, and using energy supplied by the sun.

Phytoplankton: Photosynthetic aquatic microorganisms (algae).

Pollutant: A compound that is harmful or otherwise undesired in the environment, either absolutely, or at an elevated concentration level. See also contaminant and xenobiotic compound.

Pollution: Release to the environment of a substance that can harm it.

Salinity (of sea water): Relative mass of the salt contents, given in PPT (parts per thousand) (kg per 1,000 kg), or in PSU (practical salinity units) (which is very nearly the same as PPT).

Scenario: A hypothetical combination of events and physical conditions, describing a possible future situation.

Sector planning: Planning for a specific source of income, like agriculture, fisheries, hydropower, industry, service, tourism, etc.

Seepage: Slow movement of water in the ground, or from the ground to the surface.

Stakeholder: A person, group or institution that has a particular interest in an activity, project, programme or policy. This includes both intended beneficiaries and intermediaries, winners and losers, and those involved in, or excluded from the decision-making process. A key stakeholder is one who can significantly influence or who is otherwise important to the success of the activity, project, programme or policy.

Strategy: (1) A conceptual plan for how to reach a goal; (2) a plan, method or series of actions designed to achieve a specific goal or objective.

Subsistence economy: An economy in which agricultural, hunting and other activities are undertaken primarily to meet household consumption requirements.

Transparency (of a procedure): The insight conveyed to the data user about how the data were produced, for example for assessing the validity of the data for a given, possibly unforeseen, purpose. An acceptable transparency is obtained by documentation and can be supported by using standard procedures.

Vector-borne disease: A disease transmitted by an organism (for example malaria).

Water availability: The flow into an area from upstream, plus the (surface and groundwater) resources generated by net rainfall in the sub-area, minus the ecological demand within the area and at its downstream boundary. The availability changes slowly, from one decade to the next, due to medium-term climate variations, or due construction of reservoirs or diversions. The availability can be measured, and/or determined by numerical modeling, often with a high accuracy (subject to the coverage and quality of the basic hydrological data).

Water demand: The amount of water required for a given purpose, for example liter per person per day, or mm per crop. The demand can be present or future, and it can be actual (i.e. related to an available infrastructure) or potential (assuming full infrastructural development and no water shortage). The serviceable (part of the) demand is limited both by infrastructure and water availability.

Water pricing: A tool for management of water allocation between areas, sectors and individual users, assuming that an 'optimal' allocation (or just a sustainable allocation) can be determined on the basis of a water price that reflects the full costs (and hereby the full value) of water (for example, in economic theory, by charging the full costs and relying on free market mechanisms for allocation). Such a strategy can improve water efficiencies and reduce waste of water. It will often give preference to industrial allocations rather than irrigation. See valuation and cost of water.

Watershed: A line in the landscape (e.g. a ridge) that delineates a catchment. The surface runoff on each side of the watershed will proceed towards different locations.

Wetland: An area that is covered by water in at least a part of the year. A wetland can represent a special ecological habitat, sometimes with a high biodiversity, and can serve as a fish breeding ground. The Ramsar convention defines wetlands quite broadly as 'areas of marsh, fen, peat-land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including marine areas with a depth less than 6 m at low tide'.

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