THE MEKONG RIVER COMMISSION SECRETARIAT

Project Development Implementation Plan (ProDIP), Prioritization and Ranking

The Flood Management and Mitigation Programme, Component 2: Structural Measures & Flood Proofing in the Lower Mekong Basin

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Deltares Enabling Delta Life Delft Hydraulics

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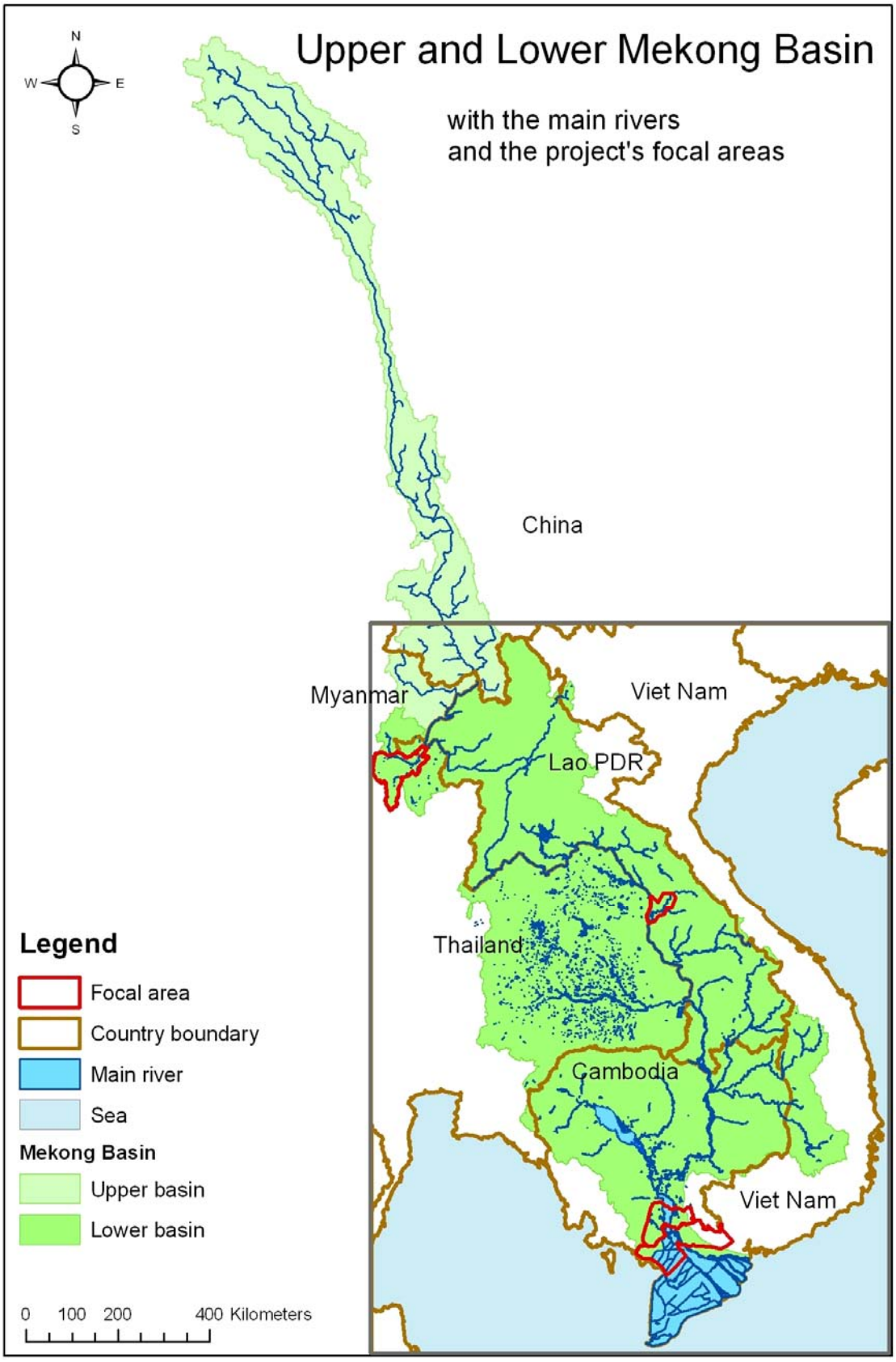

Upper and Lower Mekong Basin
with the main rivers
and the project's focal areas
N
W
E
S
China
Myanmar
Viet Nam
Lao PDR
Thailand
Cambodia
Viet Nam
Legend
Focal area
Country boundary
Main river
Sea
Mekong Basin
Upper basin
Lower basin
0 100 200 400 Kilometers

GLOSSARY

Direct damage	All harm which relates to the immediate physical contact of flood water to people, property and the environment. This includes, for example, damage to buildings, economic assets, loss of standing crops and livestock, loss of human life, immediate health impacts and loss of ecological goods.
Exposure	The people, assets and activities that are threatened by a flood hazard.
Flood control	A structural intervention to reduce the flood hazard.
Flood damage	Damage to people, property and the environment caused by a flood. This damage refers to direct as well as indirect damage.
Flood damage curve	The functional relation between inundation characteristics (depth, duration, flow velocity) and damage for a certain category of elements at risk.
Flood damage risk (= Flood risk)	The combination or product of the probability of the flood hazard and the possible damage that it may cause. This risk can also be expressed as the *average annual possible damage* or *expected damage*.
Flood hazard	A flood that *potentially may* result in damage. A hazard does not necessarily lead to damage.
Flood hazard map	Map with the predicted or documented extent/ depth/ velocity of flooding with an indication of the flood probability.
Flood proofing	A process for preventing or reducing flood damages to infrastructural works, buildings and/or the contents of buildings located in flood hazard areas.
Flood risk management	Comprehensive activity involving risk analysis, and identification and implementation of risk mitigation measures.
Flood risk management measures	Actions that are taken to reduce the probability of flooding or the possible damages due to flooding or both.
Flood risk map	Map with the predicted extent of different levels/ classes of *average annual possible damage.*
Hydrological hazard	A hydrological event (discharge) that may result in flooding.
Indirect damage	All damage which relate to the disruption of economic activity and services due to flooding.
Integrated flood risk management	The approach to Flood Risk Management that embraces the full chain of a meteorological hazard leading to flood damages and considers combinations of structural and non structural solutions to reduce that damage.

Meteorological hazard	A meteorological event (storm) that may result in a hydrological hazard and, eventually, in flooding
Resilience	The ability of a system/ community/ society to cope with the damaging effect of floods
Susceptibility	The opposite of resilience, that is to say the inability of a system/ community/ society to cope with the damaging effect of floods
Vulnerability	The potential damage that flooding may cause to people, property and the environment

ABBREVIATIONS

N.B. Abbreviations that occur only once and that are explained in the text are not included in the table below.

ADB	Asian Development Bank
ADPC	Asian Disaster Preparedness Center
BCM	Billion Cubic Meters
BDP	Basin Development Planning
BPG	Best Practise Guidelines
CBA	Cost Benefit Analysis
CBDRM	Community Based Disaster Risk Management
CNMC	Cambodian National Mekong Committee
d/s	downstream
DARD	Department of Agriculture and Rural Development
DSF	Decision Support Framework
EC	European Commission
EU	European Union
FHA	Flood Hazard Assessment
FMM	Flood Management and Mitigation
FMMP-C2	Flood Management and Mitigation Programme, Component 2
FPS	Flood Proofing System
FRA	Flood Risk Assessment
FV	Future Value (economic analysis)
GIS	Geographic Information System
HEC	Hydrologic Engineering Center
HH	Household(s)
IFRM	Integrated Flood Risk Management
IKMP	Information and Knowledge Management Programme
ISIS	Hydrodynamic simulator for modelling flows and levels in open channels and estuaries
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
KOICA	Korean International Cooperation Agency
LMB	Lower Mekong Basin
LMD	Lower Mekong Delta
LXQ	Long Xuyen Quadrangle (Vietnam)
MAFF	Ministry of Agriculture, Fisheries and Forestry
MARD	Ministry of Agriculture and Rural Development

MCM	Million Cubic Meters
MLUPC	Ministry of Land Management, Urban Planning and Construction
MONRE	Ministry of Natural Resources and Environment
MOWRAM	Ministry of Water Resources and Meteorology
MRC(S)	Mekong River Commission (Secretariat)
MSL	Mean sea level, the average (mean) height of the sea, with reference to a suitable reference surface
NAP	Navigation Programme (MRC)
NCDM	National Committee on Disaster Management
NEDECO	Netherlands Engineering Consultants
NMC	National Mekong Committee (NMCs are not part of the MRC 1995 Agreement, are structured differently in each country and are funded by their respective countries)
NPV	Net Present Value (economic analysis)
PDR (Lao)	(Lao) People's Democratic Republic
PDS	Project Description Sheet (ProDIP)
PDWRAM	Provincial Department of Water Resources and Meteorology
PoR	Plain of Reeds (Vietnam)
ProDIP	Project Development Implementation Plan
PV	Present Value (economic analysis)
RFMMP	Regional Flood Management and Mitigation Programme
RN	Route Nationale (National Road)
SBF	Se Bang Fai (Lao PDR)
SIWRP	Southern Institute of Water Resources Planning
SWAT	River basin scale model quantifying the impact of land management practices in large, complex watersheds
TA	Technical Advisor
u/s	upstream
UNDP	United Nations Development Program
USD	US$
VND	Vietnamese Dong
VRSAP	Vietnam River Systems and Plains (hydrological/ landuse model)
WUP	Water Utilisation Programme

CHAPTER 1

INTRODUCTION

1 INTRODUCTION

During Stage 1 of the Flood Management and Mitigation Programme, Component 2 (FMMP – C2) consultancy services, a long-list of Flood Management and Mitigation (FMM) projects was prepared for the four riparian countries in the Lower Mekong Basin (LMB) taking into account requirements of the National Mekong Committees (NMCs) and Line Agencies in the respective countries, FMM projects in the Basin Development Plan (BDP) long-list and policies of the Mekong River Commission (MRC) in regard to IWRM (Integrated Water Resources Management) in the LMB.

Following preparation of the long-list of projects, the list was narrowed down based on a system of ranking using a set of criteria developed by the Consultant and in consultation with the various NMC's and Line Agencies. The set of criteria applied included:

- impacts on flood risk reduction;
- impacts on protection of environment and other benefits of flood (socio-economic);
- project status;
- relation with IWRM; and
- transboundary impacts.

A total of 36 (including joint/ transboundary) FMM projects were shortlisted for the LMB. The breakdown of the number of shortlisted projects for each country is shown below:

- Cambodia: 12
- Laos PDR: 6
- Thailand: 6
- Vietnam: 12

The names of the projects for individual countries are shown in Table 1.1 to Table 1.4 below.

1.1 Cambodia shortlist of selected projects for ProDIP

The selected FMM projects for the Project Development Implementation Plan (ProDIP) for Cambodia are shown in the following table.

Table 1.1 Shortlist of selected projects for Cambodia.

	Description/ Name
1	IFRM Plan Preparation for Takeo – West Bassac
2	Flood Protection Deep-flooded Area (Zone 2) - West Bassac
3	Flood Protection Five Polders (Zone 1) – West Bassac
4	Flood Proofing Settlements and Infrastructure (Zone 2) – West Bassac
5	Flood Protection/ Proofing Anchor Borey in West Bassac
6	Flood Protection Shallow-flooded Area (Zone 3) – West Bassac
7	Flood Risk Mitigation/ Diversion in the Border Areas Between Cambodia and Vietnam
8	IFRM Plan Preparation East of Mekong (Prey Veng), East Mekong
9	IFRM Plan Preparation Stung Sreng
10	Flood Risk Management Options Tonle Sap Great Lake
11	Land Zoning Flood Proofing Peam Ro
12	Capacity Building Disaster Management

1.2 Lao PDR shortlist of selected projects for ProDIP

The selected FMM projects for the ProDIP for Lao PDR are shown in the following table.

Table 1.2 Shortlist of selected projects for Lao PDR.

	Description/ Name
1	Capacity Building in Flood-prone Area of Champasack
2	IFRM Plan in Lower Se Bang Fai River Basin
3	Landuse Planning in Sebanghien Flood-prone Area
4	Joint Bank Protection Study – Bokeo
5	Establishment of National Flood Forecasting and Warning Centre
6	Study on Flash Floods in Luangnamtha Province

1.3 Thailand shortlist of selected projects for ProDIP

The selected FMM projects for the ProDIP for Thailand are shown in the following table.

Table 1.3 Shortlist of selected projects for Thailand.

	Description/ Name
1	Preparation of IFRM Plan for the Lower Kok River Basin
2	Study on flash floods in the Kok River Basin
3	Capacity Building on Flood Risk Management in Chiang Rai Province
4	Landuse Planning for Flood-prone Areas in Chiang Rai Province
5	Flood Proofing of Key Infrastructure in selected areas in Chiang Rai Province
6	Joint Bank Protection Study – Bokeo

1.4 Vietnam shortlist of selected projects for ProDIP

The selected FMM projects for the ProDIP for Vietnam are shown in the following table.

Table 1.4 Shortlist of selected projects for Vietnam.

	Description/ Name
1	Design Criteria for Flood Protection
2	Flood Risk Mitigation/ Diversion in the Border Area Between Cambodia & Vietnam
3	Development of Flood Control Structures along Tu Thuong Canal
4	Rotation Flood Control Embankment in Deep-flooded area of the POR area.
5	Flood Control Sluice Gates along Tien River
6	Flood Control For Fruit Tree Area in the Southern Nguyen Van Tiep Canal
7	Enlarge Main Canals in the POR
8	Flood Control Sluice Gates along Hau River
9	Rotation Flood Control Embankment in Deep-flooded area of the LXQ area.
10	Enlarge Main Canals in the LXQ
11	Riverbank Protection Works in Dong Thap, Tien Giang, Ben Tre, An Giang, Can Tho and Vinh Long Provinces
12	Integration of Flood Risk Reduction in the Implementation of P135, with emphasis on Flood Proofing of Infrastructure and housing in Kon Tum Province

CHAPTER 2

STRATEGIC DIRECTIONS FOR FLOOD RISK MANAGEMENT IN THE LMB

2 STRATEGIC DIRECTIONS FOR FLOOD RISK MANAGEMENT IN THE LOWER MEKONG BASIN

2.1 Background

At the end of the Inception Phase of the FMMP-C2, a number of areas was selected for which strategic directions for flood risk management were developed during the Stage 1 Implementation Phase.

The areas that were selected are:

- The Lower Nam Kok Basin in Thailand;
- The Lower Se Bang Fai Basin in the Lao PDR;
- The Upper Se San Basin in Vietnam;
- The transboundary Mekong Delta area on the right bank of the Bassac River;
- The transboundary Mekong Delta area on the left bank of the Mekong River.

Two other areas (Bokeo in Lao PDR and Kratie in Cambodia) refer to areas where river bank erosion during floods is the main issue, rather than flooding.

For the formulation of the strategic directions for flood risk management in the above mentioned areas the following approach was developed:

- Assessment of the flood risks for the actual situation;
- Formulation of flood risk management measures;
- Estimates of impacts of the flood risk management measures.

For the assessment of the flood risks in these areas reference is made to the Annex 2 of the Stage 1 Evaluation Report. The strategic directions for Flood Mitigation and Management in the areas are described below.

2.2 The Lower Se Bang Fai area

The main objective of the proposed project is to reduce flood risks. The reduction of the flood risk can be achieved by either the reduction of the flood hazard with the help of structural measures, the reduction of the vulnerability or a combination of both.

The flood risk in the Lower Se Bang Fai is mostly due to agricultural damages to wet season crops. Overall reduction of vulnerability is most effective if the susceptibility of agricultural production is reduced. This can be done by adapting the cropping pattern to the flood regime and/or the introduction of more flood-resistant crops.

The reduction of the flood hazard in the Lower Se Bang Fai area can be achieved through:

a) The creation of flood retention capacity in or upstream of the flood-prone area. Such measure allows for the reduction of the Se Bang Fai peak discharges and, consequently of the peak water levels in the river and adjacent floodplains.
b) The creation of additional discharge capacity of the river system. Such measure will reduce the peak water levels. The discharge capacity can be increased by deepening and/or widening of the river or by creating additional capacity in a diversion and/or by-pass canal.
c) The construction of dike schemes that protect selected areas against high water levels.
d) The construction of gates that prevent Mekong waters to enter the Se Bang Fai floodplains.
e) The improvement of the drainage system in the floodplains, allowing for a reduction of the duration of the flooding. Further reduction of the duration of flooding can be obtained by the installation of gated structures at the locations where the (natural) drainage system of the floodplains drains into the Se Bang Fai or the Mekong rivers.

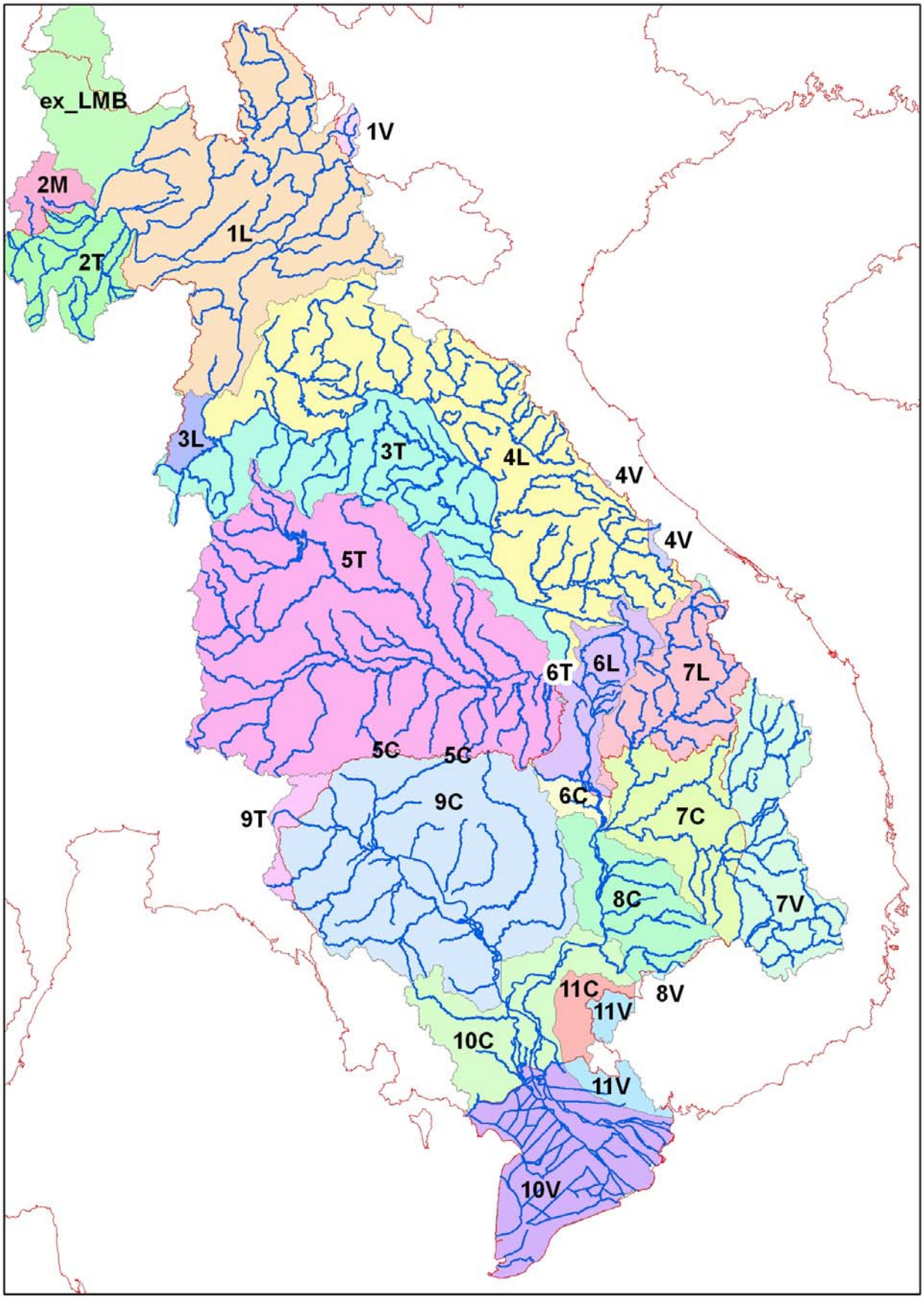


Figure 2.1 The sub-areas in the Lower Mekong Basin; the letters refer to the countries (C = Cambodia, T = Thailand, L = Lao PDR, V = Vietnam, M= Myanmar).

Regarding the creation of flood retention capacity upstream of the flood-prone area, a project idea was identified concerning the construction of a flood storage reservoir in the Se Bang Fai at the confluence with the Xe Noy, just upstream of the Road 13 crossing, combined with construction of a flood gate at the Se Bang Fai mouth. This option has been discarded for reasons of far-reaching resettlement needs, impact on environment and financial construction costs.

Under actual conditions the floodplains have their own natural retention capacity. The creation, reservation and/or enhancement of retention capacity in the flood-prone area is, therefore, only relevant in combination with the implementation of dike schemes. In that case, part of the floodplain can be protected while other parts can be reserved for the retention of flood waters. The retained floodwater could be used as water for irrigation in the dry seasons.

For the creation of additional discharge capacity, reference is made to previous studies on the flood diversion canal "Xelat" from Banne Sokbo to Banne. A flood diversion option is thought to be cost-wise much more attractive than increasing the discharge capacity of the river channel itself.

For Nongbok District, ideas have been developed that focus on drainage improvement rather than on flood protection. A number of 23 schemes have been identified for widening and deepening (natural) drains to be provided with gates at the confluence with Se Bang Fai or Mekong. These schemes try to achieve a reduction in the inundation time of flooded areas to 15 days or less.

The development of a strategic direction for flood risk management in the lower Se Bang Fai area is closely related with the envisaged landuse scenarios. The risk under the present landuse conditions is relatively low, essentially because the actual cropping patterns are fully tuned to the natural flood cycle. Nevertheless, the risk under the actual conditions is still of the order of USD 3 million per year in the Nongbok district alone.

It is anticipated that substantial reduction of the existing risk can be achieved by reduction of the duration of flooding. The option of drainage improvement in combination with gating of the Se Bang Fai tributaries is an attractive option to achieve this goal.

2.3 The Upper Se San area

The Steering Committee for Flood Storm Control of the People's Committee of Kon Tum Province has stipulated that a long-term plan for flood risk management needs to be developed to minimize the losses and to replace the existing reactive approach. In line with this recommendation Community Based Disaster Risk Management (CBDRM) activities have been initiated in which the communal Committee for Flood and Storm Control members, together with villages' representatives, develop plans for "Safer Communities".

The relatively low flood-related damages (besides the human fatalities) and limited development potentials do not justify substantial investments in sub-basin-wide structural measures for flood hazard reduction. Flood proofing of infrastructure though seems a sound measure that could reduce substantially the existing flood risks in the area, including human fatalities.

The strategic direction is to incorporate flood risk assessments and flood proofing measures in the socio-economic development and poverty reduction initiatives in the affected areas. Measures for incorporation will be based on guidelines developed under this FMMP-C2 (i.e.

guidelines for risk assessments, IFRM guidelines for basin planning and guidelines for flood proofing).

2.4 The West Bassac region in Cambodia

During Stage 1 of FMMP-C2 a variety of flood risk management options were considered and on the basis of initial evaluation of the impacts on risk reduction and potential loss of flood benefits, strategic directions for flood risk management were formulated for the different areas.

The development of strategic directions for flood risk management in the unprotected floodplains in Cambodia is closely related with the envisaged landuse scenarios:

a) single cropping in the deep-flooded areas (actual landuse);
b) double cropping in the deep-flooded areas;
c) double or triple cropping in the shallow-flooded areas.

The direct relation between the different landuse scenarios and flood risk management strategies is as follows:

Ad a Single cropping
can be done without protection of the agricultural land. Structural measures can be restricted to protection and/or flood proofing of human settlements and public infrastructure.

Ad b Double cropping
in the deep-flooded areas requires flood management to ensure that sufficient flood-free time is available between two floods. In practice, this comes down to early flood protection of the agricultural land and/or adequate drainage of flooded areas after the flood. Additional protection and/or flood proofing will be required for infrastructure and human settlements.

Ad c Double or triple cropping
in the shallow-flooded areas requires a full protection of these areas. A differentiation of the protection levels in these areas is to be considered, in which human settlements and essential infrastructure is provided with a higher level of protection then the agricultural areas.

Current landuse in the West Bassac areas is merely restricted to single rice cropping in the absence of adequate structural measures for flood management and irrigation. "Living with flood" is the leading concept. The existing flood risks in the West of Bassac area do not justify substantial investments in flood protection works to reduce agriculture related risks. In case no further agricultural development in this area is envisaged, flood risk management measures should focus on the reduction of flood risks related to business, housing and infrastructure. These risks can be reduced by:

- early warning;
- relocation of houses and businesses;
- flood proofing and/or protection of residential areas and infrastructure.

Relocation of houses and or business may be considered if the related costs are less than flood proofing and/or protection. This is not likely to be the case, but needs further investigation.

If, however, agricultural development is envisaged in these unprotected floodplains then such developments would create increased risks in the absence of adequate flood protection measures. Polder development would then be an obvious approach. Such development should go together with the provision of irrigation facilities. The loss of environmental benefits,

especially fisheries related benefits, will play a crucial role in the planning and design of such polder schemes.

2.5 The East of Mekong Region in Cambodia (Prey Veng)

In the Cambodian East of Mekong region "living with floods" is the leading concept. Landuse is merely restricted to single rice cropping in the absence of adequate structural measures for flood management and irrigation. The formulation of a strategic direction for flood risk management in the deep-flooded areas is based on the living with floods concept in combination with the same landuse scenarios and corresponding flood protection strategies as presented for West Bassac.

Preliminary estimates indicated that the flood risk in this region is of the order of some USD 2 million per year. Over 60% of this risk is agricultural damage. Flood damage to agriculture applies mainly to wet season paddy cultivation and depends more on the maximum annual level of the flood rather than on the timing.

Four flood risk management zones and the type of structural measures required were identified under Stage 1 of FMMP-C2 based on present flood conditions, existing road and flood embankments, human settlements and landuse.

For the flood management in East of Mekong area, the same strategic direction is proposed as for the West Bassac area described above. An essential difference, though, would be to keep a substantial zone unprotected near the Vietnamese border. Flood protection in this area is closely related to the operation of the flood management infrastructure in Vietnam and flood management, if any, in this area is to be done jointly with Vietnam.

2.6 The Long Xuyen Quadrangle in Vietnam

Strategic directions for flood risk management in the Long Xuyen Quadrangle (LXQ) are clearly defined in the Long-term Flood Control Planning 1998, as approved by the Vietnamese Government in 1999. The Vietnamese long-term planning for this area is essentially based on the concept of "living with floods" and management of floods, to allow for a safe production of double rice - winter-spring and summer-autumn - crops.

The overall strategy is to:

- Control floods from the border areas by enlarging canals in the LXQ to increase flood discharge to the Gulf of Thailand and hence reduce the inundation depth for cultivation of late flood season crops and to improve the overall flood condition in the border areas.
- Provide a flood mitigation scheme which would enable the production of three crops per year. The rotation scheme to be adopted will assist with flood protection of crops, sediment distribution to enrich the soils, and enhance flushing of soil acidity, fertilizers and other toxic materials and thus improve the quality of the soil for cultivation.

Under the present landuse and flood protection conditions the risk related to agriculture is relatively low as compared to the total risk. The share of agricultural risk is only 1% of the total risk. By far most of the risk (about 85%) is related to infrastructure and relief.

Moreover, under average flood conditions hardly any damage occurs and that most risk is related to extreme flood conditions. Apparently, adequate protection is already in place for the lower floods.

2.7 The Plain of Reeds in Vietnam

Strategic directions for flood risk management in the Plain of Reeds (POR) are clearly defined in the Long-term Flood Control Planning 1998, as approved by the Vietnamese Government in 1999 (Decision No 144/1999/QD-TTg) and the Master Plan Study on Water Works of the Mekong Delta as approved by the Vietnamese Government in 2006 (Decision No 84/2006/QD-TTg).

Similar to the approach for the LXQ, the strategy proposed to achieve the flood control objectives for the POR relies on isolating areas from floodwaters by dikes, and utilizing embankment systems at different scales and levels to control the movement of floodwaters. The corresponding technical options aim at:

- The control of flooding using the principle of "living with floods" and distributing flood flows in the most efficient way;
- Reduction of flood pressure on the central area of the POR by improving flood drainage capacity at Tu Thuong and at the lower parts of Mekong and Vam Co Rivers;
- The control of early floods for harvesting of summer – autumn crops and acceleration of drainage for winter - spring crops while concurrently allowing for sediment accretion on the floodplains from the Mekong River;
- Improvement of the canal drainage system in order to reduce depth, duration of inundation, increase dry season discharge for irrigation and impede salinity intrusion;
- Using the tidal influence to enhance the effectiveness of drainage and irrigation measures;
- Raising ground levels above flood levels for residential areas and road networks;
- Construction of new canals and enlargement of existing canals to help reduce depth and duration of inundation, and in particularly, to accelerate flood drainage for early seeding winter – spring crop.

2.8 Mekong erosion management in Bokeo and Kratie

In the Bokeo area in Lao PDR and Kratie in Cambodia, river bank erosion rather than flooding along the Mekong River is considered to be a major issue.

Like many other rivers, the Mekong erodes its banks at many locations. Erosion along the Mekong in the Bokeo stretch has not reached alarming proportions but the effects on (i) international border, (ii) sustained socio-economic development of the region, and (iii) flood protection of existing infrastructure and cultural heritage sites require prompt attention at critical erosion locations. In Kratie, the erosion is not significant. It is mostly gully erosion of the Mekong banks which has been caused by overland flows from roads running parallel to the river.

The problems, which until now have prevented a systematic and strategic approach to erosion management, in particular in Lao PDR, are of a morphological, economic and technical nature. The increase in population, the investment in infrastructure in towns and rural areas (irrigation and drainage projects), the river training works already carried out in the recent past for various as well as cost-effective improved techniques in arresting bank erosion, are all the more reasons for formulating a project with a broader view into the technical and socio-economic feasibility of protection works against bank erosion.

The overall strategy will focus on the engineering analysis of all reasonable options for protecting the river banks against erosion, with special emphasis on floods, environmental, social and political considerations.

The main objectives will be (i) to prevent erosion along the international border between Lao-PDR and Thailand in the case of Bokeo and (ii) to prevent bank erosion that affects urban and semi-urban areas, transport and flood infrastructure from damage during floods.

CHAPTER 3

PROJECT DESCRIPTION SHEETS

3 PROJECT DESCRIPTION SHEETS

In developing the ProDIP further, Project Description Sheets (PDS) have been prepared for each of the nominated 36 ProDIP projects. Basically, the PDS constitutes a collation of information on each project. In general, information contained in the PDS includes:

- Project description and its strategic importance;
- Development and project objectives and key indicators;
- Project outputs;
- Principal beneficiaries;
- Outline of the key features/ scope of works for the project;
- Proposed institutional/ implementing arrangements;
- Expected timing of implementation of activities;
- Estimated costs and proposed financing arrangement;
- Key risks and assumptions that could affect the implementation of the project and desired outcomes.

Thus, the PDS can be regarded as a "stand-alone" document that provides vital information at a glance on each of the selected ProDIP projects. It should be noted that the PDS also forms part of MRC's Project Portfolio, which is currently being assembled for the Basin Development Plan (BDP). The Project Portfolio contains information on projects that are regarded as strategically important in achieving sustainable and efficient development of the basin under the IWRM-based Basin Development Strategy that developers, planners and government agencies can use to attract financing sources for investments.

The format of the PDS has been provided by the BDP.

Information contained on the PDS was compiled from available data/ information and from information provided by the Programme Coordinators/ NMC's in the four countries. It has not been possible to provide all the information required to complete fully the PDS, because some of the ProDIPs are only "concept ideas" at this stage. This particularly relates to project costs, institutional and financing arrangements and timing schedule for implementation.

The PDS prepared for the 36 ProDIP projects are contained in the Appendices of this document.

CHAPTER 4

PRIORITISATION OF PRODIP FOR THE LMB

4 PRIORITISATION OF PRODIP FOR THE LMB

4.1 General

It became necessary to prioritise the shortlisted FMM projects for each country as some projects required urgent attention and need to be implemented as early as possible, while others that are less urgent can be implemented at a later stage.

In view of the above, the Consultant has provided an assessment of the relative importance of each ProDIP project in each of the riparian countries. The ranking was purely based on the perceived importance of the individual project in terms of expected reduction in flood risk, anticipated socio-economic benefits on the vulnerable people living in the flood-prone areas, and sustainability of the proposed schemes.

In prioritising the projects it appeared that some of them had the same level of importance. In such cases, the projects were equally ranked. However, there is a need for proper sequencing of projects that have been equally ranked or are linked in such a way that implementation of one could affect the outcome of the other and hence the overall success of the proposed flood mitigation measures.

Table 4.1 to Table 4.4 in the following sections show the prioritisation by the Consultant of the ProDIP projects for each country.

4.2 Cambodia ProDIP prioritisation

The prioritised list for the selected 12 FMM projects for the ProDIP for Cambodia is shown in the following table.

Table 4.1 Prioritisation of ProDIP for Cambodia.

Project	Rank	Comments/ Reasons
IFRM Plan Preparation for Takeo – West Bassac	1	Very High priority; Demonstration project
Flood Protection Deep-flooded Area (Zone 2) - West Bassac	2	High priority; Demonstration project
Flood Protection Four Polders (Zone 1) – West Bassac	2	High priority; Demonstration project
Flood Proofing Settlements and Infrastructure (Zone 2) – West Bassac	3	Medium priority; only after the implementation of infrastructure projects
Flood Protection/ Proofing Angkor Borey – West Bassac	4	Medium - Low priority; might be considered by other line agencies
Flood Protection Shallow-flooded Area (Zone 3) – West Bassac	2	High priority; as related to lower flood damage
Flood Risk Mitigation/ Diversion in the Border Areas Between Cambodia and Vietnam	4	Based on Vietnam's ranking of medium priority; to reduce flood risk in the border areas of Cambodia and Vietnam
IFRM Plan Preparation East of Mekong (Prey Veng), East Mekong	2	High priority; could be taken up by the current Work Bank project on trans-boundary project between Vietnam-Cambodia
IFRM Plan Preparation Stung Treng	4	Low priority; could be a component of an existing project

Project	Rank	Comments/ Reasons
Flood Risk Management Options Tonle Sap Great Lake	4	Low priority; should be linked to a specific project in the area.
Land Zoning Flood Proofing Peam Ro	4	Low priority; should be part of the comprehensive IFRM in East Mekong region.
Capacity Building Disaster Management	5	Low priority; should be taken care of by the FMMP-C4.

4.3 Lao PDR ProDIP prioritisation

The prioritised list of the selected 6 FMM projects for the ProDIP for Lao PDR is shown in the following table.

Table 4.2 Prioritisation of ProDIP for Lao PDR.

Project	Rank	Comments/ Reasons
Capacity Building in Flood-prone Area of Champasack	4	Low priority;
IFRM Plan in Lower Se Bang Fai River Basin	1	Very high priority; Demonstration Project
Landuse Planning in Sebanghien Flood-prone Area	5	Very low priority;
Joint Bank Protection Study – Bokeo	2	High priority; riverbank erosion is considered a major problem in the area.
Establishment of National Flood Forecasting and Warning Centre	3	Medium priority; current practice in flood warning requires improvement
Study on Flash Floods in Luangnamtha Province	3	Medium priority

4.4 Thailand ProDIP prioritisation

The prioritised list of the selected 6 FMM projects for the ProDIP for Thailand is shown in the following table.

Table 4.3 Prioritisation of ProDIP for Thailand.

Project	Rank	Comments/ Reasons
Preparation of IFRM Plan for the Lower Kok River Basin	1	Very high priority.
Study on flash floods in the Kok River Basin	1	Very high priority; could also be part of the IFRM Plan for Lower Kok River Basin
Capacity Building on Flood Risk Management in Chiang Rai Province	3	Medium priority
Landuse Planning for Flood-prone Areas in Chiang Rai Province	2	High priority; could be part of the IFRM Plan for Lower Kok River Basin
Flood Proofing of Key Infrastructure in selected areas in Chiang Rai Province	4	Low priority; could be part of the IFRM Plan for Lower Kok River Basin
Joint Bank Protection Study – Bokeo	2	High priority.

4.5 Vietnam ProDIP prioritisation

The prioritised list of the selected 12 FMM projects for the ProDIP for Vietnam is shown in the following table.

Table 4.4 Prioritisation of ProDIP for Vietnam.

Project	Rank	Comments/ Reasons
Design Criteria for Flood Protection	2	High priority; as there is the need to improve the existing design approach for flood protection.
Flood Risk Mitigation/ Diversion in the Border Area Between Cambodia & Vietnam	4	Medium priority; reduce flood risk in the border areas of Cambodia and Vietnam.
Development of Flood Control Structures along Tu Thuong Canal	7	Low priority; as only the Tu Thuong section is to be considered.
Rotation Flood Control Embankment in Deep-flooded area of the POR area.	5	Low priority; enable cultivation of 3 crops per year.
Flood Control Sluice Gates along Tien River	6	Low priority; will not have significant impact on flood risk reduction
Flood Control For Fruit Tree Area in the Southern Nguyen Van Tiep Canal	4	Medium priority; protection of fruit crops
Enlarge Main Canals in the POR	3	High priority; need to increase drainage capacity of canals in the POR and border areas
Flood Control Sluice Gates along Hau River	6	Low priority; Will not have significant impact on flood risk reduction
Rotation Flood Control Embankment in Deep-flooded area of the LXQ area.	5	Low priority; enable cultivation of 3 crops per year.
Enlarge Main Canals in the LXQ	3	High priority; need to increase drainage capacity of canals in the POR and border areas
Riverbank Protection Works in Dong Thap, Tien Giang, Ben Tre, An Giang, Can Tho and Vinh Long Provinces	1	Very high priority; as there is risk to the loss of life in some areas, such as Vinh Long, Tau Chau and Houg Ngu.
Integration of Flood Risk Reduction in the Implementation of P135, with emphasis on Flood Proofing of Infrastructure and housing in Kon Tum Province.	1	Very high priority; more vulnerable people (ethnic and poor) are affected

CHAPTER 5

TENTATIVE IMPLEMENTATION PLANS/ SCHEDULES

5 TENTATIVE IMPLEMENTATION PLANS/ SCHEDULES

Tentative plans for the implementation of the various ProDIPs for each country have been prepared and these are shown on Figure 5.1 to Figure 5.4. The durations shown on the bar charts include, where applicable, periods for study/ investigations, preliminary and detailed engineering designs and construction. The Project Description Sheet column refers to the PDS-sheet numbers in the Appendices.

It is emphasised that the proposed implementation plans are tentative only, and as such are expected to be revised at a later stage by the individual countries based on availability of funding and other implementation arrangements.

PDS #	DESCRIPTION/ NAME	YEAR										
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
01	IFRM Plan Preparation for Takeo – West Bassac											
02	Flood Protection Deep-flooded Area (Zone 2) - West Bassac											
03	Flood Protection Five Polders (Zone 1) – West Bassac											
04	Flood Proofing Settlements and Infrastructure (Zone 2) – West Bassac											
05	Flood Protection/ Proofing Angkor Borey – West Bassac											
06	Flood Protection Shallow-flooded Area (Zone 3)– West Bassac											
07	Flood Risk Mitigation/ Diversion in the Border Areas Between Cambodia and Vietnam											
08	IFRM Plan Preparation East of Mekong (Prey Veng), East Mekong											
09	IFRM Plan Preparation Stung Sreng											
10	Flood Risk Management Options Tonle Sap Great Lake											
11	Land Zoning Flood Proofing Peam Ro											
12	Capacity Building Disaster Management											

Figure 5.1 Cambodia projects implementation plan.

PDS #	DESCRIPTION/ NAME	YEAR										
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
01	Capacity Building in Flood-prone Area of Champasack											
02	IFRM Plan in Lower Se Bang Fai River Basin											
03	Landuse Planning in Sebanghien Flood-prone Area											
04	Joint Bank Protection Study – Bokeo											
05	Establishment of National Flood Forecasting and Warning Centre											
06	Study on Flash Floods in Luangnamtha Province											

Figure 5.2 Lao PDR projects implementation plan.

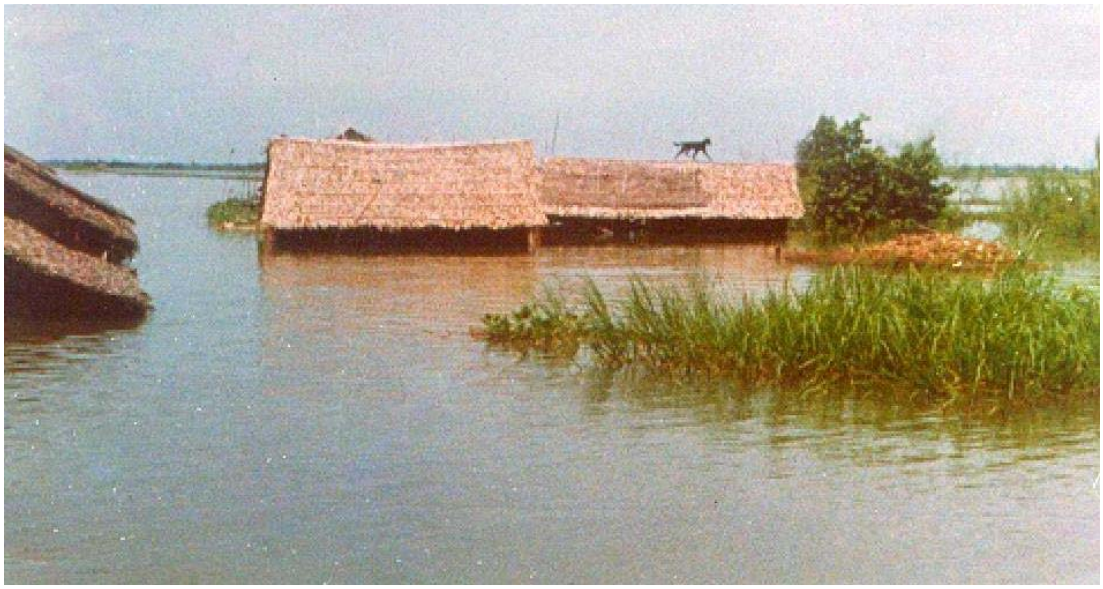
PDS #	DESCRIPTION/ NAME	YEAR										
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
01	Preparation of IFRM Plan for the Lower Kok River Basin											
02	Study on flash floods in the Kok River Basin											
03	Capacity Building on Flood Risk Management in Chiang Rai Province											
04	Landuse Planning for Flood-prone Areas in Chiang Rai Province											
05	Flood Proofing of Key Infrastructure in selected areas in Chiang Rai Province											
06	Joint Bank Protection Study – Bokeo											

Figure 5.3 Thailand projects implementation plan.

PDS #	DESCRIPTION/ NAME	YEAR										
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
01	Design Criteria for Flood Protection											
02	Flood Risk Mitigation/ Diversion in the Border Area Between Cambodia & Vietnam											
03	Development of Flood Control Structures along Tu Thuong Canal											
04	Rotation Flood Control Embankment in Deep-flooded area of the POR area											
05	Flood Control Sluice Gates along Tien River											
06	Flood Control For Fruit Tree Area in the Southern Nguyen Van Tiep Canal											
07	Enlarge Main Canals in the POR											
08	Flood Control Sluice Gates along Hau River											
09	Rotation Flood Control Embankment in Deep-flooded area of the LXQ area											
10	Enlarge Main Canals in the LXQ											
11	Riverbank Protection Works in Dong Thap, Tien Giang, Ben Tre, An Giang, Can Tho and Vinh Long Provinces											
12	Integration of Flood Risk Reduction in the Implementation of P135, with emphasis on Flood Proofing of Infrastructure and housing in Kon Tum											

Figure 5.4 Vietnam projects implementation plan.

APPENDICES



APPENDIX 1 PROJECT DESCRIPTION SHEETS FOR CAMBODIA

Project Description Sheet: Cambodia 01

Project name	**IFRM Plan Preparation for Takeo (West Bassac)**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Flood control – control flooding;flood control - embankment**	Mainstream reach	**Bassac**	
Implementation	**National**	Tributary/ Sub-area(s)	**10C**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The rural population living in the provinces along the Mekong and Bassac River systems in Cambodia depend predominantly on the floodplains of these river systems for their subsistence and livelihood which are mostly based on agricultural activities. Normal floods bring fertile sediment to the farmlands and floodwaters to the forest areas which sustain a rich floodplain biodiversity. The big floods do cause major damage to crops, houses, infrastructure such as roads, bridges, irrigation facilities; disrupts economic activities and normal daily life and also cause the loss of life in some cases. However, it is generally accepted that the big floods bring more benefits in terms of increased soil fertility, fish resources, and flushing/ cleaning of farmlands in the flood-prone areas.

Traditional coping mechanism to floods is to build houses on stilts that are high enough and above observed flood levels, in the villages; practicing agriculture in upper, medium and shallow-flooded fields or only grow recession crops. With growing population, traditional coping mechanisms have become increasingly less efficient. More land needs to be reclaimed from the floodplains for growing of crops as well as for housing, water management and transport infrastructure (roads). In the floodplain, flooding is caused by natural causes and by flood protection measures constructed in parts of the floodplain.

The concept of "living with floods" utilises to maximum advantage, benefits from floods while at the same time implementing measures to limit flood damages. The integrated flood risk management plan for West Bassac will involve a holistic approach to flooding conditions and measures necessary to reduce risk of damage inflicted by frequent flooding. Avoiding high flood periods and implementing different levels of protection for the deep and shallow-flooded areas have been widely accepted and successfully applied in the Mekong Delta in Vietnam.

The Delta part of Cambodia is the most productive part for agriculture development of the country. However, for sustainable medium to long-term development needs, careful medium to long-term planning based on solid scientific approach of an integrated flood risk management is required.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The overall objective of the project is to achieve sustainable use of water and related resources in the Cambodian part of the Mekong Delta for the country's economic development, while minimizing the overall flood impacts from structural measures proposed for flood management in the region.

The immediate objective is to establish an integrated flood risk management plan for the West Bassac area for the medium to long-term as part of an overall integrated flood risk management, in particular, in the part of the Cambodian Mekong Delta and the Mekong Delta as a whole. Main key indicators are:

- Increased degree of integration of flood management measures in socio-economic development planning;
- Increased landuse utilisation and diversification as well as more stable crop production in the project area;
- Increasing coordination of activities/ measures at all administrative levels for flood risk reduction and management.

Principal beneficiaries	*Main groups of people the project will benefit*
The ultimate beneficiary will be affected communities in the project area, related government line agencies at national, provincial and district levels.	

Outline description	*Key features of the project/ programme*

Key features of the Project will be based on existing information and analysis of the West Bassac Demonstration Project studies including any established guidelines. The elaborated Terms of Reference for the feasibility study of the Integrated Flood Risk Management Plan of the West Bassac flood management area will be followed and developed into a bankable project.

The project will consist of a more detailed investigation on flood risk reduction assessment for different options in the different protection zones and at different levels of flood protection; detailed design of flood protection infrastructure including dikes and flood diversion channels; irrigation and drainage canals; water control structures, sluice gates, culverts, water intake structures, storage reservoirs, pumping stations, etc..

The study will include detail socio-economic, topographic, soil and geotechnical survey including public participation. Operation and maintenance plan of the proposed measures and capacity building of technical staff at national, provincial and district levels will also be included.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: MOWRAM/ MAFF/ MDR/ MLUPC/ CNMC.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- The West Bassac Demonstration Project documents, by FMMP-C2.
- Main Evaluation Report of the FMMP-C2, Stage 1 and Stage, 2.
- Roads and Floods, Best Practices Guidelines for Integrated Planning and Design of Economically Sound and Environmentally Friendly Roads in The Mekong Floodplains of Cambodia and Vietnam. Final Draft report, 2008.
- Water Utilization Program (WUP by JICA).
- The consolidation of Hydro-meteorological data and Multi-functional Hydrologic Roles of Tonle Sap Lake and vicinities.
- The Chaktomuk Junction, Hydraulics and Environment, by MRC, 2000.

Timing		
Studies	Expected start year	2011
	Duration (years)	2
Implementation	Expected start year	2013
	Duration (years)	5
Operation	Expected start year	2019

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ 10 million
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- It is assumed that the government will begin building institutional capacity in integrated flood risk management and integrated water resource management at national and provincial levels including building up financial capacity for medium to long-term development.
- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 02

Project name	**Flood Protection Deep-flooded Area (Zone 2) - West Bassac**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Flood control – embankments; controlled flooding**	Mainstream reach	**Bassac River**	
Implementation	**National**	Tributary/ Sub-area(s)	**10C**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Zone 2 has a total area of 104,288 ha. The north- eastern corner of this area is located in Kandal Province and the rest of the area is located in Takeo Province. Zone 2 is located in the deep-flooded area and it covers a large elongated area of the West Bassac River floodplain. Deep and prolonged flooding is the main constraint for water resources development for Zone 2. The main economic activities are dominated by flood recession rice growing with some limited cash crop cultivation. Large part of the land resources is underutilized due to inadequate water resources and flood management infrastructure. The planning capacity of the concerned line agencies is limited. Rice farming depends largely on natural climatic conditions (flood and droughts).

According the preliminary assessment made by the FMMP-C2, based on flood hazards mapping and flood damage assessment, it was found that the risk of damage to agriculture is very high, up to 50% of the total damage costs, as compared to Vietnam, which is only 3%.

The implementation of a flood risk management and mitigation for Zone 2 will provide an opportunity for more effective use of the underutilized land and water resources of the zone as well as improve the efficiency of the existing IWRM infrastructure. An integrated planning in management of the wetland areas would benefit fisheries, preserve the ecosystem and improve local transportation and trade.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

There is no comprehensive plan for structural flood control measures in Zone 2, although some flood control works do exist including a number of rehabilitated irrigation/ drainage canals namely; the polder system in Por Sar (Koh Andeth and Treang districts); irrigation/ drainage canal systems: Takeo, Angkor Borey, Canals, and a number of irrigation/ drainage canals in Koh Andeth; a number of isolated water reservoirs such as Thnot Te, Thammanon, Bati, Samroang, the upper Slakou reservoir river, etc.

Amongst the project ideas identified for the West Bassac, Zone 2 was identified as one of the potential areas with comparatively low investment and higher returns for increasing and stabilizing agricultural production in the deep flood-affected areas. The implementation of an appropriate flood control measure in this zone would lead to stable agricultural production, particularly rice cultivation, by increasing and securing two crops per year in addition to leading the way for the development of other related natural resources such as fisheries, eco-system conservation, etc., with appropriate zoning and regulation. Adopting the concept of living with floods, it was proposed to protect Zone 2 area against early floods in order to secure and stabilize early crops (May-July) by providing dikes and drainage canal infrastructure and management capacity building. After the harvest of the early crops at the end of July, the zone will be flooded, fulfilling its natural function as a flood storage area until the beginning of flood recession period in November marking the beginning of the crop recessing which could last until April-May depending on flood depth and water availability.

The overall objective is to increase and stabilize agricultural production in the deep-flooded area of the West Bassac by applying integrated flood risk and water resources management as part of poverty reduction strategy. The immediate objectives are:

- To increase landuse intensification for agricultural production by providing adequate early flood protection to crop and settlement areas
- To provide adequate and affordable water supply system to supplement irrigation for early and flood recession crops.
-
- Major indicators are:
- Living conditions in the deep-flood area of the West Bassac will improve after the implementation of the Project , including drop in poverty rate.
- Intensified landuse after the provision of major flood protection and water management infrastructure.

Principal beneficiaries *Main groups of people the project will benefit*

Planning departments at national, provincial, district and commune levels. When implemented, the ultimate beneficiaries will be people living in the deep-flooded area in Zone 2 of the West Bassac.

Outline description *Key features of the project/ programme*

The deep-flooded area zone 2 of the West Bassac Demonstration Project is extending between the western bank of the main diversion canal of zone 1(Prek Ho, Prek Ambel, Prek Moat Chhrouk) to the east and the shallow-flooded area (Zone 3) flood protection dike to the west, to the north by the RN 2 and to the south by the low dike embankment Kampong Krasaing-Sangkum Mean Chey-Phnom Den covering an area of 78,200 ha.

The zone will be protected against early flood (May to 31st July) for early rice crop. After 31st July the area will be allowed to be flooded and will be used again for rice recession and dry season crops (November-April). The design concept for the zone 2 is to protect early crop from flooding and to supply supplement irrigation to the area. IFRM measures in this zone is consisting of a combination of structural measures and their appropriate operation to protect rice crop against early flood (May- 31St July) as well as to provide supplement irrigation water for all cropping period (early, recession and dry season crop).. During early flood period,water level in this zone controlled by the proposed infrastructure will be maintained below design flood level (dike embankment system along the right bank of the main drain of the zone1 and the Stung Takeo assuring that excess water could be conveyed through the main drains: the Stung Takeo, stored in retention eservoirs and furthermore regulated by sluice gates at Prek Ambel, Prek Ho and Stung Takeo and the five link canals). The main irrigation/ diversion canal linking Boeung Choeung Luong and Stung Takeo floodplain will play also important role in reducing flood risk as well as supply of supplement irrigation water. For future management, the zone 2 is subdivided into seven management sub-zones.

The proposed measures for IFRM in zone 2 consist of main infrastructure and infrastructures related to each sub-zones. Main infrastructures related to zone 2 are:

- Left bank of the main diversion canal extending from Ta Khmao town to Kampong Krasaing along the Prehk Ho-Prek Ambel, Prek Moart Chrouk Canal to protect the area against maximum early floods for the period up to 31st July. Flood after 31July will be allowed to spill over into the zone via a number of low level crossings.
- A low dike embankment to protect early flood from Kampong Krasaing at Takeo River at the Cambodian-Vietnamese border from Kampong Krasaing through Sankum Meanchey and on to Phnom Den (joining with RN 2) is planned to protect the area against maximum early floods.
- Improvement of the conveyance capacity of the Stung Takeo and embankments to contain early flood waters within its channel.
- Five cross-regulators to control water flow in and out of the zone.
- Secondary infrastructure relating to each sub-zone for water management includes off-take sluice gates, culverts, pumping stations and irrigation/ drainage canals.

Proposed institutional arrangements *Expected implementing agency(s), operator(s) etc*

Executing Agencies: MOWRAM; CNMC.

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- Flood hazard maps and flood damage curves have been developed based on long-term hydrological maximum flows at Kratie (1910-2006) and flood damage curves derived from socio-economic survey in Koh Andeth and Koh Thom.
- One initial studies was The Community Self Reliance and Flood Risk Reduction Project financed by ADB under TA 4574-CAM, and implemented by MOWRAM and NCDM in collaboration with Asian Disaster Preparedness Center (ADPC).
- "Community Based Disaster Risk Reduction Strategy (2007-2012) for Flood and Droughts. Under this project the "Flood Vulnerability GIS Application" was developed as a "Tool for Community Self-Reliance and Flood Risk Reduction" covering the provinces: Prey Veng, Svay Rieng, Kandal and Takeo (16 sets of maps were produced).
- For the West Bassac deep-flooded area, Zone 2, the socio-economic surveys were carried out for 25 districts in Takeo, Kandal and Prey Veng Provinces.

Timing		
Studies	Expected start year	2010
	Duration (years)	5
Implementation	Expected start year	2012
	Duration (years)	10
Operation	Expected start year	2020

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Zone 2 is located to the west of Zone 1 (adjacent to the Bassac River) and hence any flood mitigation works carried out in the Zone 1 Area will affect the vulnerability of Zone 2 area to flooding from the Bassac River. Thus, the success of the proposed flood mitigation works for Zone 2 area is highly dependent on the successful implementation of Zone 1 works, which are intended to prevent/ minimise overbank flows from the Bassac River entering the right bank floodplain.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ 4
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 03

Project name	**Flood Protection Five Polders (Zone1), West Bassac**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Flood control – embankments; river diversion**	Mainstream reach	**Bassac River**	
Implementation	**National**	Tributary/ Sub-area(s)	**10C**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Zone 1 of the West Bassac Integrated Flood Risk Management Project covers an area of 27,419 ha and has high potential for high value crop diversification when compared with the other two zones in West Bassac. The zone is subjected to frequent, prolonged and partly deep flooding by Mekong/ Bassac floodwaters due to the lack of a comprehensive integrated flood risk management measures. Although floods in this area are caused by floodwaters from the Mekong/ Bassac Rivers, the flooding condition is made worse by the impacts of developments both upstream and downstream of the zone including the Mekong Delta in Cambodia. Existing flood management measures in Zone 1 of the West Bassac are isolated, on a small scale and do not lead to sustainable use of water and related resources in this area or stable crop production and secure living conditions.

An overall integrated approach to flood risk management on regional basis taking into account medium and long-term development scenarios, the concept of "living with floods" and making maximum use of the floodwaters while at the same time protecting the area from flood risks is considered more appropriate than the current ad hoc approach to flood risk management in Zone 1.

The project will be implemented with active participation from stakeholders at national, provincial and grass root levels.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The overall objective is to achieve sustainable use of water and related resources in the Mekong Delta region by integrating flood risk management with an integrated water resource development and management plan.

The immediate objectives are:

- To assist relevant line agencies at national and provincial levels in medium to long-term integrated flood risk management plans and its implementation in the West Bassac area.
- To strengthen the capacity of related line agencies at national and provincial level on integrated flood risk management planning as well as integrated water resources and development planning.

Principal beneficiaries — *Main groups of people the project will benefit*

Planning departments of directly related line Ministries at national, provincial, district and commune level. The ultimate beneficiaries will be the flooded-affected people in the West Bassac areas.

Outline description	*Key features of the project/ programme*

The Zone 1 is a deep-flooded area extending between the RN 21 which forms the eastern boundary and runs along the Bassac River from Ta Khmao town in the north to the Cambodian-Vietnam border in the south. It is bounded on the west by Prek Ho-Prek Ambel-Prek Moat Chhrouk Rivers. This zone is to be fully protected against the 1% flood (1 in 100 year flood).

Combined flood mitigation measures being proposed consists of flood diversion and dike systems. Floods will be diverted through a main diversion canal by improving the existing major natural drainage system, the Prek Ho, Prek Ambel and Prek Moat Chhrouk, connecting them and improving the conveyance capacity of the Prek Ho-Prek Ambel segment. For practical operation and management purposes, it is proposed to subdivide Zone 1 into five independent polders. The flood diversion function of some existing 90 colmatage canals connecting the Bassac with the main diversion canal will be replaced by five main canals linking each polder with the Bassac River and with the main drain. The main diversion/ drainage canal will also be used as a main water supply source for irrigation and navigation.

The proposed infrastructure for flood protection in Zone 1 can be sub-divided into: a) main infrastructure, belonging to all five polder system and b) infrastructure specific to each polder:

A. Main infrastructure

- Western dike:
- The western dike is proposed to protect the western side of Zone 1. The plan is to built the dike on the existing road embankment (after improvements are made) which is to be used as a flood-free access road linking each polder with the national road RN 21. The western dike consists of three segments: i) a new segment to be built between Prek Ho and Prek Ambel along the main diversion canal; ii) segment between Prek Ambel and Angkor Borey iii) and the segment Ankor Borey-Kouk Thlok.
- The RN 21, eastern embankment:
- The flood-free RN 21 shall be used as the eastern flood protection dike with additional segment between Chrey Thom and Kok Thlok.
- The main diversion canal has two segments:
- i) the Prek Ho-Prek Ambel (will involve improvements and a new alignment to the existing natural stream; ii) the segment Prek Ambel-Kouk-Thlok (involves improvement to Moat Chrouk Canal).

B. Water management structures and facilities in polders

Zone 1 is sub-divided into five independent polders, covering areas of 2,755 ha, 4,824 ha, 2,887 ha, 6,657 ha, and 9,040 ha respectively. Each polder will have i) one main canal connecting it to the Bassac River with a main diversion canal replacing the flood diversion function of the existing colmatage canals. The connecting canals which will be equipped with intake and outtlet structures will provide water for irrigation; ii) one main irrigation/ drainage canal with a pumping station and one water retention reservoir; iii) a network of secondary and tertiary irrigation/ drainage canals including water control structures; iv); dikes between polders; v) internal access roads.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing Agencies: MOWRAM; CNMC

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- Preliminary flood hazards maps and flood damages curve have been developed based on long-term hydrological maximum flows at Kratie (1910-2006) and flood damage curves derived from socio-economic survey in Koh Andeth and Koh Thom.
- One of the initial studies was The Community Self Reliance and Flood Risk Reduction Project financed by ADB under the TA 4574-CAM, and implemented by MOWRAM and NCDM in collaboration with Asian Disaster Preparedness Center (ADPC).
- "Community Based Disaster Risk Reduction Strategy (2007-2012) for Flood and Droughts. Under this project the "Flood Vulnerability GIS Application" was developed as a "Tool for Community Self-Reliance and Flood Risk Reduction" covering the provinces: Prey Veng, Svay Rieng, Kandal and Takeo (16 sets of maps were produced).
- Flood damage and flood risk studies under the West Bassac Demonstration Project. During Stage 1, intensive data collection was carried out in 2 districts, Koh Andeth in Takeo and Koh Thom in Kandal with the remaining 9 districts in Takeo and 4 in Kandal carried out during Stage 2 of FMMP-C2.

Timing		
Studies	Expected start year	2010
	Duration (years)	2
Implementation	Expected start year	2012
	Duration (years)	5
Operation	Expected start year	2017

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*
Country development plan in the Mekong Delta, the development plan of Zone 2 and Zone 3.	

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US1.8 million…
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- It is assumed that the government will begin building institutional capacity in integrated flood risk management and integrated water resource management at national and provincial levels including building up financial capacity for medium to long-term development.
- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 04

Project name	**Flood Proofing Settlements and Infrastructure (Zone 2) – West Bassac**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Flood proofing**	Mainstream reach	**Bassac River**	
Implementation	**National**	Tributary/ Sub-area(s)	**10C**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Zone 2 has a total area of 104,288 ha. The north- eastern corner of this area is located in Kandal Province while the rest of the area is located in Takeo Province. Zone 2 belongs to the deep-flooded area and it covers a large elongated area of the West Bassac River floodplain. Deep and prolonged flooding is the main constraint for water resources development for Zone 2. The main economic activities are dominated by flood recession rice growing and some limited cash crop cultivation. Large part of the land resources is underutilized due to inadequate water resources and flood management infrastructure. Besides, the existing infrastructure is not operational. The planning capacity of the concerned line agencies is limited. Rice farming in the area depends largely on natural climatic conditions (floods and droughts).

Due to regular flooding, Zone 2 is sparsely populated and farmlands are expanding more into this zone. A small number of isolated villages have been established in areas of higher grounds.

The Stung Takeo, the Takeo Canals and a number of other existing smaller canals are major transportation routes to and from the farms for farmers living in the surrounding villages in the shallow and non flooded areas.

Upon the implementation of the IFRM in Zone 2, landuse will be intensified. The associated benefits with the intensified landuse will be that farmers living close to their farms will reduce their travel times to their farms, cut down on transportation costs of equipment and also harvest, be able to attend more to their crops and have improved access to market and social facilities.

Based on the existing and planned flood management infrastructure, it is proposed to establish a number of flood proofed settlement areas to provide better conditions for farmer and business communities to operate more efficiently.

According to the preliminary assessment made by FMMP-C2, based on flood hazards mapping and flood damage assessment, it was found that the risk of damage to agriculture is very high, up to 50% of the total damage costs, as compared to Vietnam, which is only 3%.

The implementation of flood proofing measures for Zone 2 will provide an opportunity for more effective use of the underutilized land and water resources of the zone as well as improve the efficiency of the existing IWRM infrastructure. An integrated planning in management of the wetland areas would benefit fisheries, preserve the ecosystem and improve local transportation and trade.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

There is no comprehensive plan for structural flood control measures in Zone 2, although some flood control works do exist including a number of rehabilitated irrigation/ drainage canals namely; the polder system in Por Sar (Koh Andeth and Treang districts); irrigation/ drainage canal systems: Takeo, Angkor Borey, Canals, and a number of irrigation/ drainage canals in Koh Andeth; a number of isolated water reservoirs such as Thnot Te, Thammanon, Bati, Samroang, the upper Slakou reservoir river, etc.

Amongst the project ideas identified for the West Bassac, Zone 2 was identified as one of the potential areas with comparatively low investment and higher returns for increasing and stabilizing agricultural production in the deep flood-affected areas. The implementation of an appropriate flood mitigation measure in this zone would lead to stable agricultural production, particularly rice cultivation, by increasing and securing two crops per year in addition to leading the way for the development of other related natural resources such as fisheries, eco-system conservation, etc., with appropriate zoning and regulation.

The overall objective is to maximize benefits through an integrated flood risk and water resources management in the deep-flooded area of the West Bassac.

The immediate objective will be to reduce flood damages to housing and personal properties by establishing flood-proofed villages in the deep-flooded areas, increase farming efficiency and improving living conditions.

Key indicators are:

- Reduced flood losses and increase in landuse utilisation and efficiency
- Livelihood improvements in new settlement areas in the West Bassac as a whole.

Principal beneficiaries	*Main groups of people the project will benefit*

Provincial Urban Land Management and Construction of Takeo and Kandal Provinces and those living in the floodplain areas of Takeo and Kandal Provinces, particularly in Zone 2.

Outline description	*Key features of the project/ programme*

The plan proposes to establish a number of flood-proofed settlement areas in Zone 2, that is,three along the right bank of the main diversion channel, two along the Stung Takeo right bank, two along the Cambodian-Vietnam border and one along the proposed Angkor Borey-Borey Chulsa Road. Each settlement area will be built as either a polder with surrounding dikes with internal drainage systems or on an elevated land (fill system). The settlement areas will be accessible by roads or navigation canals to main business centres of the district and province as well as health care and schools. All settlement areas will be protected against the 100-year flood level.

This area is deep-flooded during the high flood season. This zone will be protected against early floods in order to secure early rice crop (May-July) harvest. Because the neighbouring Zone 1 (on the west side of the Bassac River) will be made flood-free, floodwaters in the Zone 2 area can only come from the downstream end (southern side) due to overbank flows from the Bassac River. The proposed measures for Zone 2 are:

- Flood-free settlement areas at six locations in deep-flooded areas. Each settlement area is planned to accommodate around 500 families. Each flood-free settlement will have an area of 15,000 m2 and will be connected to rural roads or navigation canals.
- Improvement of rural roads in the southern part (deep-flooded area) to connect with flood-free settlement areas.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing Agencies: MOWRAM/ MLUPC/ CNMC.

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- Flood hazard maps and flood damage curves have been developed based on long-term hydrological maximum flows at Kratie (1910-2006) and the curves are derived from socio-economic surveys in Koh Andeth and Koh Thom.
- One of the initial studies was The Community Self Reliance and Flood Risk Reduction Project financed by ADB under the TA 4574-CAM, and implemented by MOWRAM and NCDM in collaboration with Asian Disaster Preparedness Center (ADPC).
- "Community Based Disaster Risk Reduction Strategy (2007-2012) for Flood and Droughts. Under this project the "Flood Vulnerability GIS Application" was developed as a "Tool for Community Self-Reliance and Flood Risk Reduction" covering the provinces: Prey Veng, Svay Rieng, Kandal and Takeo (16 sets of maps were produced).
- For the West Bassac deep-flooded area, Zone 2, socio-economic and flood damage surveys were carried out for: Koh Andeth and Boery Chulsar Districts during Stage 1 involving seven villages (Borey Chulsar, Banteay Thleay, Chroy Paun, Tanhim, Tahien, Taphan and Prey Bay) and the remaining district during Stage 2.

Timing		
Studies	Expected start year	2010
	Duration (years)	1
Implementation	Expected start year	2012
	Duration (years)	2
Operation	Expected start year	2014

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Zone 2 is located to the west of Zone 1 (adjacent to the Bassac River) and hence any flood mitigation works carried out in the Zone 1 Area will influence the vulnerability of Zone 2 area to flooding from the Bassac River. Thus, the success of the proposed flood mitigation works for Zone 2 area is highly dependent on the successful implementation of Zone 1 works, which are intended to prevent/ minimise overbank flows from the Bassac River from entering the right bank floodplain.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ 116,000
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- It is assumed that the line agencies will work in an integrated way.
- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 05

Project name	**Flood Protection/ Flood Proofing Angor Borey – West Bassac**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Flood control – embankments**	Mainstream reach	**Mekong/ Confluence of 5 rivers**	
Implementation	**National**	Tributary/ Sub-area(s)	**10C**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Angkor Borey Town, which is located in Takeo Province, is the district centre of Angkor Borey District. Angkor Borey was an ancient town centre during the Founan period (3rd to the 7th Century). The town is located at the confluence of five main river branches namely, Prek Angkor, Prek Tuol, Prek Kbal Khmoach, Prek Moat Chhrouk and Prek Sandek, and it is surrounded by a dike system. Angkor Borey town is subdivided into eight villages which have been grouped into two blocks and build as polders surrounded by dikes: The first polder is approximately 1 km by 2km in size, covering Prey Sambour, Samakakki A, Samakki B, Kampong Luong and Angkor. The second polder is approximately 800m by 400m in size covering Lampong Po and Ba Tep. There is in total 3,631 families comprising about 21,342 people living within the area. During the 2000 floods, the dike surrounding the town was overtopped (approximately 1.0m of water above the dike crest) and the town was inundated.

The dike systems surrounding Angkor Borey have deteriorated with time as a result of neglect and lack of maintenance. Similarly, the drainage system is no longer working efficiently for the same reason as above.

Items of historical significance could be damaged and lost forever if steps are not taken to mitigate the floods and protect this ancient city.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The objective is to restore the status of Angkor Borey Town as a historical and tourist town by providing it with flood protection infrastructure which is considered basic for its future development as a tourist attraction and an economic centre in the West Bassac area.

The project once implemented would pave the way for the development of the sewerage and sanitation system for the town, including domestic water supply. Angkor Borey will become a tourist attraction town due to its past history and its link with well known ancient temples in the province such as Phnom Chi So, Tonle Bati, Phnom Ta Mao, etc.

Located in the isolated deep-flooded area, the town would become a centre for economic development by promoting trade and tourism. In terms of water resources management, the town marks an important key location where the five river branches converge and distribute flow.

Principal beneficiaries	*Main groups of people the project will benefit*

The project will benefit, in particular, the people living in Angkor Borey, businesses relating to tourism and, in general, the Province of Takeo as the ancient town would attract more tourists when the project is implemented.

Outline description	*Key features of the project/ programme*

The following works are proposed:

- rehabilitate and reinforce the surrounding protection dike for both polders
- rehabilitate and provide a new drainage canal
- provide 3 pumping stations for drainage of excess water
- support awareness building programs and local committees involved in polder management.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing Agencies: MOWRAM; CNMC/ Min of Culture and Fine Arts/ Min of Tourism.

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- Preliminary flood hazard maps and flood damage curves have been developed based on long-term hydrological maximum flows at Kratie (1910-2006) and flood damage curves derived from socio-economic survey in Koh Andeth and Koh Thom.
- One of the initial studies was The Community Self Reliance and Flood Risk Reduction Project financed by ADB under the TA 4574-CAM, and implemented by MOWRAM and NCDM in collaboration with Asian Disaster Preparedness Center (ADPC).
- "Community Based Disaster Risk Reduction Strategy (2007-2012) for Flood and Droughts. Under this project the "Flood Vulnerability GIS Application" was developed as a "Tool for Community Self-Reliance and Flood Risk Reduction" covering the provinces: Prey Veng, Svay Rieng, Kandal and Takeo (16 sets of maps were produced)
- For the West Bassac deep-flooded area, Zone 2, the socio-economic surveys were carried out for: Koh Andeth and Boery Chulsar Districts involving seven villages (Borey Chulsar, Banteay Thleay, Chroy Paun, Tanhim, Tahien, Taphan and Prey Bay). Under FMMP-C2: Koh Andeth damage survey was carried out. From the preliminary study of the area, six subprojects were identified for further studies.

Timing		
Studies	Expected start year	2010
	Duration (years)	1
Implementation	Expected start year	2012
	Duration (years)	2
Operation	Expected start year	2014

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

The project could be considered as one case of settlement flood proofing in the West Bassac Integrated Flood Risk Management.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

- The estimated cost of the study is US$ x million made up of:
- Consultancy services US$ 150,000
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 06

Project name	**Flood Protection Shallow-flooded Area (Zone 3) – West Bassac**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Flood control – embankments**	Mainstream reach	**Bassac**	
Implementation	**National**	Tributary/ Sub-area(s)	**10C**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

This shallow-flooded area, Zone 3, is located entirely in Takeo Province and has a total area of 95,413 ha. Majority of the population living along the RN 2 in this zone are subsistence farmers depending primarily on wet season rice cultivation. Subsistence rice cultivation in this area is constrained by poor soil, erratic rainfall regimes, flash floods from the western catchment and the Mekong/ Bassac floodwaters. The topography of the region provides little opportunity for medium to large water storage reservoirs for supplementary irrigation and also for flood management. The area suffers from regular flash floods which cause damage to the wet season rice crops.

Infrastructure for flood protection measures in this zone would, in addition, provide an opportunity to convey water from the Bassac River to Zone 3 and store floodwaters for supplementary irrigation by pumping. This would enable the farmers to stabilize their wet season rice crop production and provide opportunities for second and third crops. Thus, leading to poverty reduction and livelihood improvements.

The implementation of a flood risk management and mitigation for Zone 3 would provide an opportunity for effective use of the underutilized land and water resources of the zone as well as improve the efficiency of the existing IWRM infrastructures. An integrated planning in management of the wetland areas would benefit fisheries, preserve the ecosystem, and improve local transportation and trade.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The ultimate objective of the project is to assist farmers in the project area to stabilize their crop production in order to achieve sustainable and optimum use of water and related resources in the zone with regard to poverty reduction.

The immediate objective is to support planning capability at national, provincial and community levels in an integrated way for the medium to long-term plan for the development of the West Bassac area.

The West Bassac is an integral part of the Mekong floodplain. The project when implemented will reduce flood damages to agricultural lands, increase the potential for further agricultural development, increase crop yield and assist with the development of fisheries and other resources in the floodplain areas of Takeo Province. Livelihood opportunities of communities living in the flood-affected areas will improve as a result.

Principal beneficiaries — *Main groups of people the project will benefit*

National and provincial line agencies in charge of landuse, water resources and agricultural development. The main beneficiaries will be people living in Zone 3 of the West Bassac area.

Outline description	*Key features of the project/ programme*

The Zone 3 of the West Bassac area extends along the RN 2 from Prek Kampis to Krabak village south of Kampong Chrey town and it is subdivided into five water management zones. Subsistence rice farmers in this zone suffer regularly from flash floods caused by heavy rainfalls on the western catchments, and also floods from the Mekong. Besides flooding, the zone experiences frequent droughts which cause crop losses.

It is proposed to rehabilitate the existing irrigation/ drainage canal along RN 2 to serve as a main drain/ irrigation canal to convey/ store water for flood prevention and provide water for supplementary irrigation as well as for navigation. The eastern shallow-flooded area will be protected against the Mekong/ Bassac floods by a dike (based on the rehabilitation of the existing dike). Water control structures such as culverts and sluice gates will be provided along the dikes.

For flood management and water supply for supplementary irrigation to Zone 14, the Stung Tauch, Boeung Tonle Bati, and Boeun Choeung Luong systems will be used as water sources and water retention reservoirs. The Boeung Choeung Luong will be built as floodwater storage with a surrounding embankment and water control structures (intake and outlet structures), connecting it with the Stung Tauch (the Zone 1 main diversion channel) and with the Stung Takeo by a main irrigation/ drainage canal. The main irrigation/ drainage canal will served as the main water supply and drain to Sub-zones 15 and 16 as well as for inland navigation. The remaining Sub-zones 17 and 19 will be connected to the Takeo Canal and Stung Takeo for water supply and drainage.

Two main pumping stations are proposed for Sub-zones 15 and 16.

Rehabilitation of existing and planned primary, secondary and tertiary canals and the required water control infrastructure, including pumping stations for internal drainage are also proposed. On farm water supply will be based on small hand-lift pumps.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing Agencies: MOWRAM/ MAFF/ MDR

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- One of the initial studies was The Community Self Reliance and Flood Risk Reduction Project financed by ADB under the TA 4574-CAM, and implemented by MOWRAM and NCDM in collaboration with Asian Disaster Preparedness Center (ADPC).
- "Community Based Disaster Risk Reduction Strategy (2007-2012) for Flood and Droughts. Under this project the "Flood Vulnerability GIS Application" was developed as a "Tool for Community Self-Reliance and Flood Risk Reduction" covering the provinces: Prey Veng, Svay Rieng, Kandal and Takeo (16 sets of maps were produced)
- Flood damage and flood risk studies under the West Bassac Demonstration Project. During Stage 1, intensive data collection was carried out in 2 districts, Koh Andeth in Takeo and Koh Thom in Kandal with the remaining 9 districts in Takeo and 4 in Kandal carried out during Stage 2 of FMMP-C2.

Timing		
Studies	Expected start year	2010
	Duration (years)	2
Implementation	Expected start year	2012
	Duration (years)	5
Operation	Expected start year	2017

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Zone 3 is closely inked with the implementation of the main infrastructure for Zone 1 and Zone 2

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ 7
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Lack of project management skills at the national and provincial levels.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 07

Project name	**Flood Risk Mitigation/ Diversion in the Border Area Between Cambodia and Vietnam**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia Vietnam**	
Intervention sub-category(s):	**River Diversion**	Mainstream reach	**Mekong Bassac**	
Implementation	**Joint**	Tributary/ Sub-area(s)	**10V**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The border areas of Cambodia and Vietnam are located in deep-flooded areas of the Bassac and Mekong Rivers.

Flood risk assessment studies carried out under FMMP-C2 indicated that the flood risk expressed as an average annual flood damage is in the order of USD 50 million per year on the Vietnamese part of the Long Xuyen Quadrangle and approximately USD 3 million per year on the Cambodian side of the border. Whereas agricultural damage to crops in Vietnam is in the order of 3% of the total risk, it is in the order of 50% on the Cambodian part.

It is anticipated that this joint project would help minimise the impacts of floods and hence reduce flood damages along the border areas of Cambodia and Vietnam.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The main aim of this joint demonstration project is to minimise the risk of flooding in the border areas of Cambodia and Vietnam and as such enhance economic development in the affected areas.

The output of the project will be the Terms of Reference for the preparation of flood risk mitigation measures in the border zone. Flood diversion is likely to be the most attractive option for the mitigation of transboundary impacts of flood risk management measures in the respective countries.

The project is based on the following assumptions:

- Structural flood risk management measures in the two countries that aim at the reduction of flood hazard will have transboundary impacts;
- Structural measures can be implemented in the border area to mitigate these transboundary impacts.

The first assumption was verified during Stage 1 of FMMP-C2. For different flood protection scenarios on both sides of the boundary simulations were carried out with the help of the ISIS model. The results have been reported on in the Annex 1 to the Stage 1 Evaluation Report.

Regarding the second assumption, no studies were carried out during Stage 1. Options for diversion of Mekong flood waters towards the Gulf of Thailand have been considered before in the Mekong Delta Master Plan (NEDECO, 1993) and The Flood Control Planning for Development of the Mekong Delta (KOICA, 2000). The first study considered diversion in the border area (Tan Chau - Chau Doc - Gulf of Thailand. The latter study looked at the option of diversion from Takeo to the Gulf of Thailand.

Principal beneficiaries — *Main groups of people the project will benefit*

The main groups of beneficiaries would be the communities living in the floodplains of the Mekong Delta, particularly those living in the border districts of Long An, Dong Thap, An Giang and Kien Giang Provinces in Vietnam and in Cambodia, Svay Rieng and Ta Kev Provinces.

Outline description *Key features of the project/ programme*

The area for the flood diversion is the border area between Vietnam and Cambodia.

The scope of this project is as follows:

- Assessment of the impact of existing flood risk management plans on both sides of the border on the flood risks in the Vietnam and Cambodia part of the Mekong Delta.
- Identification of measures in the border zone for mitigating negative impacts on flood risk in the neighbouring country.
- Formulation of a plan for flood risk mitigation in the border zone.
- Drafting of the Terms of Reference for the preparation of priority works for flood risk mitigation in the border zone.
- Control floods from the border to Long Xuyen Quadrangle and drain floods to the Gulf of Thailand.
- Construct a drainage canal to the Gulf of Thailand.
- Build infrastructure to control saltwater intrusion and keep fresh water in the coastal areas of the Gulf of Thailand.
- Control floods from the Bassac River to the Long Xuyen Quadrangle.

These structural measures allow, in principle, not only for the protection against early floods, but also for full control of floods that are lower than the design floods of the works.

The plan is formulated using the concept of "living with floods" as a guiding principle in the management of early floods.

Proposed institutional arrangements *Expected implementing agency(s), operator(s) etc*

Executing/ Implementing Agencies: SIWRP/ VNMC/ MARD in Vietnam; CNMC/ MOWRAM in Cambodia.

Existing documentation *Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Mekong Delta Comprehensive Planning - 2004.
- Southern Institute for Water Resources Research (SIWRP) and Sub-Institute of Geology (SIG) of the National Centre for Natural Sciences and Technology (NCST) carried out scientific researches on measures recommendation and scientific basis for follow up researches such as flooding areas' disaster mitigation and prevention strategy, provinces and sub-areas' flood control planning, 10V sub-area planning and recent Mekong Delta comprehensive planning.
- Research titled "water utilization and flood control in Dong Thap Muoi" was carried out by Sub-Institute of Geology in 1995 with flood prevention measures for deep flooding area of Dong Thap Muoi and Long Xuyen Quadrangle.
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.
- State level Research No KC08.19 "Research on socio-economic and environment problems for Dong Thap Muoi sustainable development", by SIWRP, 2004.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.

Timing

Studies	Expected start year	2015
	Duration (years)	3
Implementation	Expected start year	2020
	Duration (years)	5
Operation	Expected start year	2025

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

As both countries are undertaking flood mitigation measures within their own borders, there is the need for proper coordination and collaboration to ensure that this joint project will not significantly impact on existing or proposed IFRMs (such as the IFRM plan for Takeo in Cambodia and mitigation works in the Long Xuyen Quadrangle.

This Project is linked to the following projects:

- Development of Flood Control Structures along Tu Thuong Canal, Vietnam.
- Enlarge main canals in the POR, Vietnam.
- Enlarge main canals in the LXQ, Vietnam.
- Rotation Flood Control Embankment in Deep-Flooded Area of the POR, Vietnam.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each project.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the governments to implement works for other reasons.
- Public opposition to the project.
- The Diversion Canal could change the morphology of the canal systems in the POR and LXQ.
- Discharge from the proposed diversion canal could affect the eco-system in the vicinity of the canal outlet along the coast of the Gulf of Thailand.

Project Description Sheet: Cambodia 08

Project name	**IFRM Plan Preparation East Mekong (Prey Veng), East Mekong**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Flood Control - embankments; control flooding**	Mainstream reach	**Mekong**	
Implementation	**National**	Tributary/ Sub-area(s)	**10C**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The East Mekong area is delimited to the west by the left bank of the Mekong River from Neak Leung to the Cambodian-Vietnamese border, to the north by the RN 1, to the east by Stung Kampong Chrey and to the south by the Prek Smao-Tanou at the Cambodian-Vietnamese border.

According to flood maps established during flood hazard and flood risk assessment of the Eastern Mekong part of Cambodia by FMMP-C2, a large part of this area was identified as a deep-flooded area. This area includes the Stung Slot floodplain, the Prek Kampong Trabek and the Stung Kampong Chrey floodplains, and the area along the Cambodia-Vietnam border. The non-flooded area is located immediately south of the RN1, where a large population is concentrated. This non-flooded area is surrounded by a shallow-flooded area where most of the rain-fed subsistence rice cultivation is located. Flooding in this area is the result of Mekong River overbank flows crossing the RN1 through Stung Slot, Prek Kampong Trabek,Stung Kampong Chrey and also direct Mekong overbank flows between Neak Leung and the Cambodian-Vietnamese border. Due to deep and prolonged flooding, degree of landuse in this area is rather low. Floods often cause significant damages to crops, properties, local infrastructure such as roads, bridges, irrigation and drainage canals and houses. Flood and droughts are considered major constraints to sustainable development of water and related resources in this area. The concept of "living with floods" and making maximum use of floodwaters has been successfully implemented in the Mekong Delta in Vietnam. Under this concept, distinctions have been made between deep and shallow-flooded areas including the level and timing for protection.

The integrated flood risk management plan for the East Mekong area will involve a holistic approach to flood conditions and measures necessary to reduce risk of damage inflicted by frequent flooding. Impacts of proposed measures will be evaluated using simulation models to support scenarios developed for the area and for the Mekong Delta as a whole. The implementation of flood risk management measures in this area would offer opportunities for maximum utilisation of land and livelihood improvement of local fishermen and subsistence farmers and the community as a whole.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The overall objective of the project is to achieve a sustainable development of water and related resources in the Mekong Delta in Prey Veng Province.

The immediate objectives are:

- To establish a comprehensive integrated flood risk management plan to support medium to long-term integrated water resources development in the area.
- To build institutional capacity in integrated flood risk development planning and management at national, provincial and local levels (district and commune).

Indicators:

- An effective integrated flood risks management plan established for the project area.
- A number of sub-projects of integrated flood risk management and mitigation nature developed to implementation level or actually implemented.

Principal beneficiaries	*Main groups of people the project will benefit*

Planning Departments of MOWRAM, PDWRAM (Prey Veng, Kampong Cham, Kandal), CNMC and local line agencies as well as local communities.

Outline description	*Key features of the project/ programme*

During Stage 1 under the Focal Area Study, preliminary integrated flood risk management measures were proposed for various development scenarios and for different options of flood protection measures. The relative impacts of the scenarios and mitigation measures on the overall flooding conditions in the area (as in the case of the border area between Cambodia and Vietnam) were assessed. The area has been subdivided into deep and shallow-flooded areas. The deep-flooded area will be subjected to only early flood protection, while the shallow-flooded area will be fully protected. Four distinct flood risk management zones have been identified:

- Zone 1, the deep-flooded area between the left bank of the Mekong River and the left bank of the Stung Slot River, will be protected against early floods until 31st of July to secure early crops consisting mainly of early rice (May-July) and cash crops. After this period, the area will be allowed to resume its usual function as a flood storage and conveyance route. During the flood recession period, the area will be again used for flood recession rice or cash crops (November-March). Water for supplementary irrigation will be drawn by pumping from the main rivers, the Mekong, the Prek Kampong Trabek and the existing/ planned irrigation/ drainage canals.
- Zone 2 consists of a non-flooded area and a shallow-flooded area between the left bank of the Stung Slot to the west and the right bank of the Prek Kampong Tabek to the east, and to the north by the RN1. The left bank of the Stung Slot and the right bank of the Prek Kampong Trabek will be raised to a 10-year flood protection level and the southern dike along the five-metre contour/ land elevation will also be raised to the same protection level. Internal irrigation/ drainage canal networks including water control structures such as sluice gates, culverts, pumping stations , rural roads and related facilities are also proposed.
- Zone 3 is the zone between the RN 1 to the north, to the west by the left embankment of the Prek Kampong Trabek, to the east by the right embankment of the Stung Kampong Chrey, to the south by a low embankment following the 5 m contour line. For supplementary irrigation and drainage, a network of irrigation/ drainage canals including pumping stations for internal drainage as well as for irrigation and water control structures are proposed.
- The Zone 4 is a deep-flooded area along the border with no flood protection. The area will be used only for flood recession and dry season rice crops. A number of flood proofed villages are proposed. Other facilities including rural roads, irrigation and drainage canals are also proposed.

For medium to long-term development of the area, it is proposed to establish an IFRM plan for the entire area.

The project will carry out detailed survey of flood damages, socio-economic surveys, stake-holder consultations, topographic and geotechnical surveys. Detailed design of flood management structures as well as operation and maintenance of the future schemes including institutional capacity building will be part of the Project activities.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing Agencies: MOWRAM; in cooperation with CNMC: PDWRAM, MAFF, MRD and MLUPC.

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- Main Evaluation Report of the FMMP-C2, Stage 1 and Stage, 2
- Roads and Floods, Best Practices Guidelines for Integrated Planning and Design of Economically sound and Environmentally Friendly Roads in The Mekong floodplains of Cambodia and Vietnam. Final Draft report,2008.

- Water Utilization Program (WUP by JICA)
- The consolidation of Hydro-meteorological data and Multi-functional Hydrologic Roles of of Tonle Sap Lake and Vicinities (TSLV).
- The Chaktomuk Junction, Hydraulics and Environment, by MRC, 2000.

Timing		
Studies	Expected start year	2011
	Duration (years)	2 years
Implementation	Expected start year	2015
	Duration (years)	5
Operation	Expected start year	2020

Linkages *Linkages that need to be observed with other developments (before, after, in parallel with …)*

- The Basin Development Plan for the Sub-area 10 C covering the Mekong Delta below Kampong Cham
- The Chaktomuk junction Hydraulics and Environment Project

Estimated costs and financing arrangements *Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ 5 million
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions *Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- It is assumed that the government will begin building institutional capacity in integrated flood risk management and integrated water resource management at national and provincial levels including building up financial capacity for medium to long-term development.
- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 09

Project name	**IFRM Plan Preparation Stung Sreng**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Dams – Regulation**	Mainstream reach	**Stung Sreng River/ Tonle Sap Great Lake**	
Implementation	**National**	Tributary/ Sub-area(s)	**9C**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Stung Sreng River catchment is the second largest sub-catchment of the Tonle Sap Great Lake. The low-lying areas of the Stung Sreng catchment suffer regularly from floods and droughts. The existing dikes built on the ancient road between Baray Reservoir and Phimay Temple in Thailand were damaged by floods in the mid-1990's and are yet to be repaired. A rehabilitation feasibility study was completed under the ADB sector project T.A. 4848 but the implementation date is still uncertain. When rehabilitated, the project is aimed at managing floods and droughts in order to increase agricultural production. The reservoir will regulate and store floodwaters from the upper part of the catchment. The water will be used for floating rice and for supplementary irrigation for areas downstream of the dike through a number of intake structures and distribution canals. Fishery is one of the major natural resources of the area which also needs to be properly managed. The operation of the project infrastructure for irrigation and flood management is rather complex and needs careful planning in order to minimize risk to crop damage.

There is a need to understand the potential risk of floods and droughts affecting the area as well as the optimum use of the floodwaters in the whole sub-catchment over medium to long-terms. There is also the need to minimize potential conflicts between upstream and downstream water users.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The overall objective of the project is to achieve sustainable development of water and related resources in the Stung Sreng River catchment.

The immediate objective is to establish an integrated flood risk management plan and an integrated water resource development plan in the Stung Sreng catchment as well as establishing capacity to manage these activities.

Key indicators are:

- Co-ordination improvement among related stakeholders.
- Reduction in damage to crops and structures caused by floods and droughts.

Principal beneficiaries — *Main groups of people the project will benefit*

The ultimate beneficiaries will be farmer communities living in the project area. Immediate beneficiaries will be planning departments of related line agencies.

Outline description	*Key features of the project/ programme*

A feasibility study has been carried out for the rehabilitation of the existing damaged dike and a number of water intake structures for an irrigation scheme covering an area of about 3,000 ha which is partly located in Siem Reap Province. Potential irrigable land extends over a large area including the right side of the Stung Sreng floodplain in Banteay Mean Chey Province. The total area in Siem Reap and Banteay Mean Chey is estimated at about 25,000 ha.

The proposed project concept is to look at flood hazards, potential risk of floods and droughts as well as measures to reduce such risks; to minimize conflicts between different users; basic data collection and analyses; and institutional capacity building.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing Agencies: MOWRAM/ MAFF/ MDR/ CNMC.

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

A Feasibility Study on the rehabilitation of the dike system and reservoir has been completed under the ADB Sector project T.A. 4848.

Timing		
Studies	Expected start year	2011
	Duration (years)	1
Implementation	Expected start year	2012
	Duration (years)	
Operation	Expected start year	2013

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

- ADB, Sector project
- The ADB Tonle sap initiatives

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- It is assumed that the Tonle Sap sector project will not affect/ delay this project and that institutional capacity will be strengthened in areas of project management and operation at the national and provincial levels.
- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 10

Project name	**Flood Risk Management Options Tonle Sap Great Lake**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Flood control – controlled flooding**	Mainstream reach	**Tonle Sap Great Lake**	
Implementation	**National?**	Tributary/ Sub-area(s)	**9C**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Tonle Sap Great lake plays a major role in Mekong River peak flood attenuation and also flow regulation for dry season irrigation water supply. It is estimated that about 20% of the Mekong floodwaters is temporarily stored in the Lake during peak floods and released during the flood recession period. The concept of "living with floods" by utilising the floods to obtain maximum benefits has led to deep and shallow flood management zones, early flood protection, mixed protection and full protection in the Mekong Delta areas in Cambodia and in Vietnam. It is perceived that it is possible to make maximum use of the existing natural storage of the Tonle Sap Great Lake to attenuate floods and hence reduce the amount of flood protection works required in the entire delta. Under current conditions and during the early flood season e.g when water levels in the Mekong is below 8.0 m at Phnom Penh (at Chroui Changvar),fish fry can reach the Great Lake only through the Chaktomuk Junction and along the Tonle Sap River. However when the water level in the Mekong is higher, the fish fry travel with the floodwaters across the floodplain between the Mekong and Tonle Sap Rivers to reach the Great Lake.

The possibility to divert Mekong River early floods and control flow in the Tonle Sap River will benefit early flood protection in the delta areas, fisheries, water supply for irrigation in the dry season as well as salinity intrusion management in Viet nam.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The overall objective is to achieve sustainable water resources development and management in the Mekong Delta by making use of the natural storage capacity of the Great Lake.

The immediate objective is to investigate the feasibility of diversion of early floodwaters from the Mekong River to the Great Lake for early flood management in the Mekong Delta, for fisheries management as well as for dry season irrigation water supply and salinity intrusion management.

Principal beneficiaries — *Main groups of people the project will benefit*

People in the flood-affected areas of the Mekong Delta, national planning agencies in Cambodia and in Vietnam.

Outline description — *Key features of the project/ programme*

The project will investigate the possibility of diverting early Mekong flood waters downstream of Kampong Cham at Angkor Ban area through a floodway with a capacity of about 20,000 m3/s. It is proposed to build a dike along the right bank of the Mekong River from Angkor Ban to Rokar Kong and RN 6A. The other dike will run along the RN 6.

To prevent water from flowing back, there will be a sluice gate on the Tonle Sap river downstream of Prek Kdam.

In general, the works will include channel improvements, dikes and resettlement areas.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing Agencies: MOWRAM/ MAFF/ CNMC.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- The Chatomuk junction development and environment
- The Water Utilisation Program (WUP) JICA
- The Tonle Sap Lake ad Vicinity (TSLV) Project
- One of the initial studies was The Community Self Reliance and Flood Risk Reduction Project financed by ADB under the TA 4574-CAM, and implemented by MOWRAM and NCDM in collaboration with Asian Disaster Preparedness Center (ADPC).

Timing		
Studies	Expected start year	2012
	Duration (years)	1
Implementation	Expected start year	2014
	Duration (years)	Long-term
Operation	Expected start year	Long-term

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 11

Project name	**Landuse Zoning Flood Proofing Peam Ro**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure/ Enabling Developments**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Flood Contol/ Capacity Building**	Mainstream reach	**Mekong, Prey Veng**	
Implementation	**National**	Tributary/ Sub-area(s)	**10C**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Peam Ro District is located in the deep- flooded area of the eastern part of the Mekong floodplain at the junction of a number of river branches of the Mekong namely, the Tonle Tauch and the Prek Banam. Some 50% of the left overbank flows from the Mekong River between Kampong Cham and Phom Penh is conveyed through this area during flooding. The Tonle Tauch receives floodwaters from the Prek Ta Tam which links with a major flood storage around Prey Veng Provincial capital town and a number of other semi and permanent lakes. Further south, the Prek Banam is divided into Stung Slot and Prek Kampong Trabek, both of which cross the RN 1 at Neak Leung and Kampong Trabek towns respectively. Land elevation in the area varies between 2 m in the deepest part to 7-8m along the Mekong levees. In recent years, the need for additional agricultural land, settlement areas and roads for transportation has led to persistent encroachment on the floodplain without any appropriate medium to long-term planning (i.e., taking into consideration the increasing flood risks in the area and its surroundings).

To minimize flood risks and to achieve sustainable development of the area, it is proposed to adopt the concept of "living with floods" in order to assist national and local stakeholders, and communities in establishing an Integrated Flood risk Management Plan (IFRM) with meaningful participation by local communities. The strategic direction for the IFRM will be to avoid economic activities (agriculture) during the high flood periods in the deep-flooded areas, to protect agricultural land in the shallow- flooded areas, to avoid building structures which obstruct flow paths, and to utilise the floods to maximum advantage. The IFRM will adopt a holistic approach taking into consideration, in an integrated way, development plans for the others areas and their possible impacts,

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The overall objective is a sustainable development of water and related resources of the Peam Ro area for poverty alleviation and support for national economic development.

The immediate objectives are:

- To establish an Integrated flood risk management (IFRM) and IWRM plans for the area under the framework of the Eastern Mekong Delta development plan in Cambodia;
- To strengthen the institutional capacity at national and local levels with active public participation in IFRM and IWRM

Key indicators:
Local SH awareness and the degree of participation and commitment in the decision-making process (participation by communities in project design and formulation) on Integrated Flood Risk Management. Guidelines developed by FMMP-C2 will be applied.

Medium to long-term indicators will be the reduction in flood damage and increased utilisation of land resources.

Principal beneficiaries	*Main groups of people the project will benefit*
Local and national planning agencies including community and district councils; people in Peam Ro districts and regional related business.	

Outline description	*Key features of the project/ programme*
The Project will identify flood hazards for the area and related potential flood risk under the framework of the eastern Mekong flood management as well as the entire Mekong delta for the medium to long-term development and management. Different development options will be identified, investigated and prioritized for future development. The study will be based on proven modelling tools which can also be applied to institutional capacity building at national, provincial and local levels. Meaningful public participation in the consultation process aimed at raising public awareness will be organized.	

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: MOWRAM/ MLUPC/ CNMC.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- One of the initial studies was The Community Self Reliance and Flood Risk Reduction Project financed by ADB under the TA 4574-CAM, and implemented by MOWRAM and NCDM in collaboration with Asian Disaster Preparedness Center (ADPC).
- "Community Based Disaster Risk Reduction Strategy (2007-2012) for Flood and Droughts. Under this project the "Flood Vulnerability GIS Application" was developed as a "Tool for Community Self-Reliance and Flood Risk Reduction" covering the provinces: Prey Veng, Svay Rieng, Kandal and Takeo (16 sets of maps were produced).
- Pilot landuse planning by FMMP-C5.
- Flood emergency implemented by FMMP-C4.

Timing		
Studies	Expected start year	2011
	Duration (years)	1
Implementation	Expected start year	2015
	Duration (years)	5
Operation	Expected start year	2020

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*
Component 5 of the FMMP have already produced flood maps for this area.	

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.

- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Cambodia 12

Project name	**Capacity Building Disaster Management**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Enabling Developments**	Country(s)	**Cambodia**	
Intervention sub-category(s):	**Capacity Building**	Mainstream reach	**Mekong, Bassac and Tonle Sap Great Lake**	
Implementation	**National**	Tributary/ Sub-area(s)	**6C, 8C, 9C, 10C**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Almost every year floods and droughts with varying magnitudes affect Cambodia. The flood of 2000 was very severe when compared with previously recorded floods over the past 70 years. The dead toll for the year 2000 floods was 347, and overall, 750,618 families were affected by the floods. An estimate of direct damages caused by the 2001 flood was USD 36 million and 34 million for the 2002 flood. These flood damages can be minimized through implementation of awareness raising, early warning and self-reliance in disaster management planning. These activities can be directly implemented by Provincial and District Committees for Disaster Management.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The overall objective of the project is to reduce flood risk damage for the people living in the flood-prone areas by building their capacity to be self-reliant in flood disaster management.

The immediate objective is to strengthen Provincial and District Disaster Management Committees in the planning and operation of flood emergency preparedness, response and recovery.

Indicators:

- Reduced casualties and damage to properties during each major flood event.
- Operational emergency plan in each flood-prone district and province.

Some activities have already been implemented by Provincial and District Committees for Disaster Management, but their capacity is still limited. However, more capacity building is needed to strengthen the above.

Implementing this project using the concept of IFRM would help to improve the understanding and further implementation of IWRM for the communities and institutions involved in water and related resources in the area.

Principal beneficiaries — *Main groups of people the project will benefit*

Provincial and District Disaster Management Committees, and local communities living in the flood-prone areas along the Mekong-Tonle Sap River systems.

Outline description — *Key features of the project/ programme*

The project will train and support members of Provincial and District Disaster Management Committees in developing flood emergency management plans in each of the flood-prone provinces and districts. The main output of the training is an operational disaster management plan for each province and district. The plans will be regularly reviewed and adjusted.

This non-structural flood mitigation measure is a concept idea.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies/ NCDM/ CNMC.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- One of the initial studies was The Community Self Reliance and Flood Risk Reduction Project financed by ADB under TA 4574-CAM, and implemented by MOWRAM and NCDM in collaboration with Asian Disaster Preparedness Center (ADPC).
- "Community Based Disaster Risk Reduction Strategy (2007-2012) for Flood and Droughts. Under this project a "Flood Vulnerability GIS Application" was developed as a "Tool for Community Self-Reliance and Flood Risk Reduction" covering the provinces of: Prey Veng, Svay Rieng, Kandal and Takeo (16 sets of maps were produced).
- FMMP-C2, Report on Socio-economic survey in 25 districts in Focal areas 1 and 2 in Cambodia.
- FMMP-C2 Flood damage studies.

Timing		
Studies	Expected start year	2011
	Duration (years)	6 months
Implementation	Expected start year	2013
	Duration (years)	1
Operation	Expected start year	2014

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Component 5 of the FMMP have already produced flood maps for this area.

Component 4 of FMMP-C2 is implementing flood emergency in flood-prone areas and have developed flood risk management plans at provincial and district levels.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- It is assumed that there is no overlap between this Capacity Building Program and other similar projects in the area, and that the government would commit and allocate resources to achieve sustainable activities after the project.
- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Reluctance by the Provincial and District Disaster Management Committees to implement or participate in the Project activities.
- Reluctance by the local communities to participate in the Capacity Building Programme.

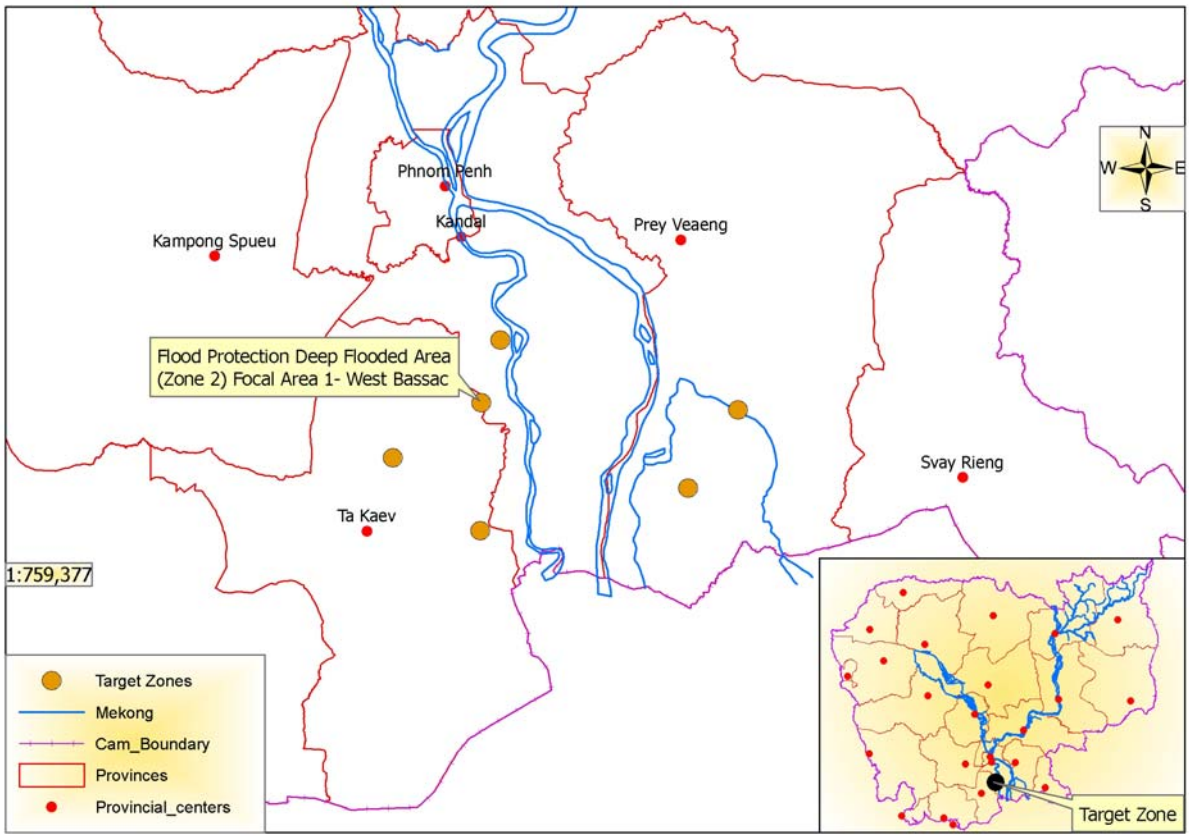


Figure 5.5 Flood Protection Deep-flooded Area (Zone 2) - West Bassac: PDS 02

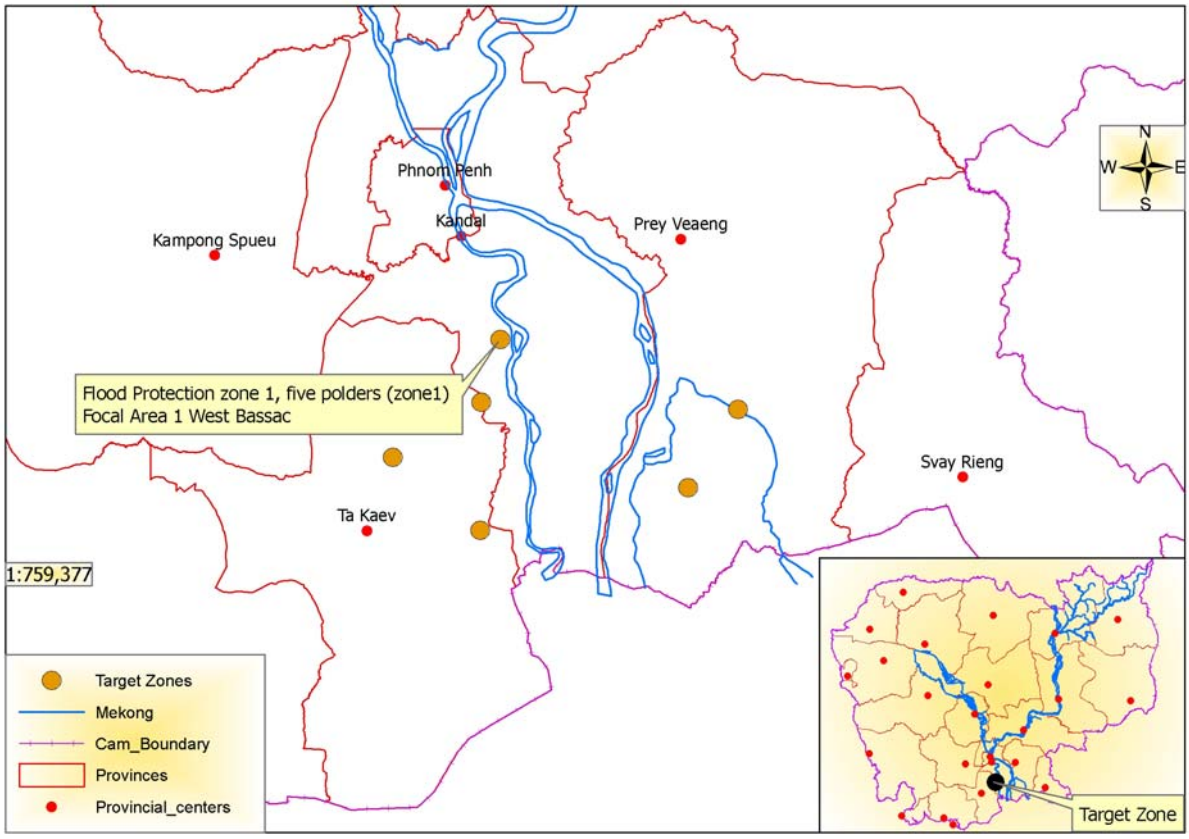


Figure 5.6 **Flood Protection, Five Polders (Zone1), West Bassac: PDS** 03

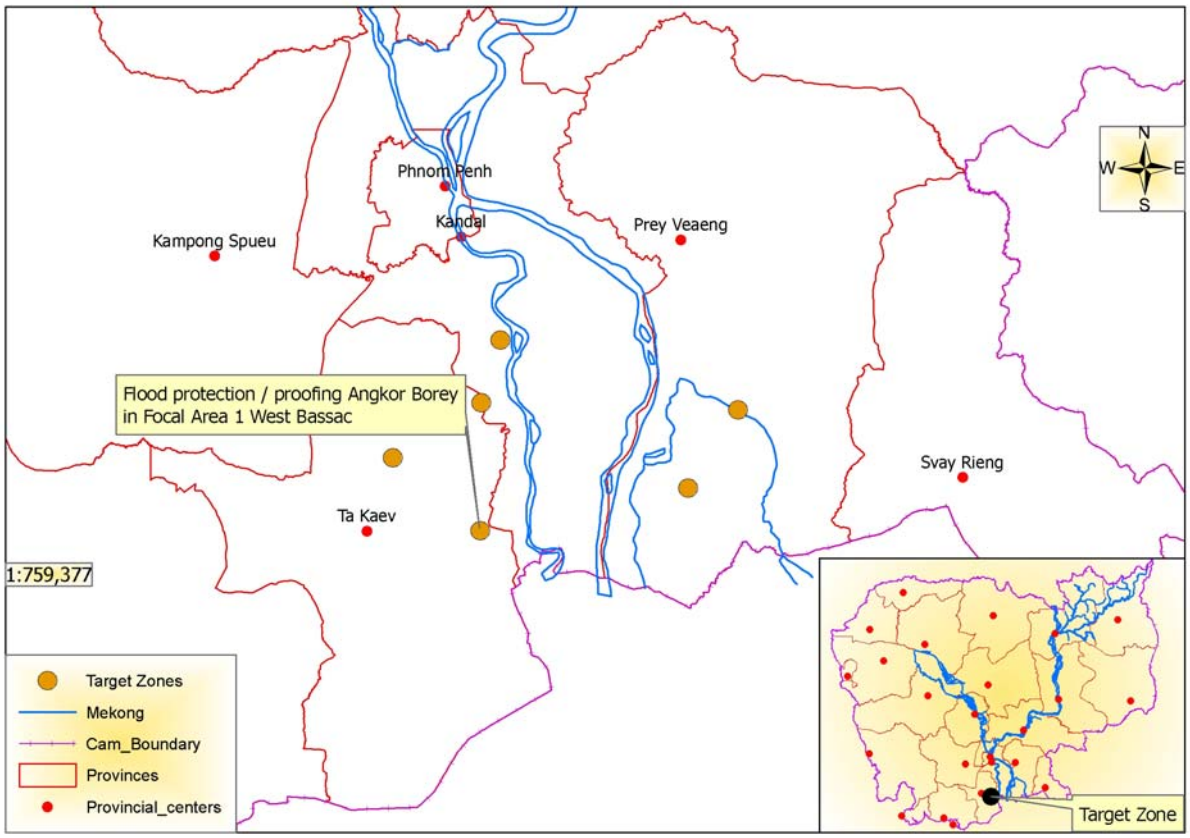


Figure 5.7 Flood Protection/ Flood Proofing Angor Borey – West Bassac: PDS 05

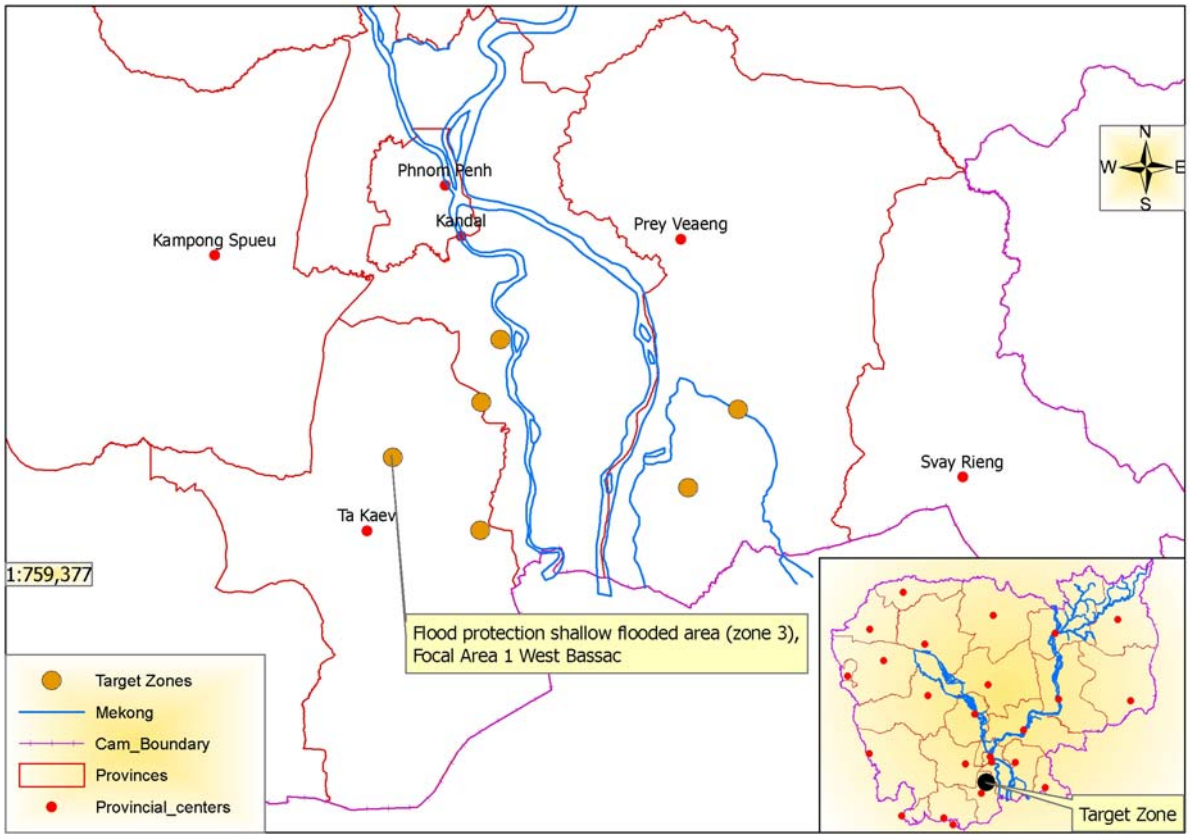


Figure 5.8 Flood Protection Shallow-flooded Area (Zone 3) – West Bassac: PDS 06

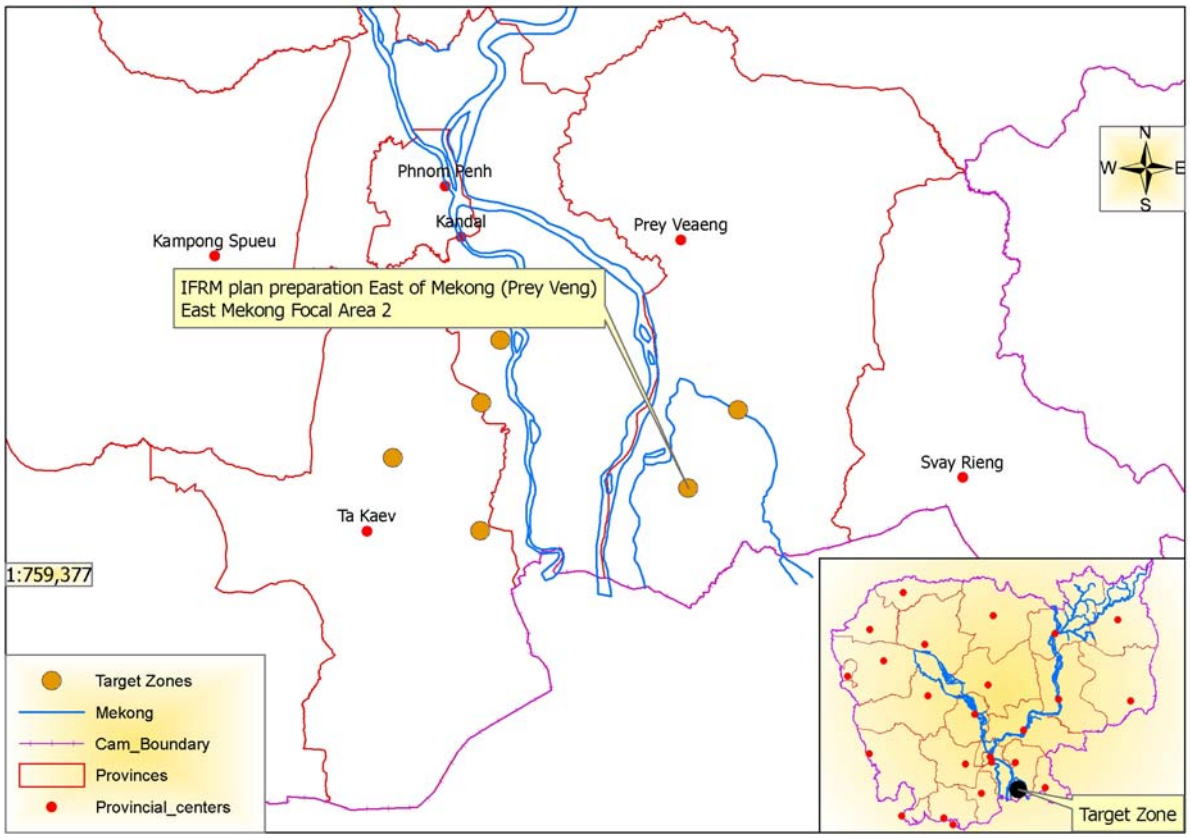


Figure 5.9 IFRM Plan Preparation East Mekong (Prey Veng), East Mekong: PDS 08

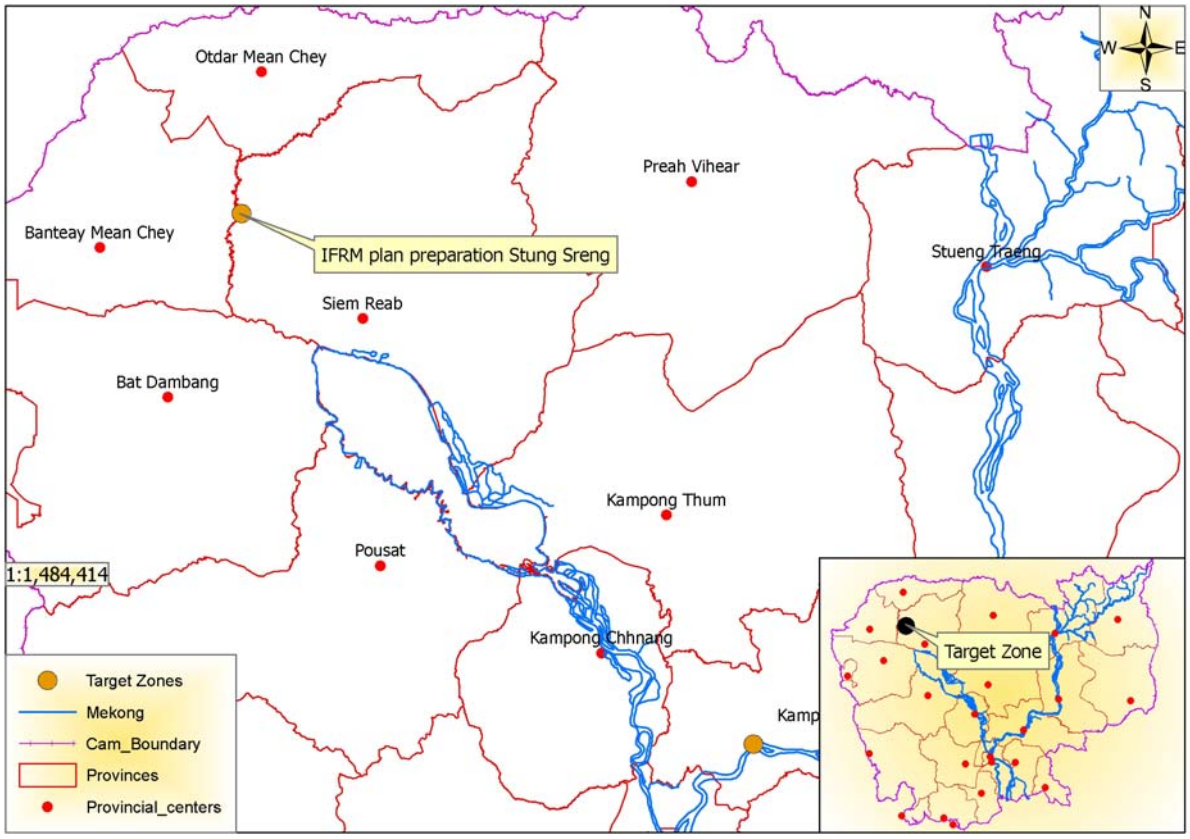


Figure 5.10 **IFRM Plan Preparation Stung Sreng**: PDS 09

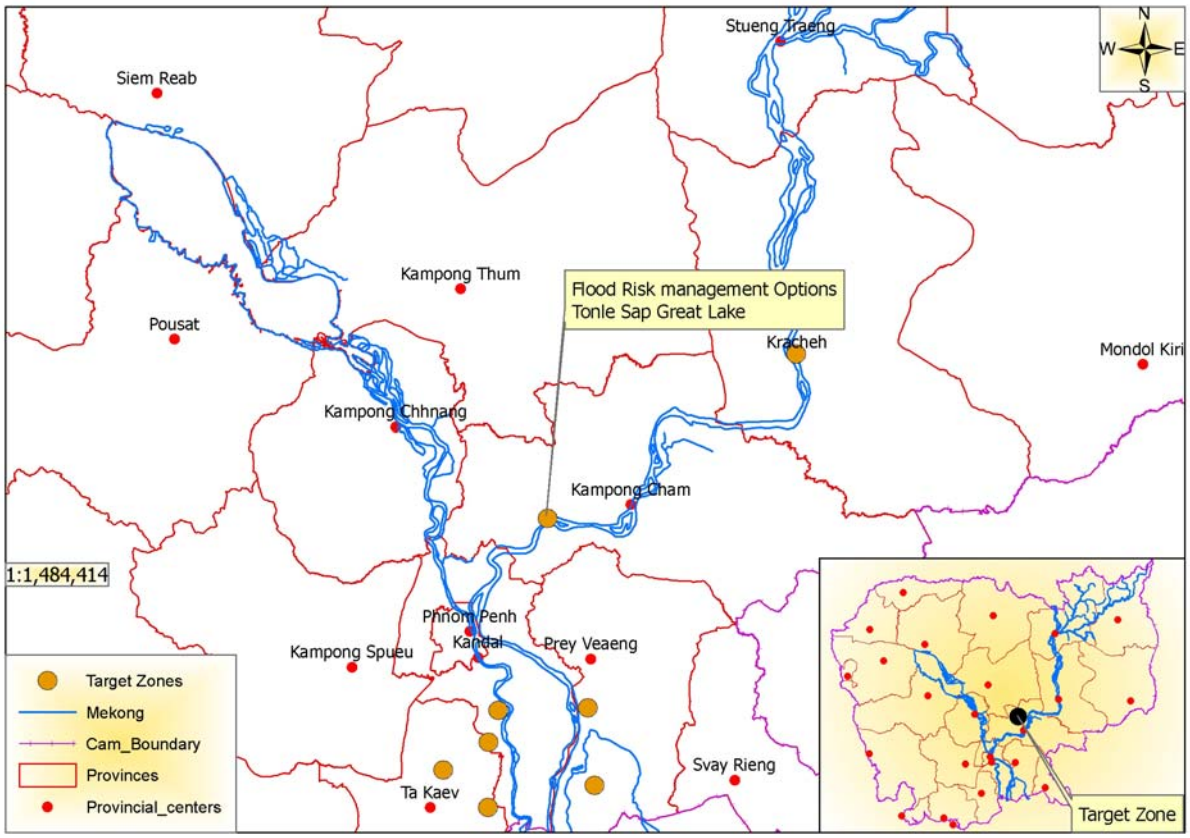


Figure 5.11 **Flood Risk Management Options Tonle Sap Great Lake**: PDS 10

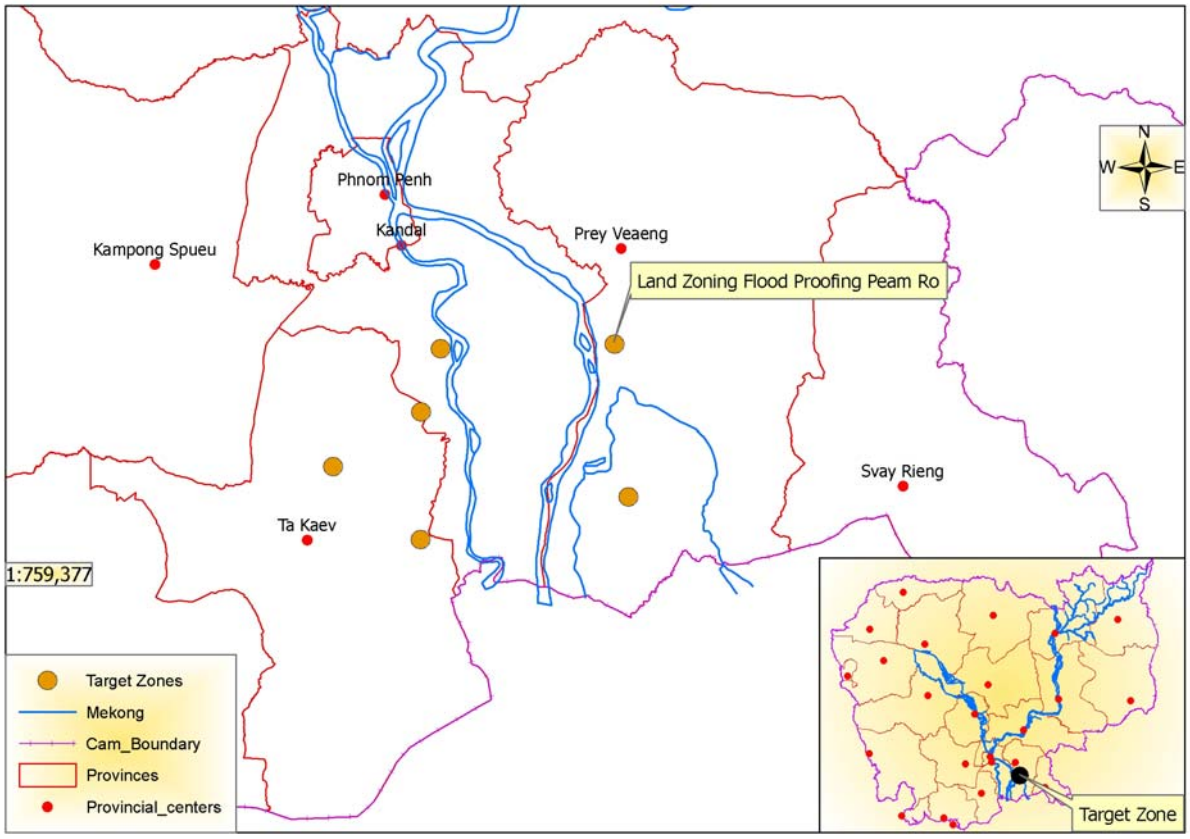


Figure 5.12 **Landuse Zoning Flood Proofing Peam Ro**: PDS 11

APPENDIX 2 PROJECT DESCRIPTION SHEETS FOR LAO PDR

Project Description Sheet: Lao PDR 01

Project name	**Capacity Building in Flood-prone Area of Champasack**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Enabling Developments**	Country(s)	**Lao PDR**	
Intervention sub-category(s):	**Capacity Building**	Mainstream reach	**Mekong**	
Implementation	**National**	Tributary/ Sub-area(s)	**6L**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The districts of Khong, Moonlapamok and Pathoomphorn in Champasack Province experience severe flooding annually. In 2005, the floods damaged over 6,470 ha of rice fields and 322 families were affected.

The Province of Champasack has set up provincial and district disaster management committees to foresee to flood response and disaster management in the affected districts. Data and information concerning flood damages are collected annually by the Provincial Department of Agriculture and Forestry, and Provincial Department of Labour and Social Welfare in Champasack Province.

Although district disaster management committees have been set up, there is, however, a strong need to develop and strengthen the capacity of these committees at both district and provincial levels if the committees are to effectively cope.

This capacity building programme will provide the skills required for the committees and districts affected to cope with flood disasters.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The Project aims at the implementation of a Capacity Building Programme for the local community in 3 districts of Champasack Province by strengthening the capacity of the disaster management committees at provincial and district levels on flood risk management and early warning information dissemination in proper and timely manner and also to raise awareness of communities in flood risk areas.

Principal beneficiaries — *Main groups of people the project will benefit*

The main beneficiaries will be those living in the districts of Khong, Moonlapamok and Pathoomphorn in Champasack Province.

Outline description — *Key features of the project/ programme*

- The Project consists of the following activities :
- Establishment of flood preparedness plan and an annual plan of action;
- Establishment of flood disaster information centre in local areas;
- Capacity Building for Provincial and District Disaster Management Committees (PDMC and DDMC) and communities in flood risk areas at village level on flood risk management;
- Establishment of flood emergency response teams (relief team, rescue team, medical team);
- Organization of simulation exercises on flood emergency response;

- Public awareness and education activities; and
- Establishment of flood contingency plan.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: National Disaster Management Office; Ministry of Labour and Social Welfare.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Timing		
Studies	Expected start year	
	Duration (years)	
Implementation	Expected start year	2015
	Duration (years)	2
Operation	Expected start year	

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Reluctance by the Provincial and District Disaster Management Committees to implement or participate in the Project activities.
- Reluctance by the local communities to participate in the Capacity Building Programme.

Project Description Sheet: Lao PDR 02

Project name	**IFRM Plan in Lower Se Bang Fai River Basin**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Lao PDR**	
Intervention sub-category(s):	**Flood control – Embankments; control flooding.**	Mainstream reach	**Se Bang Fai River/ Mekong River**	
Implementation	**National**	Tributary/ Sub-area(s)	**4L**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Se Bang Fai River Basin has an area of 90,000 ha, covering a small part of Savannakhet and Khammouane Provinces. The Se Bang Fai River Basin was selected in 1995 by the Government of Laos as a priority area due to its high potential for agricultural development and abundant water resources as compared to other river basins in the region. However, the basin has not yet achieved self-sufficiency in food production as rain-fed agriculture is still predominant. Irrigation development is limited to areas not exposed to flooding and cultivation in the fertile low-lying areas is frequently damaged by floods. The on-going electrification in the basin now makes irrigation development possible in most parts of the floodplain under the assumption that the floods can be effectively controlled. Several preliminary studies have been carried out in the past under the Ministry of Agriculture and Forestry concerning water resources development, flood control and other related sectors.

The Se Bang Fai Basin is subjected to flooding annually, mainly caused by overflows from Se Bang Fai River and backwater effects at the confluence with the Mekong River. According to statistical data from the National Disaster Management Office in 2007, 7 districts and more that 193 villages located in Se Bang Fai River Basin were flooded with an average depth of 2 metres and covering 17,994.00 hectares of agricultural land.

However, there is no integrated plan for irrigation and flood control in the Lower Se Bang Fai River Basin. The Project will assist the government to formulate an integrated sustainable and environmentally-sound development and management plans for efficient utilisation of land and water resources and thus increase food production and improve the socio-economics of the region.

This Project has been selected as a Demonstration Project for Laos.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

A Task Force Committee for the development of Lower Se Bang Fai River Basin was set up in 2005 to study and formulate a plan and project for water resources development and management in the Se Bang Fai Basin. The Department of Irrigation was assigned as a focal point for the Committee which was chaired by Deputy Prime Minister.

Overall, the Project is aimed at the preparation of an integrated flood risk management for the short, medium and long-term perspective focusing on irrigation development and flood control in the flood-prone areas of the Lower Se Bang Fai Basin. These would include flood risk, hazard and damage assessments, and preparation of flood maps; construction of dike systems, flood diversion schemes, channel capacity improvements and drainage schemes.

The output of the Project will be a plan for an integrated flood risk management and a Terms of Reference for a Feasibility Study for the water resources development and management in the Lower Se Bang Fai River

Basin.

Principal beneficiaries	*Main groups of people the project will benefit*
The main beneficiaries will be those living in the basin areas of Savannakhet and Khammouane Provinces, particularly communities in Nongbok and Xaibouly Districts.	

Outline description	*Key features of the project/ programme*

In order to control flooding, some of the structural measures proposed include the construction of dikes, flood control gates and drainage canals.

Agricultural development will be assessed with and without flood protection measures.

Flood risks related to agricultural development will be estimated taking into account not only the agricultural risk but also the risk related to irrigation, drainage and other infrastructure.

Options for flood protection will be identified and their impact on flood risk reduction will be evaluated. For promising options, conceptual designs will be prepared and costed.

Terms of References will be prepared for a feasibility study of this most attractive option.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing Agencies: Department of Irrigation, Ministry of Agriculture and Forestry.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*
Several preliminary studies have been carried out in the past under the Ministry of Agriculture and Forestry concerning water resources development, flood control and other related sectors.	

Timing		
Studies	Expected start year	2010
	Duration (years)	2
Implementation	Expected start year	2012
	Duration (years)	4
Operation	Expected start year	2016

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Flood Protection Dikes along the Lower Se Bang Fai and Mekong Rivers.
- Flood Diversion Channel, lower Se Bang Fai River "Xelat" from Banne Sokbo to Banna.
- Dike Development along the Mekong River in Thakak urban area.

It is therefore important that in developing/ implementing this IFRM project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each project.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Lao PDR 03

Project name	**Landuse Planning in Se Banghieng Flood-prone Area**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Enabling Developments**	Country(s)	**Lao PDR**	
Intervention sub-category(s):	**Research and Development**	Mainstream reach	**Sebanghieng River**	
Implementation	**National**	Tributary/ Sub-area(s)	**6L**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Annual flooding and drought in the Sebanghieng River Basin causes significant damage to agriculture and as a result hinders the socio-economic development of Savannakhet Province. In 2007, flooding caused an estimated damage of USD 18 million, affecting more than 9,300 ha of agricultural land and 43 irrigation schemes.

Droughts have also caused significant damages to agriculture in the basin. In 1987, the damage caused by drought was estimated to be USD 5 million.

Currently there is no spatial data on landuse for Sebanghieng River Basin which is needed for the proper, controlled development and management of landuse activities in the basin.

The availability of data and information concerning landuse and natural resources is very essential for the integrated water resources and flood risk management of Sebanghieng Basin and for the socio-economic development of the area.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

Unavailability of landuse data imposes a severe constraint for proper landuse planning in the flood- prone areas of Sebanghieng River basin.

The project aims at collecting and providing relevant data/ information such as flood hazard maps, inventory of natural resources, landuse planning and zoning in Sebanghieng River Basin of Savannakhet Province.

Availability of landuse and planning information will assist with proper development and utilization of the natural resources and flood risk management of the basin.

Principal beneficiaries	*Main groups of people the project will benefit*

Communities living in the floodplain areas of Sebanghieng River Basin in Savanakhet Province will be the main beneficiaries.

Outline description	*Key features of the project/ programme*

The key features of the project include:

- Physical landuse surveying in Sebanghieng River basin
- Natural resources inventory
- Landuse planning and zoning mapping in flood-prone areas of Sebanghieng River basin

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: Department of Landuse planning National Land Management Authority. Land and Natural Resources Research Centre.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*
Draft Proposal for Surveying and Landuse Planning in Sebanghieng Basin by the National Land Management Authority, 2008.	

Timing		
Studies	Expected start year	2016
	Duration (years)	3
Implementation	Expected start year	2019
	Duration (years)	
Operation	Expected start year	

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Lao PDR 04

Project name	**Joint Bank Protection Study – Bokeo**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Lao PDR/ Thailand**	
Intervention sub-category(s):	**Flood control - Embankments**	Mainstream reach	**Mekong River**	
Implementation	**Joint**	Tributary/ Sub-area(s)	**2T & 1L**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Riverbank erosion is acknowledged as one of the problems hampering effective flood protection at some locations along the Mekong River. However, not all the LMB countries have a clear concept on how to address the bank erosion problems. Furthermore, there is indication that existing riverbank protection along one side of the river is contributing to river instability on the other side. Most of the bank failure and erosion areas show that flood is the dominant cause of damage to the river banks.

The problems that have prevented a systematic and strategic approach to erosion management in the Mekong areas 1L and 2T are of morphological, economic and technical in nature.

Riverbank protection measures are considered flood risk reduction measures in the context of this Project because of the increasing urban and infrastructural development along the banks of the Mekong River, adding
significantly to the investment value of property and services needing protection from floods and shifting of the
riverbank due to erosion.

The increase in population, investment in infrastructure in towns and rural areas (irrigation and drainage projects), and river training works carried out in the past for various purposes, are all good reasons for formulating a project with a broader view of addressing the technical, economic and socio-economic aspects of erosion risk management.

Effective riverbank protection and stabilisation planning will also help to protect assets such as agricultural land,
infrastructure, international border and riparian zone vegetation on or near the riverbank.

The Project will assist both governments to formulate an integrated sustainable and environmentally-sound strategy for sustainable river bank protection works and thereby improve the socioeconomic benefits of the region.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The Project was formulated by a BDP Working Group of Lao and Thailand. The aim of the Project is to study the morphological development/ processes of the Mekong River, identify critical areas of bank erosion and its associated causes, and to identify appropriate mitigation measures for bank protection with emphasis on adopting traditional bank protection measures and promoting local knowledge in the process.

The project will have the following outputs:

- formulation of an overall integrated erosion management strategy project,
- sustainable long-term planning of river training works (including bank protection at vulnerable reaches),

- identification of means to cope with bank erosion,
- implementation of pilot projects that have suitable/ selected measures for the areas,
- identification of available local materials for riverbank protection that are environmentally friendly,
- data and information exchange between sub-areas.
- a prioritization scheme based on scores assigned to the threatened riverbanks and magnitude of the potential problems.

Principal beneficiaries	*Main groups of people the project will benefit*
Communities adjoining the riverbanks where erosion poses a threat to properties and other physical infrastructure.	

Outline description *Key features of the project/ programme*

The general approach for the strategic bank erosion management in the affected areas shall include the following elements:

- Adoption of a hazard corridor,
- regulation of all new developments within the hazard corridor by requiring a special use permit.
- establishment of a "no-build" zone close to the river banks (habitable structures and businesses would be required to have a minimum setback from the top of the bank).
- request erosion study to certify that proposed developments will not be affected by river bank erosion over the period of planning.

The demarcation of hazard areas shall be carried out based on:

- hydraulic modelling results and historical/ field data of rates of erosion. A model shall be developed, calibrated and validated for the prediction of morphological changes to the river bed and banks. The model shall be used to predict impact of proposed interventions to the riverbanks and bed.
- delineation of hazard areas on the floodplain and establishment of setback requirements or waterway corridors.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing Agencies: Lao and Thailand National Mekong Committees.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Timing		
Studies	Expected start year	2010
	Duration (years)	1
Implementation	Expected start year	2011
	Duration (years)	5
Operation	Expected start year	

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*
This Project also has interrelations with other MRC programmes such the NAP and IKMP.	

Estimated costs and financing arrangements *Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Lao PDR 05

Project name	**Establishment of National Flood Forecasting and Warning Centre**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Enabling Developments**	Country(s)	**Lao PDR**	
Intervention sub-category(s):	**Capacity Building**	Mainstream reach	**Mekong/ Se Bang Fai River Basin**	
Implementation	**Joint**	Tributary/ Sub-area(s)	**4L**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Every year floods cause loss of life and damage to property, agriculture and rural infrastructure, and disrupts the social and economic activities of people who live in the inundation areas. These damages could be reduced with an effective flood warning systems. The current practice for flood warning is done through official communication channels which sometimes consume a lot of time in mobilizing resources, and initiating preparedness activities. Thus, the current system of using HF/SSB radio transceivers, public telephones and facsimile is considered not to be effective.

The Department of Meteorology and Hydrology considers that flood forecasting using modern equipment and flood warning by broadcasting weather information through the television media could be an effective instrument in reducing flood damages.

The Project intends to improve flood risk management through an early warning program. With early warning information, flood preparedness can be effectively implemented.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The Project aims at the implementation of flood risk management measures by reducing flood damages through awareness raising and early warning.

The project would produce the following outputs:

- Reduced flood damages;
- Improvement of the hydro-meteorological data collection network/ stations;
- Improvement of the Flood warning systems;
- Increased flood awareness and efficient flood information dissemination to the public.

Principal beneficiaries	*Main groups of people the project will benefit*

Communities living in the flood-prone areas of Mekong River and tributaries in Laos.

Outline description	*Key features of the project/ programme*

The main activities of the project include :

- Procurement equipments for flood forecasting and warning programme
- Improvement of flood preparedness programme by upgrading and modernizing the flood forecasting methods;
- Establishment of a programme of emergency action for implementing measures
- Improvement capacity building on weather and flood early warning and dissemination for Department of Meteorology and Hydrology.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: Department of Meteorology and Hydrology.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Timing		
Studies	Expected start year	2012
	Duration (years)	1
Implementation	Expected start year	2011
	Duration (years)	3
Operation	Expected start year	

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Lao PDR 06

Project name	**Study on Flash Floods in Luangnamtha Province**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Lao PDR**	
Intervention sub-category(s):	**Flood control - Embankments**	Mainstream reach	**Mekong River**	
Implementation	**National**	Tributary/ Sub-area(s)	**1L**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

As a result of heavy rains falling during two consecutive days on 06 and 07 August 2006, the Namtha River and its tributaries overflowed their banks and onto the floodplains causing significant flash flooding in Luangnamtha Province. The floodwaters rose rapidly onto the floodplains affecting 132 villages (comprising 1,916 households) in NamTha, Long, Sing, Viengphoukha and Nale Districts (all in Luangnamtha Province). The average flood depth was 1.20 m. The two villages of Naluang and Namgnen were the worst affected. In general, more than 1000 hectares of paddy fields, 50 weirs and 6770 metres of irrigation canals were damaged, and 21 houses were swept away.

The Department of Meteorology and Hydrology identified the Study on flash floods in Luangnamtha Province as a priority project due to the severe impacts from the flash floods in 2006.

The Project will assist with the formulation of an integrated flood risk management plan for the affected areas in the Luangnamtha Province and hence reduce flood risks and damages.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The Project aims at the preparation of a flood risk management plan which will involve:

- flood hazard and damage assessments;
- flood mapping;
- Identifications of mitigation measures to reduce damages from flash floods.

The project will provide information regarding flash floods in Luangnamtha Province which will help establish an integrated flood risk management plan in the province. Flood damages to agricultural land, property and infrastructure will be reduced and livelihood opportunities of the communities in the area will improve when the project is implemented successfully.

Principal beneficiaries — *Main groups of people the project will benefit*

The principal beneficiaries will be the people living in Luangnamtha Province, particularly those living in NamTha, Long, Sing, Viengphoukha and Nale Districts.

Outline description	*Key features of the project/ programme*

The Study would involve:

- Flood hazard and damage assessment;
- Flood mapping
- Identification of measures to reduced flood damages.
- Improvement of the Flood warning system.
- Increasing public awareness and information dissemination.
- Integrated land and water management
- A participatory approach
- Integrated hazard management approache

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing Agencies:
Department of Water Resources, Department of Meteorology and Hydrology (Water Resources and Environment Administration) and Department of irrigation and Ministry of Agriculture-Forestry.

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Timing		
Studies	Expected start year	2012
	Duration (years)	1
Implementation	Expected start year	2013
	Duration (years)	3
Operation	Expected start year	2016

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Reluctance by the local communities to participate in the Public Awareness Programme.

APPENDIX 3 PROJECT DESCRIPTION SHEETS FOR THAILAND

Project Description Sheet: Thailand 01

Project name	**Preparation of IFRM Plan for the Lower Kok River Basin**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Thailand**	
Intervention sub-category(s):	**Flood Control – controlled flooding; embankment.**	Mainstream reach	**Nam Mae Kok**	
Implementation	**National**	Tributary/ Sub-area(s)	**2T**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Chiang Rai Province is located in Nam Mae Kok River (a tributary of Mekong River) Basin. The Nam Mae Kok Basin covers an area of 10,730 km2 , of which some 31% lies in Myanmar. Mayor tributaries are the Nam Mae Fang and the Nam Mae Lao, which drains immediately downstream of Chiang Rai City. The basin is mountainous on the divides with elevations of up to 2,000 m. The valleys of the Fang, the Lao and the Kok rivers from Chiang Rai to the mouth are flat and flood-prone. The basin is densely forested in the upper areas with agricultural development in the lower reaches.

Annual floods in the basin cause loss of life, damage to property, agriculture, rural infrastructure and disrupt the social and economic activities of people living in Chiang Rai Province.

This basin has been selected by the TNMC as a focal area for Integrated Flood Risk Management as a result of frequent flooding and associated damages.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The primary objective of this Demonstration Project is the development of a workable Integrated Flood Risk Management Plan for the Lower Kok River Basin. In the Lower Nam Mae Kok, most of the risks are related to damages in the urban area of Chiang Rai and its surroundings.

The project when implemented will reduce flood risks and improve livelihood opportunities for communities living in the flood-prone areas in the Lower Kok River Basin.

Principal beneficiaries	*Main groups of people the project will benefit*

The main beneficiaries would be the vulnerable people living in the flood-prone areas in the Lower Kok River Basin.

Outline description	*Key features of the project/ programme*

The Integrated Flood Risk Management Plan will focus on:

- The flood-prone area near Chiang Rai at the confluence of the Mae Kok, the Mae Lao and the Mae Korn;
- The flood-prone area near the confluence with the Mekong, where flooding is of the combined type.

In general, the Project will identify and implement measures that are considered most effective for flood risk reduction. It will take into account the different types of measures, structural and non-structural, for hazard reduction and/or vulnerability reduction.

A strategic direction will then be formulated for flood risk management in the basin

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Expected implementing agencies are:

- The Thai Department of Meteorology (TMD)
- The Royal Irrigation Department (RID)
- The Department of Water Resources
- Department of Disaster Prevention and Mitigation (DDPM)

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Timing		
Studies	Expected start year	2010
	Duration (years)	2
Implementation	Expected start year	2012
	Duration (years)	4
Operation	Expected start year	2016

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Study on Flash Floods in the Kok River Basin
- Capacity Building on Flood Risk Management in Chiang Rai Province.
- Landuse Planning for Flood-prone Areas in Chiang Rai Province.
- Flood Proofing of Key Infrastructure in Selected Areas in Chiang Rai Province.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Reluctance by the local communities to participate in the project.

Project Description Sheet: Thailand 02

Project name	**Study on Flash Floods in the Kok River Basin**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Enabling Developments**	Country(s)	**Thailand; Lao PDR**	
Intervention sub-category(s):	**Research and Development.**	Mainstream reach	**Mekong**	
Implementation	**Joint**	Tributary/ Sub-area(s)	**1L, 2T**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Nam Mae Kok Basin covers an area of 10,730 km2 , of which some 31% lies in Myanmar. Mayor tributaries are the Nam Mae Fang and the Nam Mae Lao, which latter drains immediately downstream of Chiang Rai City. The basin is mountainous on the divides with elevations of up to 2,000 m. The valleys of the Fang, the Lao and the Kok rivers from Chiang Rai to the mouth are flat and flood-prone. The basin is densely forested in the upper areas with agricultural development in the lower reaches.

Annual floods in the basin cause loss of life, damage to property, agriculture, rural infrastructure and disrupt the social and economic activities of people living in Chiang Rai Province.

Flood management and Mitigation has become a priority issue at the national and regional levels. In the mountainous areas of the basin, the existing flood forecasting and warning system is insufficient to cope with the flash floods. The flood forecasting procedures including data transmission takes long time. In the remote areas, data collection and processing is inaccurate.

The Project intends to improve flood risk management through an early warning program. With early warning information, flood preparedness can be effectively implemented.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The Project aims at the implementation of flood risk management measures by reducing flood damages through awareness raising and early warning.

The project would produce the following outputs:

- Reduced flood damages;
- Improvement of the hydro-meteorological data collection network/ stations;
- Improvement of the Flood warning systems;
- Increased flood awareness and efficient flood information dissemination to the public.

Principal beneficiaries — *Main groups of people the project will benefit*

The main beneficiaries would be the vulnerable people living in the flood-prone areas in the Kok River Basin.

Outline description	*Key features of the project/ programme*

The Study would involve:

- Identification of measures to reduced flood damages through flood forecasting.
- Assessment of the effectiveness of the existing hydro-meteorological data collection network/ stations and improvements required.
- Procurement of flood forecasting and warning equipment.
- Improvement of the Flood warning system.
- Establishment of a programme of emergency action for implementing measures.
- Increasing public awareness and information dissemination.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Expected implementing agencies are:

- The Thai Department of Meteorology (TMD)
- The Royal Irrigation Department (RID)
- The Department of Water Resources
- Department of Disaster Prevention and Mitigation (DDPM)

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Timing		
Studies	Expected start year	2011
	Duration (years)	1
Implementation	Expected start year	2012
	Duration (years)	2
Operation	Expected start year	2013

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Preparation of IFRM Plan for the Lower Kok River Basin.
- Capacity Building on Flood Risk Management in Chiang Rai Province.
- Landuse Planning for Flood-prone Areas in Chiang Rai Province.
- Flood Proofing of Key Infrastructure in Selected Areas in Chiang Rai Province.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

- Reluctance by the Provincial and District Disaster Management Committees to participate in the project.
- Reluctance by the local communities to participate in the Public Awareness Programme.

Project Description Sheet: Thailand 03

Project name	**Capacity Building on the Flood Risk Management in Chiang Rai Province**	Portfolio reference no	

BDP Sector(s)	**Flood Management & Mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Enabling Developments**	Country(s)	**Thailand**	
Intervention sub-category(s):	**Capacity Building**	Mainstream reach	**Mekong/ Nam Mae Kok River**	
Implementation	**National**	Tributary/ Sub-area(s)	**2T**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Chiang Rai Province is located in Nam Mae Kok River (a tributary of Mekong River) Basin. The Nam Mae Kok Basin covers an area of 10,730 km2 , of which some 31% lies in Myanmar. Mayor tributaries are the Nam Mae Fang and the Nam Mae Lao, which latter drains immediately downstream of Chiang Rai City. The basin is mountainous on the divides with elevations of up to 2,000 m. The valleys of the Fang, the Lao and the Kok rivers from Chiang Rai to the mouth are flat and flood-prone. The basin is densely forested in the upper areas with agricultural development in the lower reaches.

Annual floods in the basin cause loss of life, damage to property, agriculture, rural infrastructure and disrupt the social and economic activities of people living in Chiang Rai Province.

Although district disaster management committees have been set up, there is, however, a strong need to develop and strengthen the capacity of these committees at both district and provincial levels if the committees are to effectively cope with flood disasters.

This capacity building programme will provide the skills required for the committees and districts affected to cope with and effectively management flood disasters.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The Project aims at the implementation of a Capacity Building Programme for the local communities in Chiang Rai Province by strengthening the capacity of the disaster management committees at provincial and district levels on flood risk management and early warning information dissemination in proper, timely manner and also to raise awareness of communities in flood risk areas.

Principal beneficiaries — *Main groups of people the project will benefit*

The main beneficiaries would be the vulnerable people living in the flood-prone areas of Chiang Rai Province.

Outline description — *Key features of the project/ programme*

The key features of the Project involves the following activities :

- Establishment of flood preparedness plan and an annual plan of action;
- Establishment of flood disaster information centre in local areas;
- Capacity Building for Provincial and District Disaster Management Committees (PDMC and DDMC) and communities in flood risk areas at village level on flood risk management;
- Establishment of flood emergency response teams (relief team, rescue team, medical team);
- Organization of simulation exercises on flood emergency response;
- Public awareness and education activities; and

- Establishment of flood contingency plan

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Expected implementing agencies are:

- The Thai Department of Meteorology (TMD)
- The Royal Irrigation Department (RID)
- The Department of Water Resources
- Department of Disaster Prevention and Mitigation (DDPM)

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Timing		
Studies	Expected start year	
	Duration (years)	
Implementation	Expected start year	2015
	Duration (years)	2
Operation	Expected start year	

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Preparation of IFRM Plan for the Lower Kok River Basin.
- Study on Flash Floods in the Kok River Basin
- Landuse Planning for Flood-prone Areas in Chiang Rai Province.
- Flood Proofing of Key Infrastructure in Selected Areas in Chiang Rai Province.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Reluctance by the Provincial and District Disaster Management Committees to implement or participate in the Project activities.
- Reluctance by the local communities to participate in the Capacity Building Programme.

Project Description Sheet: Thailand 04

Project name	**Landuse Planning For Flood-prone Areas in Chiang Rai Province**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Enabling Developments**	Country(s)	**Thailand**	
Intervention sub-category(s):	**Research and Development**	Mainstream reach	**Mekong/ Nam Mae Kok**	
Implementation	**National**	Tributary/ Sub-area(s)	**2T**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Annual flooding in the Nam Mae Kok River Basin causes significant damage to agriculture and as a result hinders the socio-economic development of Chiang Rai Province. Unplanned developments and landuse would lead to increasing risk of annual floods and more damages.

Currently there is no spatial data on landuse for Nam Mae Kok River Basin, which is needed for proper, controlled development and management of landuse activities in the basin.

The availability of data and information concerning landuse and natural resources is very essential for the integrated water resources and flood risk management of Nam Mae Kok River Basin and for the socio-economic development of the area.

The risks of damages will continue to increase if no landuse planning concept and strategy is implemented for the basin.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The overall objective of the project is to develop and implement a landuse planning strategy which would ensure the proper utilization of land through landuse controls and management and avoid haphazard developments in the flood-prone areas. The outcome of the project will be the minimisation of flood risks and damages in Chiang Rai Province and hence improving the socio-economic development of the province.

Principal beneficiaries — *Main groups of people the project will benefit*

The main beneficiaries would be the vulnerable people living in the flood-prone areas of Chiang Rai Province.

Outline description — *Key features of the project/ programme*

The project involves collecting and providing relevant data/ information such as flood hazard maps, inventory of natural resources, landuse planning and zoning in Nam Mae Kok River Basin of Chiang Rai Province.

The key features of the project include:

- Physical landuse surveying in Nam Mae Kok River basin
- Natural resources inventory
- Landuse planning and zoning mapping in flood-prone areas of Nam Mae Kok River basin

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Expected implementing agencies are:

- The Thai Department of Meteorology (TMD)
- The Royal Irrigation Department (RID)
- The Department of Water Resources
- Department of Disaster Prevention and Mitigation (DDPM)

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Hydrological hazards for the Lower Nam Mae Kok have been assessed in Stage 1 of FMMP-C2 (refer to Annex 1 to the Stage 1 Evaluation Report).

Timing		
Studies	Expected start year	2014
	Duration (years)	3
Implementation	Expected start year	
	Duration (years)	
Operation	Expected start year	

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Preparation of IFRM Plan for the Lower Kok River Basin.
- Study on Flash Floods in the Kok River Basin
- Capacity Building on Flood Risk Management in Chiang Rai Province.
- Flood Proofing of Key Infrastructure in Selected Areas in Chiang Rai Province.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Thailand 05

Project name	**Flood Proofing of Key Infrastructure in selected areas in Chiang Rai Province**	Portfolio reference no	

BDP Sector(s)	**Flood Management & Mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Thailand**	
Intervention sub-category(s):	**Flood proofing**	Mainstream reach		
Implementation	**National**	Tributary/ Sub-area(s)	**2T**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Chiang Rai Province is located in Nam Mae Kok River (a tributary of Mekong River) Basin. The Nam Mae Kok Basin covers an area of 10,730 km2 , of which some 31% lies in Myanmar. Mayor tributaries are the Nam Mae Fang and the Nam Mae Lao, which latter drains immediately downstream of Chiang Rai City. The basin is mountainous on the divides with elevations of up to 2,000 m. The valleys of the Fang, the Lao and the Kok rivers from Chiang Rai to the mouth are flat and flood-prone. The basin is densely forested in the upper areas with agricultural development in the lower reaches.

Annual floods in the basin cause loss of life, damage to property, agriculture, rural infrastructure and disrupt the social and economic activities of people living in Chiang Rai Province.

Flood proofing of key infrastructure such as education centres, hospitals, heritage sites, flood evacuation buildings/ areas and other important infrastructure vulnerable to flooding, will protect the affected properties, prevent loss of life and hence reduce flood damages.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The objective of this project is to protect or reduce the flood risk of vital infrastructure in selected areas in Chiang Rai Province.

Principal beneficiaries	*Main groups of people the project will benefit*

The project would benefit the people of Chiang Rai Province.

Outline description	*Key features of the project/ programme*

Development of flood proofing measures in order to protect key infrastructure at risk.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Expected implementing agencies are:

- The Thai Department of Meteorology (TMD)
- The Royal Irrigation Department (RID)
- The Department of Water Resources
- Department of Disaster Prevention and Mitigation (DDPM)

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Timing		
Studies	Expected start year	2013
	Duration (years)	1
Implementation	Expected start year	2014
	Duration (years)	3
Operation	Expected start year	

Linkages *Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Preparation of IFRM Plan for the Lower Kok River Basin.
- Study on Flash Floods in the Kok River Basin
- Capacity Building on Flood Risk Management in Chiang Rai Province.
- Landuse Planning for Flood-prone Areas in Chiang Rai Province.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

Estimated costs and financing arrangements *Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$

Risks and assumptions *Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.

Project Description Sheet: Thailand 06

Project name	**Joint Bank Protection Study – Bokeo**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Lao PDR/ Thailand**	
Intervention sub-category(s):	**Flood control - Embankments**	Mainstream reach	**Mekong River**	
Implementation	**Joint**	Tributary/ Sub-area(s)	**1L & 2T**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Riverbank erosion is acknowledged as one of the problems hampering effective flood protection at some locations along the Mekong River. However, not all the LMB countries have a clear concept on how to address these problems. Furthermore, there is indication that existing riverbank protection along one side of the river is contributing to river instability on the other side. Most of the bank failure and erosion areas show that flood is the dominant cause of damage.

The problems that have prevented a systematic and strategic approach to erosion management in the Mekong areas 1L and 2T are of morphological, economic and technical in nature.

Riverbank protection measures are considered flood risk reduction measures in the context of this Project because of the increasing urban and infrastructural development along the banks of the Mekong River, adding
significantly to the investment value of property and services needing protection from floods and shifting of the riverbank due to erosion.

The increase in population, investment in infrastructure in towns and rural areas (irrigation and drainage projects), and river training works carried out in the past for various purposes, are all good reasons for formulating a project with a broader view of addressing the technical, economic and socio-economic aspects of erosion risk management.

Effective riverbank protection and stabilisation planning will also help to protect assets such as agricultural land,
infrastructure, international border and riparian zone vegetation on or near the riverbank.

The Project will assist both governments to formulate an integrated sustainable and environmentally-sound strategy for sustainable river bank protection works and thereby improve the socioeconomic benefits of people in Bokeo and Luangprabang Provinces in Laos, Chiang Rai and Chiang Khong Provinces in Thailand.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The Project was formulated by a BDP Working Group of Lao and Thailand. The aim of the Project is to study the morphological development/ processes of the Mekong River, identify critical areas of bank erosion and its associated causes, and to identify appropriate mitigation measures for bank protection with emphasis on adopting traditional bank protection measures and promoting local knowledge in the process.

The project will have the following outputs:

- formulation of an overall integrated erosion management strategy project,
- sustainable long-term planning of river training works (including bank protection at vulnerable reaches),
- identification of means to cope with bank erosion,

- implementation of pilot projects that have suitable/ selected measures for the areas,
- identification of available local materials for riverbank protection that are environmentally friendly,
- data and information exchange between sub-areas.
- a prioritization scheme based on scores assigned to the threatened riverbanks and magnitude of the potential problems..

Principal beneficiaries	*Main groups of people the project will benefit*
Communities adjoining the riverbanks where erosion poses a threat to properties and other physical infrastructure.	

Outline description *Key features of the project/ programme*

The general approach for the strategic bank erosion management in the affected areas shall include the following elements:

- Adoption of a hazard corridor,
- regulation of all new developments within the hazard corridor by requiring a special use permit.
- establishment of a "no-build" zone close to the river banks (habitable structures and businesses would be required to have a minimum setback from the top of the bank).
- request erosion study to certify that proposed developments will not be affected by river bank erosion over the period of planning.
- The demarcation of hazard areas shall be carried out based on:
- hydraulic modelling results and historical/ field data of rates of erosion. A model shall be developed, calibrated and validated for the prediction of morphological changes to the river bed and banks. The model shall be used to predict impact of proposed interventions to the riverbanks and bed.
- delineation of hazard areas on the floodplain and establishment of setback requirements or waterway corridors.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing Agencies: Lao and Thailand National Mekong Committees.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

Timing		
Studies	Expected start year	2010
	Duration (years)	1
Implementation	Expected start year	2011
	Duration (years)	5
Operation	Expected start year	

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*
This Project also has interrelations with other MRC programmes such the NAP and IKMP.	

Estimated costs and financing arrangements *Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Transferring the erosion risk to other sections along the riverbanks

APPENDIX 4 PROJECT DESCRIPTION SHEETS FOR VIETNAM

Project Description Sheet: Vietnam 01

Project name	**Design Criteria For Flood Protection**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Enabling Developments**	Country(s)	**Cambodia Vietnam**	
Intervention sub-category(s):	**Research and Development**	Mainstream reach	**Mekong Delta**	
Implementation	**National**	Tributary/ Sub-area(s)	**10C, 10V**	

Strategic importance *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Currently there is no specific design criterion for the design of flood control structures in the Cuu Long Delta. In shallow inundated area, fruit areas, town areas, residential/ settlement in deep-inundated area the existing flood control structures have been designed based on the 2000 year flood, (which corresponds to a 50-year average return period flood), and in other areas the 10-year return period flood is applied.

Applying the 2000 and 10-year floods only for the design of the flood control structures in the Delta is not considered appropriate. The level of flood protection must be decided based on factors such acceptable risk, economic, engineering, social, etc.

The current design approach has to be improved to cover a wide range of acceptable flood risks for the design of flood mitigation works. There is therefore a strong need for the development and implementation of more appropriate design criteria to assist with the development of flood control and drainage schemes in the Delta.

The Design Criteria will not only provide uniformity for the design of flood control structures but will help with the proper planning of such works to mitigate flood risk.

Development and project objectives and key indicators *Objectives of the project and social, environmental and/or economic indicators of success*

The scope of this Project is as follows:

- The Project will focus primarily on the methodology for the development of criteria for flood protection schemes in the Vietnamese part of the Delta.
- The link between protection criteria, flood risk and risk acceptance will be formulated. For areas with known flood risks, show for different protection criteria what the economic impact is and what the residual risk is.
- The output of this project will be a document to be used as a reference for decision-makers who are involved with flood protection works in the Mekong Delta.

The output would provide answers to the following questions:

- How to assess the actual flood protection level/ risk (probability of inundation) in different parts of the Delta.
- What is the residual risk in relation to the actual protection level in the Delta?

Principal beneficiaries *Main groups of people the project will benefit*

The main beneficiaries will be professionals such as Planners, Engineers, Decision-Makers and people living

in the flood-prone areas of the Cuu Long Delta.

Outline description	*Key features of the project/ programme*

The first step in this approach is the proper assessment of the flood hazard, i.e. flood levels with different exceedance probabilities. In Stage 1, such assessment was made with the help of the MRC ISIS model for the deep-flooded areas in the northern part of the Delta. However, the VRSAP model will be used for the flood hazard assessment in the development of the design criteria.

The second step is the assessment of residual risks under different levels of protection. For this purpose use will be made of damage curves.

The third step is the assessment of the existing protection levels by comparing the flood hazard levels with existing standards/ criteria.

One important element in the evaluation of the acceptability of the residual risk refers to the costs that are involved to reduce this risk. Estimate of costs of structures relating to the frequencies of flooding will be determined.

The output will be the production of a document on Design Criteria to be applied for the design of flood control structures in the Mekong Delta.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing/ Implementing Agencies: MARD, MONRE, Ministry of Science and Technology.

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Mekong Delta Comprehensive Planning - 2005.
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.
- State level Research No KC08.19 "Research on socio-economic and environment problems for Dong Thap Muoi sustainable development", by SIWRP, 2004.
- State level Research No. KC08.15/UNDP Project Code VIE/01/014 on "Capacity building for disaster mitigation in Vietnam" carried out by SIWRP (MARD) and UNDP.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.
- Existing Construction Standards for Vietnam (TCDVN 285 2002).

Timing		
Studies	Expected start year	2010-2011
	Duration (years)	1
Implementation	Expected start year	
	Duration (years)	
Operation	Expected start year	

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

The proposed Design Criteria will serve as a reference document for the design of flood control structures in the Mekong Delta.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Preparation and development of Criteria US$0. 30
- Agency services US$0.075

- MRC management fees US$0.03

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Design Criteria not being applied by Decision-Makers and professionals.
- No enforcement of Design Criteria.
- Reluctance by the governments to implement works for other reasons.
- Public opposition to the project.
- Conflict with other existing Design Standards/ Criteria (such as that for roads and other construction works)

Project Description Sheet: Vietnam 02

Project name	**Flood Risk Mitigation/ Diversion in the Border Area Between Cambodia and Vietnam**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Cambodia Vietnam**	
Intervention sub-category(s):	**River Diversion**	Mainstream reach	**Mekong Bassac**	
Implementation	**Joint**	Tributary/ Sub-area(s)	**10V**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The border areas of Cambodia and Vietnam are located in deep-flooded areas of the Bassac and Mekong Rivers.

Flood risk assessment studies carried out under FMMP-C2 indicated that the flood risk expressed as an average annual flood damage is in the order of USD 50 million per year on the Vietnamese part of the Long Xuyen Quadrangle and approximately USD 3 million per year on the Cambodian side of the border. Whereas agricultural damage to crops in Vietnam is in the order of 3% of the total risk, it is in the order of 50% on the Cambodian part.

It is anticipated that this joint project would help minimise the impacts of floods and hence reduce flood damages along the border areas of Cambodia and Vietnam.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The main aim of this joint demonstration project is to minimise the risk of flooding in the border areas of Cambodia and Vietnam and as such enhance economic development in the affected areas.

The output of the project will be the Terms of Reference for the preparation of flood risk mitigation measures in the border zone. Flood diversion is likely to be the most attractive option for the mitigation of transboundary impacts of flood risk management measures in the respective countries.

The project is based on the following assumptions:

- Structural flood risk management measures in the two countries that aim at the reduction of flood hazard will have transboundary impacts;
- Structural measures can be implemented in the border area to mitigate these transboundary impacts.

The first assumption was verified during Stage 1 of FMMP-C2. For different flood protection scenarios on both sides of the boundary simulations were carried out with the help of the ISIS model. The results have been reported on in the Annex 1 to the Stage 1 Evaluation Report.

Regarding the second assumption, no studies were carried out during Stage 1. Options for diversion of Mekong flood waters towards the Gulf of Thailand have been considered before in the Mekong Delta Master Plan (NEDECO, 1993) and The Flood Control Planning for Development of the Mekong Delta (KOICA, 2000). The first study considered diversion in the border area (Tan Chau - Chau Doc - Gulf of Thailand. The latter study looked at the option of diversion from Takeo to the Gulf of Thailand.

Principal beneficiaries	*Main groups of people the project will benefit*

The main groups of beneficiaries would be the communities living in the floodplains of the Mekong Delta, particularly those living in the border districts of Long An, Dong Thap, An Giang and Kien Giang Provinces in Vietnam and in Cambodia, Svay Rieng and Ta Kev Provinces.

Outline description *Key features of the project/ programme*

The area for the flood diversion is the border area between Vietnam and Cambodia.

The scope of this project is as follows:

- Assessment of the impact of existing flood risk management plans on both sides of the border on the flood risks in the Vietnam and Cambodia part of the Mekong Delta.
- Identification of measures in the border zone for mitigating negative impacts on flood risk in the neighbouring country.
- Formulation of a plan for flood risk mitigation in the border zone.
- Drafting of the Terms of Reference for the preparation of priority works for flood risk mitigation in the border zone.
- Control floods from the border to Long Xuyen Quadrangle and drain floods to the Gulf of Thailand.
- Construct a drainage canal to the Gulf of Thailand.
- Build infrastructure to control saltwater intrusion and keep fresh water in the coastal areas of the Gulf of Thailand.
- Control floods from the Bassac River to the Long Xuyen Quadrangle.

These structural measures allow, in principle, not only for the protection against early floods, but also for full control of floods that are lower than the design floods of the works.

The plan is formulated using the concept of "living with floods" as a guiding principle in the management of early floods.

Proposed institutional arrangements *Expected implementing agency(s), operator(s) etc*

Executing/ Implementing Agencies: SIWRP/ VNMC/ MARD in Vietnam; CNMC/ MOWRAM in Cambodia.

Existing documentation *Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Mekong Delta Comprehensive Planning - 2004.
- Southern Institute for Water Resources Research (SIWRP) and Sub-Institute of Geology (SIG) of the National Centre for Natural Sciences and Technology (NCST) carried out scientific researches on measures recommendation and scientific basis for follow up researches such as flooding areas' disaster mitigation and prevention strategy, provinces and sub-areas' flood control planning, 10V sub-area planning and recent Mekong Delta comprehensive planning.
- Research titled "water utilization and flood control in Dong Thap Muoi" was carried out by Sub-Institute of Geology in 1995 with flood prevention measures for deep flooding area of Dong Thap Muoi and Long Xuyen Quadrangle.
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.
- State level Research No KC08.19 "Research on socio-economic and environment problems for Dong Thap Muoi sustainable development", by SIWRP, 2004.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.

Timing

Studies	Expected start year	2015
	Duration (years)	3
Implementation	Expected start year	2020
	Duration (years)	5
Operation	Expected start year	2025

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

As both countries are undertaking flood mitigation measures within their own borders, there is the need for proper coordination and collaboration to ensure that this joint project will not significantly impact on existing or proposed IFRMs (such as the IFRM plan for Takeo in Cambodia and mitigation works in the Long Xuyen Quadrangle.

This Project is linked to the following projects:

- Development of Flood Control Structures along Tu Thuong Canal, Vietnam.
- Enlarge main canals in the POR, Vietnam.
- Enlarge main canals in the LXQ, Vietnam.
- Rotation Flood Control Embankment in Deep-Flooded Area of the POR, Vietnam.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each project.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the governments to implement works for other reasons.
- Public opposition to the project.
- The Diversion Canal could change the morphology of the canal systems in the POR and LXQ.
- Discharge from the proposed diversion canal could affect the eco-system in the vicinity of the canal outlet along the coast of the Gulf of Thailand.

Project Description Sheet: Vietnam 03

Project name	**Development of Flood Control Structures along Tu Thuong Canal**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**Flood control – controlled flooding; embankment**	Mainstream reach	**Mekong/ Plain of Reeds**	
Implementation	**National**	Tributary/ Sub-area(s)	**10V**	

Strategic importance *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Tu Thuong Canal is one of the major canals located in the Plain of Reeds (POR). The POR encompasses the wetlands of the upper Mekong Delta floodplain (left bank) including portions of the provinces of Dong Thap, Tien Giang and Long An. The Mekong River forms the western and southern boundaries of the area, while the Vietnam-Cambodia border defines the northern boundary. To the east, the area extends to the Vam Co Tay River and Cho Gao Canal. The POR is a deep-flooded area (floods up to a depth of 4 m) and drainage of floodwaters is slow and complex. The inundation of the Plain of Reeds comes from the Mekong River and overland flooding from Cambodia. The flood season generally lasts approximately 3.5 - 5 months with depths of about 0.5 - 4m. There are three flooding periods: (i) early floods (July to August) when there is overland flows from the Mekong River to the paddy fields resulting in the deposition of silt; (ii) the main flood which combines high water from the river and overland flooding from Cambodia; and, (iii) the receding flood period (late October to December) when overland floods from Cambodia diminish. There are generally two peaks in the flood season, the first peak in August, followed by a second higher peak in late September or early October.

Rice cultivation is the main economic activity in the Plain of Reeds with farmers generally cultivating two crops per year. Due to the high risk of flooding, the Government of Vietnam has invested in major programmes to relocate people to designated higher grounds. The deep-flooded areas in the Plain of Reeds and the Long Xuyen Quadrangle are fitted with flood protection dykes that have been designed to protect agricultural land in normal years against floods until the end of August and therefore allowing for safe harvesting of the summer-autumn crops. However, there is a need for further protection in order to reduce agriculture and infrastructure damages caused by high floods.

Strategic directions for flood risk management in the POR are clearly defined in the long-term flood control planning (of 1998), as approved by the Vietnamese Government in 1999 (Decision No. 144/1999/QD-TTg); and the Master Plan Study on Water Works for the Mekong Delta as approved by the Vietnamese Government in 2006 (Decision No. 84/2006/QD-TTg).

The flood mitigation measures proposed along the Tu Thuong Canal is to protect rice crops in the POR from early overland floods (August flood) and also control late floods (November flood) for rice seeding. This Project would ensure the socio-economic stability for people living in the flood areas of the POR.

The planned structural measures for the development of flood control structures along Tu Thuong Canal are appropriate with structural measures proposed for the POR area of the Mekong Delta.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The strategy proposed to achieve the flood control objectives for the POR relies on isolating areas from flood waters using dikes, and utilizing embankment and flood gate systems to control movement of flood waters in order to reduce flood risks and associated damages.

Overall, the Project is to achieve the following:

- Influence and control flooding using the principle of "living with floods", and distributing flood flows in the most efficient way.
- Reduce flood impacts in the central area of POR by improving drainage capacity of Tu Thuong and also at lower parts of Mekong and Vam Co Rivers.
- Control early floods to allow for the harvesting of summer – autumn crops and to accelerate drainage for winter - spring crops; concurrently, allow for the passage of flood flows from the Mekong River to the floodplains to assist with sediment deposition on the floodplains and thus enrich the soils.
- Improve drainage capacity of the existing canal systems in order to reduce the depth and duration of inundation, and also to increase dry season discharges for irrigation and impede salinity intrusion.
- Control flooding, tides and redistribute flood flows by the operation of a system of flood control gates.
- Raise existing ground levels for residential areas and road networks.
- Dig new canal systems to help reduce depth and duration of inundation, and in particularly, to accelerate flood drainage for early seeding of winter – spring crops.

Principal beneficiaries	*Main groups of people the project will benefit*

The principal beneficiaries are people living in the flood-prone areas of Tan Hong, Hong Ngu, Tam Nong, Thanh Binh, Thap Muoi and Cao Lanh Districts in Dong Thap Province; in Long An Province, the districts of Vinh Hung, Tan Hung, Moc Hoa, Tan Thanh, Thanh Hoa; and Tan Phuoc District in Tien Giang Province.

Outline description	*Key features of the project/ programme*

The proposal for the development of flood control structures along Tan Thanh-Lo Gach Canal includes:

- Construction of a dike along the southern bank of Tan Thanh-Lo Gach Canal. The dike's crest level will be above the year 2000 flood level.
- Installation of 5 flood control sluice gates to be located at the mouth of the following canals:
- 2/9, Kháng Chien, Bình Thanh, Thong Nhat and Cái Cái.
- Installation of 5 irrigation sluice gates on other parallel canals.
- Installation of 3 flood control gates/ spillways on the Southern So Thuong Road (from Hong Ngu to Tan Chau).

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing/ Implementing Agencies: SIWRP.

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Mekong Delta Comprehensive Planning - 2005.
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.

Timing		
Studies	Expected start year	2016
	Duration (years)	1
Implementation	Expected start year	2017
	Duration (years)	3
Operation	Expected start year	2020

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Enlarge main canals in the POR.
- Flood control sluice gates along Tien River.
- Rotation Flood Control Embankment in Deep-Flooded Area of the POR, Vietnam.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ 2.3
- Agency services US$ 0.575
- MRC management fees US$ 0.23

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Problems of acceptance by farmers and Local Authorities.
- Problems with the management and operation of the sluice gates.
- The Diversion Canal could change the morphology of the canal systems in the POR and LXQ.
- Increased flooding and sediment deposition in the upstream area (Northern Tan Thanh-Lo Gach Canal up to Viet Nam-Cambodia border)

Project Description Sheet: Vietnam 04

Project name	**Rotation Flood Control Embankment in Deep-flooded Area of the LXQ Area**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**Flood control – Embankment; controlled flooding**	Mainstream reach	**Bassac/ Hau River/ LXQ**	
Implementation	**National**	Tributary/ Sub-area(s)	**10V**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Long Xuyen Quadrangle (LXQ) encompasses the wetlands of the upper Mekong Delta floodplain (right bank of Bassac River) including portions of the provinces of An Giang, Kien Giang and a small part of Can Tho City. The Bassac River forms the eastern boundary, the Gulf of Thailand the western boundary, while the Vietnam-Cambodia border defines the northern boundary and Cai San Canal forms the southern boundary. The LXQ is a deep-flooded area (floods up to a depth of 4 m) and drains towards the Gulf of Thailand. However, the LXQ area is affected by saltwater intrusion and also acidity. Inundation of the LXQ comes from the Bassac River and overland flooding from Cambodia. The flood season generally lasts approximately 3.5 - 5 months with depths of about 0.5 - 4m. There are three flooding periods: (i) early floods (July to August) when there is overland flows from border areas to the paddy fields resulting in the deposition of silt; (ii) the main flood which combines high water from the river and overland flooding from Cambodia; and, (iii) the receding flood period (late October to December) when overland floods from Cambodia diminish. There are generally two peaks in the flood season, the first peak in August, followed by a second higher peak in late September or early October.

Rice cultivation is the main economic activity in the LXQ with farmers generally cultivating two crops per year. Due to the high risk of flooding, the Government of Vietnam has invested in major programmes to relocate people to designated higher grounds. The deep-flooded areas in the Long Xuyen Quadrangle are fitted with flood protection dykes that have been designed to protect agricultural land in normal years against floods until the end of August and therefore allowing for safe harvesting of the summer-autumn crops. However, there is a need for further protection in order to reduce agriculture and infrastructure damages caused by high floods.

Strategic directions for flood risk management in the LXQ are clearly defined in the long-term flood control planning (of 1998), as approved by the Vietnamese Government in 1999 (Decision No. 144/1999/QD-TTg); and the Master Plan Study on Water Works for the Mekong Delta as approved by the Vietnamese Government in 2006 (Decision No. 84/2006/QD-TTg).

This Project would ensure the socio-economic stability for people living in the flood areas of the LXQ.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The main objective is to provide a flood mitigation scheme which would enable the production of 3 crops per year in the LXQ. The rotation scheme to be adopted will assist with flood protection of crops, sediment distribution to enrich the soils in the LXQ; enhance flushing of soil acidity, fertiliser and other toxic materials and thus improve the quality of the soil for cultivation.

The Project could serve as a pilot project for the rest of the deep-inundated areas of the LXQ.

Principal beneficiaries	*Main groups of people the project will benefit*
The provinces of Long Xuyen, Kien Giang and Can Tho City will benefit from the Project. About 2 million in the LXQ will be affected.	

Outline description	*Key features of the project/ programme*
The key features of the programme will be to improve the existing embankment and enclose the area with new dikes (if required) for full flood control of deep-flooded areas (North of Cai San Canal). Provide sluice gates to properly control the floods and drainage in the LXQ. This would also require a good operation scheme for the control gates. The protected area will be rotated periodically.	

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: MARD and SIWRP.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Study on integrated agricultural development plan in the Plain of Reeds, Vietnam; TAIYO Consultants, 2000.
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.
- State level Research No KC08.19 "Research on socio-economic and environment problems for Dong Thap Muoi sustainable development", by SIWRP, 2004.
- State level Research No. KC08.15/UNDP Project Code VIE/01/014 on "Capacity building for disaster mitigation in Vietnam" carried out by SIWRP (MARD) and UNDP.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.
- Existing Construction Standards for Vietnam (TCDVN 285 2002).
- Detailed Water Resources Planning for the LXQ, 2008.
- Integrated Rural Development in Dong Thap Muoi area by JICA, 2000

Timing		
Studies	Expected start year	2015
	Duration (years)	1
Implementation	Expected start year	2016
	Duration (years)	2
Operation	Expected start year	2018

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Enlarge main canals in the LXQ.
- Flood control sluice gates along Hau River.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

There is also the need to coordinate activities with the Ministry of Transport in order to ensure that any proposed road construction fits in well with the planned flood mitigation measures and that provisions are made for appropriate road design levels and also for adequately sized cross-drainage structures (e.g. bridges and culverts).

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$0.4
- Agency services US$0.1
- MRC management fees US$0.04

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Problems of acceptance by farmers and Local Authorities.
- There could be land issues involved as most of the land is privately owned.
- Problems with the management and operation of the protected areas with regard to crop rotation as there are no regulations/ policies in place.
- Flooding in adjoining areas could be affected as the result of altering the flow paths.

Project Description Sheet: Vietnam 05

Project name	**Flood Control Sluice Gates Along Tien River**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**Flood control – controlled flooding**	Mainstream reach	**Mekong/ Tien River**	
Implementation	**National**	Tributary/ Sub-area(s)	**10V**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The POR encompasses the wetlands of the upper Mekong Delta floodplain (left bank) including portions of the provinces of Dong Thap, Tien Giang and Long An. The Mekong River forms the western and southern boundaries of the area, while the Vietnam-Cambodia border defines the northern boundary. To the east, the area extends to the Vam Co Tay River and Cho Gao Canal. The POR is a deep-flooded area (floods up to a depth of 4 m) and drainage of floodwaters is slow and complex. The inundation of the Plain of Reeds comes from the Mekong River and overland flooding from Cambodia. The flood season generally lasts approximately 3.5 - 5 months with depths of about 0.5 - 4m. There are three flooding periods: (i) early floods (July to August) when there is overland flows from the Mekong River to the paddy fields resulting in the deposition of silt; (ii) the main flood which combines high water from the river and overland flooding from Cambodia; and, (iii) the receding flood period (late October to December) when overland floods from Cambodia diminish. There are generally two peaks in the flood season, the first peak in August, followed by a second higher peak in late September or early October.

Rice cultivation is the main economic activity in the Plain of Reeds with farmers generally cultivating two crops per year. Due to the high risk of flooding, the Government of Vietnam has invested in major programmes to relocate people to designated higher grounds. The deep-flooded areas in the Plain of Reeds and the Long Xuyen Quadrangle are fitted with flood protection dykes that have been designed to protect agricultural land in normal years against floods until the end of August and therefore allowing for safe harvesting of the summer-autumn crops. However, there is a need for further protection in order to reduce agriculture and infrastructure damages caused by high floods.

Strategic directions for flood risk management in the POR are clearly defined in the long-term flood control planning (of 1998), as approved by the Vietnamese Government in 1999 (Decision No. 144/1999/QD-TTg); and the Master Plan Study on Water Works for the Mekong Delta as approved by the Vietnamese Government in 2006 (Decision No. 84/2006/QD-TTg).

The flood mitigation measures proposed is to protect rice crops in the POR from early overland floods (August flood) and also control late floods (November flood) for rice seeding. This Project would ensure the socio-economic stability for people living in the flood areas of the POR.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The key objective is to provide several sluice gates along National Road No.30 and No. 1 from Hong Ngu to My Tho in Dong Thap and Tien Giang Provinces to control incoming floods from the Tien River and also control drainage to the river.

This Project is intended to control floods and improve drainage in the affected areas and hence minimise the risk of flood damages to agriculture and other infrastructure. The scheme will also improve water management for irrigation during the dry season as enough water will be captured and stored for this

purpose.

Principal beneficiaries	*Main groups of people the project will benefit*
About 3.2 million people of Dong Thap, Long An and Tien Giang Provinces living in the flood-affected areas.	

Outline description	*Key features of the project/ programme*
Construct several sluice gates which are to be located along the stretch from Cao Lanh to My Tho (7 sluice gates) to protect the POR from early floods and to control drainage and tides.	

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: MARD, HEC2, and SIWRP	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Study on integrated agricultural development plan in the Plain of Reeds, Vietnam; TAIYO Consultants, 2000.
- Mekong Delta Comprehensive Planning - 2005: Mekong Delta Irrigation planning in 2006 – 2010.
- Detailed Flood Control Planning for the POR, 2006-7.
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.
- State level Research No KC08.19 "Research on socio-economic and environment problems for Dong Thap Muoi sustainable development", by SIWRP, 2004.
- State level Research No. KC08.15/UNDP Project Code VIE/01/014 on "Capacity building for disaster mitigation in Vietnam" carried out by SIWRP (MARD) and UNDP.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.
- Existing Construction Standards for Vietnam (TCDVN 285 2002).

Timing		
Studies	Expected start year	2016
	Duration (years)	1
Implementation	Expected start year	2017
	Duration (years)	3
Operation	Expected start year	2019

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Enlarge main canals in the POR.
- Rotation Flood Control Embankment in deep-flooded area of POR.
- Flood risk mitigation/ diversion in the border area between Cambodia and Vietnam
- Flood control for fruit tree area in the Southern Nugyen Van Tiep Canal.
- Development of flood control structures along Tu Thuong Canal.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$1.60
- Agency services US$0.4

- MRC management fees US$0.16

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Problems of acceptance by farmers and Local Authorities.
- There could be land issues involved as most of the land is privately owned.
- Problems with the management and operation of the sluice gates and water management system as there are no regulations/ policies in place.
- Poor operation and maintenance of the sluice gates could worsen the flooding and drainage situation.
- Affect the transportation system of boats moving between canals.
- Impact on sediment transport to the floodplain areas.
- Flooding in adjoining areas could be affected as the result of altering the flow paths.
- Issues with farmers regarding land compensation.

Project Description Sheet: Vietnam 06

Project name	**Flood Control For Fruit Tree Area in The Southern Nguyen Van Tiep Canal**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**Flood control – controlled flooding; embankment; dredging and re-profiling**	Mainstream reach	**Mekong/ Plain of Reeds**	
Implementation	**National**	Tributary/ Sub-area(s)	**10V**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Fruit cultivation, besides rice, is one of the major agricultural activities in the Mekong Delta. The Mekong Delta produces more than 50% of Vietnam's total fruit exports. The plantations are mainly located in the provinces of, Vinh Long and Dong Thap. The area around Southern Nguyen Van Tiep Canal, which is located in Tien Giang and Dong Thap Provinces, is one of the major fruit growing areas.

Flood damage to fruit trees forms a large portion of the overall flood damage to agriculture produce. During the 2000 floods, an estimated 16,000 - 48,000 ha of fruit trees were destroyed amounting to 200billion VND (total Agricultural loss in 2000 was estimated at 380 billion VND).

Southern Nguyen Van Tiep canal area is considered as a shallow- inundated area. There is a need to provide all-year- round flood protection for the fruit trees. Also currently, the water resources infrastructure is not adequate and improvements to the existing systems are required in order to provide enough water for the cultivation of the crops.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The key objective of the project is to protect the fruit- growing areas around Southern Nguyen Van Tiep Canal from flooding and to increase the available water resource.

The expected outcome would be minimal flood damage to fruit trees and hence increase in fruit production.

Principal beneficiaries — *Main groups of people the project will benefit*

Principal beneficiaries will be fruit growers (in the affected areas in Tien Giang, Dong Thap, Long An Provinces.

This will affect the livelihood of nearly 1.7 million people in the project area.

Outline description — *Key features of the project/ programme*

The programme will involve:

- the improvement of the existing embankment system for full flood control;
- construction of secondary sluice gates;
- Improvement (dredge and widen) of approximately 21 main canals; and
- Installation of pumping stations.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: SIWRP.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010, SIWRP, 1999.
- Mekong Delta Comprehensive Planning, SIWRP, 2005
- Detail flood control planning for the POR, SIWRP, 2006
- Water Resource for development of the Southern Nguyen Van Tiep fruit tree area, SIWRP, 2007
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.

Timing		
Studies	Expected start year	2011
	Duration (years)	1
Implementation	Expected start year	2012
	Duration (years)	3
Operation	Expected start year	2015

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Enlarge main canals in the POR.
- Rotation Flood Control Embankment in deep-flooded area of POR.
- Flood risk mitigation/ diversion in the border area between Cambodia and Vietnam
- Flood control sluice gates along the Tien River.
- Development of flood control structures along Tu Thuong Canal.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$0.6
- Agency services US$0. 15
- MRC management fees US$0.0 6

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Problems of acceptance by farmers and Local Authorities.
- There could be land issues involved as most of the land is privately owned.
- Problem with the management and operation of the sluice gates and water management system as there are no regulations/ policies in place.
- Affect the transportation system of boats moving between canals.
- Impact on sediment transport to the floodplain areas.
- Flooding in adjoining areas could be affected as the result of altering the flow paths.
- Issues with farmers regarding land compensation.

Project Description Sheet: Vietnam 07

Project name	**Enlarge Main Canals in POR**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**Flood control – controlled flooding; Dredging and re-profiling**	Mainstream reach	**Mekong/ Tien River**	
Implementation	**National**	Tributary/ Sub-area(s)	**10V**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The POR encompasses the wetlands of the upper Mekong Delta floodplain (left bank) including portions of the provinces of Dong Thap, Tien Giang and Long An. The Mekong River forms the western and southern boundaries of the area, while the Vietnam-Cambodia border defines the northern boundary. To the east, the area extends to the Vam Co Tay River and Cho Gao Canal. The POR is a deep-flooded area (floods up to a depth of 4 m) and drainage of floodwaters is slow and complex. The inundation of the Plain of Reeds comes from the Mekong River and overland flooding from Cambodia. The flood season generally lasts approximately 3.5 - 5 months with depths of about 0.5 - 4m. There are three flooding periods: (i) early floods (July to August) when there is overland flows from the Mekong River to the paddy fields resulting in the deposition of silt; (ii) the main flood which combines high water from the river and overland flooding from Cambodia; and, (iii) the receding flood period (late October to December) when overland floods from Cambodia diminish. There are generally two peaks in the flood season, the first peak in August, followed by a second higher peak in late September or early October.

Rice cultivation is the main economic activity in the Plain of Reeds with farmers generally cultivating two crops per year. Due to the high risk of flooding, the Government of Vietnam has invested in major programmes to relocate people to designated higher grounds. The deep-flooded areas in the Plain of Reeds and the Long Xuyen Quadrangle are fitted with flood protection dykes that have been designed to protect agricultural land in normal years against floods until the end of August and therefore allowing for safe harvesting of the summer-autumn crops. However, there is a need for further protection in order to reduce agriculture and infrastructure damages caused by high floods.

Strategic directions for flood risk management in the POR are clearly defined in the long-term flood control planning (of 1998), as approved by the Vietnamese Government in 1999 (Decision No. 144/1999/QD-TTg); and the Master Plan Study on Water Works for the Mekong Delta as approved by the Vietnamese Government in 2006 (Decision No. 84/2006/QD-TTg).

This Project would ensure the socio-economic stability for people living in the flood areas of the POR.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The flood mitigation measures proposed to enlarge canals in the POR are to improve the drainage capacity of the canals in order to accelerate the discharge of overland flows, reduce the inundation depth for cultivation of late flood season crops and to improve the overall flood condition in the border areas.

Specifically, the project will involve:

- Deepening and widening of canals to increase flood flow from POR to the Tien River and divert flood from Tien River to West Vam Co River. Increase irrigation water for central area of POR.
- Construction of embankments along the canal to serve as settlement areas for the local population.

This Project was recommended by an earlier Pre-Feasibility Study (PFS) and is currently being designed as part of a detailed planning study.

Principal beneficiaries	*Main groups of people the project will benefit*
About 3.2 million people of Dong Thap, Long An and Tien Giang Provinces living in the flood-affected areas.	

Outline description	*Key features of the project/ programme*
The project includes improvement of 4 main canals, 22 primary parallel canals (with Tien River), and other 4 main perpendicular canals connecting Tien River and West Vam Co River Currently 2 of the 4 perpendicular main canals and 4 of the 22 primary canals have been improved.	

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: MARD, DARD and SIWRP	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Study on integrated agricultural development plan in the Plain of Reeds, Vietnam; TAIYO Consultants, 2000.
- Mekong Delta Comprehensive Planning - 2005: Mekong Delta Irrigation planning in 2006 – 2010.
- Detailed Flood Control Planning for the POR, 2006-7.
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.
- State level Research No KC08.19 "Research on socio-economic and environment problems for Dong Thap Muoi sustainable development", by SIWRP, 2004.
- State level Research No. KC08.15/UNDP Project Code VIE/01/014 on "Capacity building for disaster mitigation in Vietnam" carried out by SIWRP (MARD) and UNDP.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.
- Existing Construction Standards for Vietnam (TCDVN 285 2002).

Timing		
Studies	Expected start year	2011
	Duration (years)	1
Implementation	Expected start year	2012
	Duration (years)	5
Operation	Expected start year	2017

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Flood Control sluice gates along the Tien River.
- Rotation Flood Control Embankment in deep-flooded area of POR.
- Flood risk mitigation/ diversion in the border area between Cambodia and Vietnam
- Flood control for fruit tree area in the Southern Nugyen Van Tiep Canal.
- Development of flood control structures along Tu Thuong Canal.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services (total) US$0.9
- Agency services (25%) US$0.225
- MRC management fees (10%) US$0.09

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Problems of acceptance by farmers and Local Authorities.
- There could be land issues involved as most of the land is privately owned.
- Flooding in adjoining areas could be affected as the result of altering the flow paths.
- Issues with farmers regarding land compensation.

Project Description Sheet: Vietnam 08

Project name	**Flood Control Sluice Gates Along Hau River**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**Flood control – controlled flooding;**	Mainstream reach	**Bassac/ Hau River**	
Implementation	**National**	Tributary/ Sub-area(s)	**10V**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Long Xuyen Quadrangle (LXQ) encompasses the wetlands of the upper Mekong Delta floodplain (right bank of Bassac River) including portions of the provinces of An Giang, Kien Giang and a small part of Can Tho City. The Bassac River forms the eastern boundary, the Gulf of Thailand the western boundary, while the Vietnam-Cambodia border defines the northern boundary and Cai San Canal forms the southern boundary. The LXQ is a deep-flooded area (floods up to a depth of 4 m) and drains towards the Gulf of Thailand. However, the LXQ area is affected by saltwater intrusion and also acidity. Inundation of the LXQ comes from the Bassac River and overland flooding from Cambodia. The flood season generally lasts approximately 3.5 - 5 months with depths of about 0.5 - 4m. There are three flooding periods: (i) early floods (July to August) when there is overland flows from border areas to the paddy fields resulting in the deposition of silt; (ii) the main flood which combines high water from the river and overland flooding from Cambodia; and, (iii) the receding flood period (late October to December) when overland floods from Cambodia diminish. There are generally two peaks in the flood season, the first peak in August, followed by a second higher peak in late September or early October.

Rice cultivation is the main economic activity in the LXQ with farmers generally cultivating two crops per year. Due to the high risk of flooding, the Government of Vietnam has invested in major programmes to relocate people to designated higher grounds. The deep-flooded areas in the Long Xuyen Quadrangle are fitted with flood protection dykes that have been designed to protect agricultural land in normal years against floods until the end of August and therefore allowing for safe harvesting of the summer-autumn crops. However, there is a need for further protection in order to reduce agriculture and infrastructure damages caused by high floods.

Strategic directions for flood risk management in the LXQ are clearly defined in the long-term flood control planning (of 1998), as approved by the Vietnamese Government in 1999 (Decision No. 144/1999/QD-TTg); and the Master Plan Study on Water Works for the Mekong Delta as approved by the Vietnamese Government in 2006 (Decision No. 84/2006/QD-TTg).

This Project would ensure the socio-economic stability for people living in the flood areas of the LXQ.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The flood mitigation measures proposed is to improve flood drainage in the LXQ including the border areas, flush out the acidity and fertilizers in the soils; control saltwater intrusion, and increase the amount of water available for irrigation and domestic use. The scheme will also improve navigation in the LXQ.

The project will also assist with the protection of rice crops from early floods and seeding for late flood season crops.

Principal beneficiaries	*Main groups of people the project will benefit*
The provinces of Long Xuyen, Kien Giang and Can Tho City will benefit from the Project. About 2 million in the LXQ will be affected.	

Outline description	*Key features of the project/ programme*
The Project will involve the construction of 8 sluice gates to be located at the confluence of the canals with the Hau River along the section from Long Xuyen to Chau Doc.	

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: MARD, DARD, SIWRP.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Mekong Delta Comprehensive Planning - 2005
- Review the Water Resource planning for the LXQ, SIWRP, 2008
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.

Timing		
Studies	Expected start year	2016
	Duration (years)	1
Implementation	Expected start year	2017
	Duration (years)	3
Operation	Expected start year	2019

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Enlarge main canals in the LXQ.
- Rotation Flood Control Embankment in Deep-Flooded Area of the LXQ.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects. There is also the need to coordinate with the Ministry of Transport any proposed road construction plans.

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ 1.8
- Agency services US$ 0.45
- MRC management fees US$ 0.18

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Problems of acceptance by farmers and Local Authorities.
- There could be land issues involved as most of the land is privately owned.

- Problems with the management and operation of the sluice gates and water management system as there are no regulations/ policies in place.
- Poor operation and maintenance of the sluice gates could worsen the flooding and drainage situation.
- Affect the transportation system of boats moving between canals.
- Impact on sediment transport to the floodplain areas.
- Flooding in adjoining areas could be affected as the result of altering the flow paths.
- Issues with farmers regarding land compensation.

Project Description Sheet: Vietnam 09

Project name	**Rotation Flood Control Embankment in Deep-flooded Area of the POR Area**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**Flood control – Embankment; controlled flooding**	Mainstream reach	**Mekong/ Plain of Reeds**	
Implementation	**National**	Tributary/ Sub-area(s)	**10V**	

Strategic importance	*Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The POR encompasses the wetlands of the upper Mekong Delta floodplain (left bank) including portions of the provinces of Dong Thap, Tien Giang and Long An. The Mekong River forms the western and southern boundaries of the area, while the Vietnam-Cambodia border defines the northern boundary. To the east, the area extends to the Vam Co Tay River and Cho Gao Canal. The POR is a deep-flooded area (floods up to a depth of 4 m) and drainage of floodwaters is slow and complex. The inundation of the Plain of Reeds comes from the Mekong River and overland flooding from Cambodia. The flood season generally lasts approximately 3.5 - 5 months with depths of about 0.5 - 4m. There are three flooding periods: (i) early floods (July to August) when there is overland flows from the Mekong River to the paddy fields resulting in the deposition of silt; (ii) the main flood which combines high water from the river and overland flooding from Cambodia; and, (iii) the receding flood period (late October to December) when overland floods from Cambodia diminish. There are generally two peaks in the flood season, the first peak in August, followed by a second higher peak in late September or early October.

Rice cultivation is the main economic activity in the Plain of Reeds with farmers generally cultivating two crops per year. Due to the high risk of flooding, the Government of Vietnam has invested in major programmes to relocate people to designated higher grounds. The deep-flooded areas in the Plain of Reeds and the Long Xuyen Quadrangle are fitted with flood protection dykes that have been designed to protect agricultural land in normal years against floods until the end of August and therefore allowing for safe harvesting of the summer-autumn crops. However, there is a need for further protection in order to reduce agriculture and infrastructure damages caused by high floods.

Strategic directions for flood risk management in the POR are clearly defined in the long-term flood control planning (of 1998), as approved by the Vietnamese Government in 1999 (Decision No. 144/1999/QD-TTg); and the Master Plan Study on Water Works for the Mekong Delta as approved by the Vietnamese Government in 2006 (Decision No. 84/2006/QD-TTg).

The flood mitigation measures proposed is to protect rice crops in the POR from early overland floods (August flood) and also to control late floods (November flood) for rice seeding. This Project would ensure the socio-economic stability for people living in the flood areas of the POR.

Development and project objectives and key indicators	*Objectives of the project and social, environmental and/or economic indicators of success*

The main objective is to provide a flood mitigation scheme which would enable the production of 3 crops per year in the POR. The rotation scheme to be adopted will assist with flood protection of crops, sediment distribution to enrich the soils in the POR; enhance flushing of soil acidity, fertiliser and other toxic materials and thus improve the quality of the soil for cultivation.

The Project would serve as a pilot project for the rest of the deep-inundated areas of the POR.

Principal beneficiaries	*Main groups of people the project will benefit*
About 3.2 million people of Dong Thap, Long An and Tien Giang Provinces living in the flood-affected areas.	

Outline description	*Key features of the project/ programme*
The key features of the programme will be to improve the existing embankments and enclose the area with new dikes (if required) for full flood control of selected deep-flooded areas (Northern Nguyen Van Tien canal). Provide sluice gates to properly control the floods and drainage in the POR. This would also require a good operation scheme for the control gates. The protected area will be rotated periodically.	

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: MARD, SIWRP.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Study on integrated agricultural development plan in the Plain of Reeds, Vietnam; TAIYO Consultants, 2000.
- Mekong Delta Comprehensive Planning - 2005: Mekong Delta Irrigation planning in 2006 – 2010.
- Detailed Flood Control Planning for the POR, 2006-7.
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.
- State level Research No KC08.19 "Research on socio-economic and environment problems for Dong Thap Muoi sustainable development", by SIWRP, 2004.
- State level Research No. KC08.15/UNDP Project Code VIE/01/014 on "Capacity building for disaster mitigation in Vietnam" carried out by SIWRP (MARD) and UNDP.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.
- Existing Construction Standards for Vietnam (TCDVN 285 2002).

Timing		
Studies	Expected start year	2015
	Duration (years)	1
Implementation	Expected start year	2016
	Duration (years)	2
Operation	Expected start year	2018

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Enlarge main canals in the POR.
- Flood control sluice gates along Tien River.
- Flood risk mitigation/ diversion in the border area between Cambodia and Vietnam
- Flood control for fruit tree area in the Southern Nugyen Van Tiep Canal.
- Development of flood control structures along Tu Thuong Canal.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

There is also the need to coordinate activities with the Ministry of Transport in order to ensure that any proposed road construction fits in well with the planned flood mitigation measures and that provisions are made for appropriate road design levels and also for adequately sized cross-drainage structures (e.g. bridges and culverts).

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$0.4
- Agency services US$0.1
- MRC management fees US$0.04

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Acceptance by farmers and Local Authorities.
- There could be land issues involved as most of the land is privately owned.
- Problem with the management and operation of the protected areas with regard to crop rotation as there are no regulations/ policies in place.
- Flooding in adjoining areas could be affected as the result of altering the flow paths.

Project Description Sheet: Vietnam 10

Project name	**Enlarge Main Canals in the LXQ**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**Dredging and re-profilling**	Mainstream reach	**Mekong/ Tien River/ LXQ**	
Implementation	**National**	Tributary/ Sub-area(s)	**10V**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Long Xuyen Quadrangle (LXQ) encompasses the wetlands of the upper Mekong Delta floodplain (right bank of Bassac River) including portions of the provinces of An Giang, Kien Giang and a small part of Can Tho City. The Bassac River forms the eastern boundary, the Gulf of Thailand the western boundary, while the Vietnam-Cambodia border defines the northern boundary and Cai San Canal forms the southern boundary. The LXQ is a deep-flooded area (floods up to a depth of 4 m) and drains towards the Gulf of Thailand. However, the LXQ area is affected by saltwater intrusion and also acidity. Inundation of the LXQ comes from the Bassac River and overland flooding from Cambodia. The flood season generally lasts approximately 3.5 - 5 months with depths of about 0.5 - 4m. There are three flooding periods: (i) early floods (July to August) when there is overland flows from border areas to the paddy fields resulting in the deposition of silt; (ii) the main flood which combines high water from the river and overland flooding from Cambodia; and, (iii) the receding flood period (late October to December) when overland floods from Cambodia diminish. There are generally two peaks in the flood season, the first peak in August, followed by a second higher peak in late September or early October.

Rice cultivation is the main economic activity in the LXQ with farmers generally cultivating two crops per year. Due to the high risk of flooding, the Government of Vietnam has invested in major programmes to relocate people to designated higher grounds. The deep-flooded areas in the Long Xuyen Quadrangle are fitted with flood protection dykes that have been designed to protect agricultural land in normal years against floods until the end of August and therefore allowing for safe harvesting of the summer-autumn crops. However, there is a need for further protection in order to reduce agriculture and infrastructure damages caused by high floods.

Strategic directions for flood risk management in the LXQ are clearly defined in the long-term flood control planning (of 1998), as approved by the Vietnamese Government in 1999 (Decision No. 144/1999/QD-TTg); and the Master Plan Study on Water Works for the Mekong Delta as approved by the Vietnamese Government in 2006 (Decision No. 84/2006/QD-TTg).

This Project would ensure the socio-economic stability for people living in the flood areas of the LXQ.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The flood mitigation measures proposed to enlarge canals in the LXQ are to improve the drainage capacity of the canals in order to accelerate the discharge of overland flows, reduce the inundation depth for cultivation of late flood season crops and to improve the overall flood condition in the border areas.

Specifically, the project will involve:

- Deepening and widening of canals to increase flood flow from LXQ, border areas and Bassac River to the Gulf of Thailand.
- Increase irrigation water for the LXQ, and in particular, the coastal areas.

- Construction of embankments along the canal to serve as settlement areas for the local population.

This Project was recommended by an earlier Pre-Feasibility Study (PFS) and is currently being designed as part of a detailed planning study.

Principal beneficiaries	*Main groups of people the project will benefit*

The provinces of Long Xuyen, Kien Giang and Can Tho City will benefit from the Project. About 2 million in the LXQ will be affected.

Outline description	*Key features of the project/ programme*

Deepening and widening of approximately 18 main canals (total length is 721 km).

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*

Executing/ Implementing Agencies: MARD and SIWRP.

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- FPS (1999) - Mekong Delta Flood Utilisation and Control Planning to the year 2010.
- Mekong Delta Comprehensive Planning - 2005
- Review the Water Resource planning for the LXQ, SIWRP, 2008
- State level Research No. KC08.14, "Research on flood identification, forecasting, controlling and discharging for living with flood demand in the Mekong Delta", by SIWRP, 2001-2004.
- State level Research No. KC08.15/UNDP Project Code VIE/01/014 on "Capacity building for disaster mitigation in Vietnam" carried out by SIWRP (MARD) and UNDP.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.

Timing		
Studies	Expected start year	2011
	Duration (years)	2
Implementation	Expected start year	2012
	Duration (years)	3
Operation	Expected start year	2016

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

This Project is linked to the following projects:

- Flood control sluice gates along Hau River.
- Rotation Flood Control Embankment in Deep-Flooded Area of the LXQ.
- Flood Risk Mitigation/ Diversion in the Border Area between Cambodia and Vietnam.

It is therefore important that in developing/ implementing this project, the above projects should be taken into consideration to ensure that there are no major overlaps in the mitigation measures proposed for each of the above projects.

There is also the need to coordinate activities with the Ministry of Transport in order to ensure that any proposed road construction fits in well with the planned flood mitigation measures and that provisions are made for appropriate road design levels and also for adequately sized cross-drainage structures (e.g. bridges and culverts).

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$0.9

- Agency services US$ 0.225
- MRC management fees US$0.09

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Problems of acceptance by farmers and Local Authorities.
- There could be land issues involved as most of the land is privately owned.
- Flooding in adjoining areas could be affected as the result of altering the flow paths.
- Issues with farmers regarding land compensation.
- Possible effects on the ecosystem of the coastal areas due to increase in the discharge of sediment and water acidity.

Project Description Sheet: Vietnam 11

Project name	**River Bank Protection Works in Dong Thap, Tien Giang, Ben Tre, An Giang, Can Tho and Vinh Long Provinces**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**River bank protection**	Mainstream reach	**Mekong/ Tien and Bassac/ Hau Rivers**	
Implementation	**National**	Tributary/ Sub-area(s)	**10V**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

Every year, riverbank erosion is one of the major problems affecting some towns/ areas in the Mekong Delta and causing millions of dollars in losses. Due to the severity of the erosion problem, Scientists from the SIWRP were assigned the task of collecting information, assessing the causes of erosion and to find measures to mitigate them. Statistical data collected in recent years on the damages caused by riverbank erosion showed that incidents that occurred in the past included:

- 32 deaths as a result of collapsed or damaged buildings from severe bank erosions ;
- buildings (5 rows) swept into adjacent rivers;
- villages (6) destroyed, over 2,200 houses collapsed and people had to be evacuated;
- bridges, roads, offices, hospital, schools, and other infrastructure were swept into rivers; and
- the town of Tan Chau had to be relocated.

The Mekong and Bassac Rivers appear to have undergone morphological changes over the years and these have contributed to the riverbank instability problems being encountered. However, the increase in damages and loss of life may be attributed to intense developments and increased habitation along the riverbanks resulting in high risks.

There are about 68 sites currently affected in the following provinces:

- Dong Thap Province: 16 site
- An Giang Province: 48 sites
- Tien Giang Province: 4 sites
- Ben Tre Province: 5 sites
- Vinh Long Province: 10 sites
- Tra Vinh Province: 7 sites
- Can Tho Province: 6 sites
- Soc Trang Province: 1 site

To prevent further deterioration of the riverbanks, loss of life and damage to property and infrastructure, it is important that measures are taken to prevent or control erosion in the affected areas mentioned above.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The main objective is for an erosion management strategy project for the Mekong and Bassac Rivers aimed at the future control of erosion of the banks of these major rivers. The strategy would be aimed at a sustainable long-term planning of river training (including bank protection at vulnerable reaches) to stabilize the width of the river and thus safeguard valuable land, properties, and other infrastructure; and to prevent the loss of life.

Principal beneficiaries	*Main groups of people the project will benefit*
People living in the cities and towns such as, Tan Chau, Chau Doc, Long Xuyen, Vinh Long and My Tho along Tien and Hau Rivers.	

Outline description *Key features of the project/ programme*

The Project will generally involve the construction of riverbank protection works and development of resettlement programmes for those directly affected.

The riverbank erosion protection will involve the construction of protection works at the following locations:

- River bank of Tien River at Tan Chau Town, An Giang Province;
- River bank of Vam Nao River at Hoà Bình Hamlet, Kiến An Commune, Phú Tân District in An Giang Province;
- River bank of Hau River at Long Xuyen Town in An Giang Province;
- River bank of Tien River at Long Thuận Commune, Hồng Ngự District in Đồng Tháp Province;
- River bank of Tien River at Sa Đéc Town in Dong Thap Province;
- River bank of Tien River at Cồn Rồng, Wards 4 and 6 in My Tho City, Tien Giang Province;
- Bank of Bao Dinh River at Wards 4 and 5 and Đạo Thạnh in Mỹ Tho City of Tien Giang Province.
- Bank of An Hoá River at Hamlet 1 in An Hoa Commune, Ben Tre Province;
- Bank of Hau River at Long Châu Hamlet, Tân Lộc Commune, Thốt Nốt District in Can Tho City;
- Bank of Tiền River at Hamlet 1, Hamlet 5 in Vĩnh Long Town;
- Bank of Cổ Chiên River at Hamlet Phước Định I and II, Bình Hoà Phước Commune in Long Hồ District, Vĩnh Long Province;
- Bank of Hậu River from Vàm Kênh Hai Quý to Cần Thơ ferry, Bình Minh District in Vĩnh Long Province;

Construction works for river bank protection is currently taking place in Tan Chau town and some sections of the Hau River in Can Tho City and Vinh Long City. However, some of the works have already been completed.

Proposed institutional arrangements *Expected implementing agency(s), operator(s) etc*

Executing/ Implementing Agencies: MARD and Water Resources Research Institute.

Existing documentation *Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- State level Research No. KC08.15/UNDP
- Project Code VIE/01/014 on "Capacity building for disaster mitigation in Vietnam" carried out by SIWRP (MARD) and UNDP.
- Mekong Delta Comprehensive Planning - 2004
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.

Timing

Studies	Expected start year	2010
	Duration (years)	2
Implementation	Expected start year	2012
	Duration (years)	8
Operation	Expected start year	

Linkages *Linkages that need to be observed with other developments (before, after, in parallel with …)*

Estimated costs and financing arrangements *Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ 3.93

- Agency services US$ 0.78
- MRC management fees US$ 0.39

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement works for other reasons.
- Public opposition to the project.
- Problems of acceptance by farmers and Local Authorities.
- Issues with residents regarding land compensation.
- Transferring the erosion risk to other sections along the riverbanks.

Project Description Sheet: Vietnam 12

Project name	**Integration of Flood Risk Reduction in The Implementation of P135 with Emphasis on Flood Proofing of Infrastructure and Housing**	Portfolio reference no	

BDP Sector(s)	**Flood management & mitigation**	Master database no		Location map: see end of this appendix and Figure 2.1
Intervention type	**Infrastructure**	Country(s)	**Vietnam**	
Intervention sub-category(s):	**Flood proofing**	Mainstream reach	**Upper Se San River**	
Implementation	**National**	Tributary/ Sub-area(s)	**7L**	

Strategic importance — *Relevance to IWRM-based Basin Development Strategy (indicate which aspect(s))*

The Upper Se San Basin in the Kon Tum Province experiences flash floods. The headwaters of the Se San are formed by the Dak Bla and Krong Po Ko Rivers, which join some 15 km downstream of the City of Kon Tum. Reported flood damages in this province over the period 2001 - 2005 are in the order of 0.9 million USD per year (in 2007 a damage of 1.9 million USD was reported). These damages are direct damages only. About half of the damages are related to irrigation and transport infrastructure, while the other half is related to households and agriculture.

Kon Tum City does not suffer from inundation, except under extreme flood conditions. Despite the fact that Kon Tum is relatively safe for flooding, its location on the bank of the Dak Bla tributary makes bank protection necessary to avoid damages due to erosion. Most flood-related damages in the province occur, reportedly, in the area upstream of Kon Tum City. Most disaster-related damages are due to landslides and not as a direct impact of floods. However, fatalities are essentially related to floods.

The relatively low flood related damages (besides the human fatalities) and limited development potentials do not justify substantial investments in sub-basin wide structural measures for flood hazard reduction. However, flood proofing of infrastructure could substantially reduce the existing flood risks in the area, including human fatalities.

Development and project objectives and key indicators — *Objectives of the project and social, environmental and/or economic indicators of success*

The Steering Committee for Flood Storm Control of the People's Committee of Kon Tum Province has stipulated that a long-term plan for flood risk management needs to be developed to minimise losses.

The objective of the project is to incorporate flood risk assessments and flood proofing measures in the socio-economic development and poverty reduction initiatives in these areas.

Principal beneficiaries — *Main groups of people the project will benefit*

The principal beneficiaries will be the community living in the flood-inundation areas of Kon Tum Province.

Outline description — *Key features of the project/ programme*

The key features of the programme will be the development of flood risk management in the Province focusing essentially on the reduction of the vulnerability of the people and infrastructure through flood proofing measures of infrastructure and housing.

Proposed institutional arrangements	*Expected implementing agency(s), operator(s) etc*
Executing/ Implementing Agencies: SIWRP.	

Existing documentation	*Reference to existing reports , studies etc that will provide the background and latest information on the project/ programme*

- State level Research No. KC08.15/UNDP Project Code VIE/01/014 on "Capacity building for disaster mitigation in Vietnam" carried out by SIWRP (MARD) and UNDP.
- Provincial strategies for disaster management and mitigation contributed to "strategy for disaster management and mitigation to the year 2020", approved by Prime Minister in 2007.

Timing		
Studies	Expected start year	2010
	Duration (years)	1
Implementation	Expected start year	2011
	Duration (years)	2
Operation	Expected start year	

Linkages	*Linkages that need to be observed with other developments (before, after, in parallel with …)*

Estimated costs and financing arrangements	*Estimated costs of implementing project/ programme, of operational and maintenance costs (if relevant) and proposed financing arrangements*

The estimated cost of the study is US$ x million made up of:

- Consultancy services US$ …
- Agency services US$ …
- MRC management fees US$ …

Risks and assumptions	*Key risks and assumptions that could affect achievement of the desired outcomes and/or implementation effectiveness*

- One of the main risks of the project is unavailability of adequate funds to carry out and complete fully the flood mitigation works as proposed. Partially completed works will not achieve the full socio-economic benefits of the project.
- Reluctance by the government to implement project for other reasons.
- Public opposition to the project.
- Unavailability of funds to home-owners and other establishments for flood proofing.

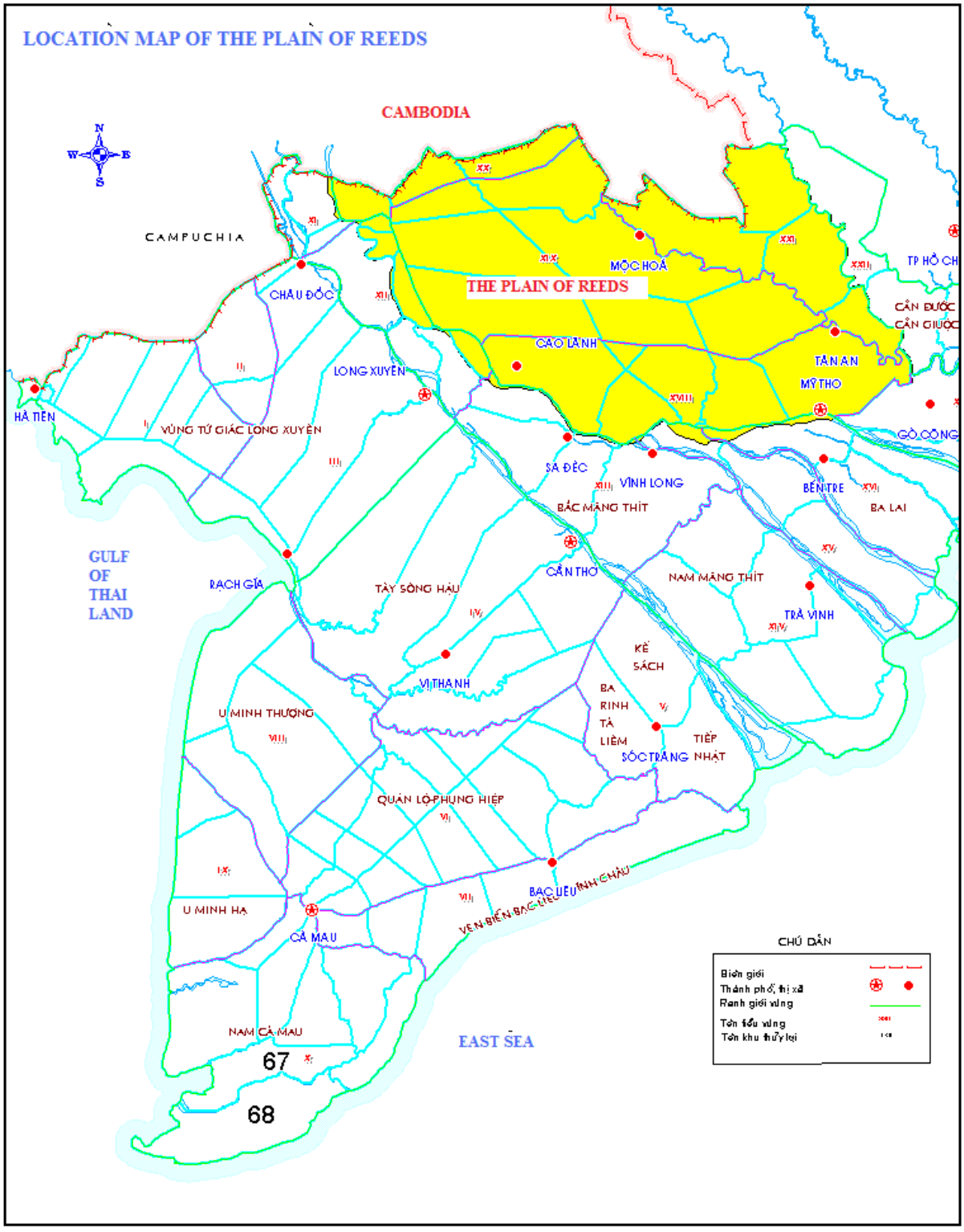


Figure 5.13 Mekong delta Vietnam: location of the Plain of Reeds (PoR); the Long Xuyen region is located west of the PoR.

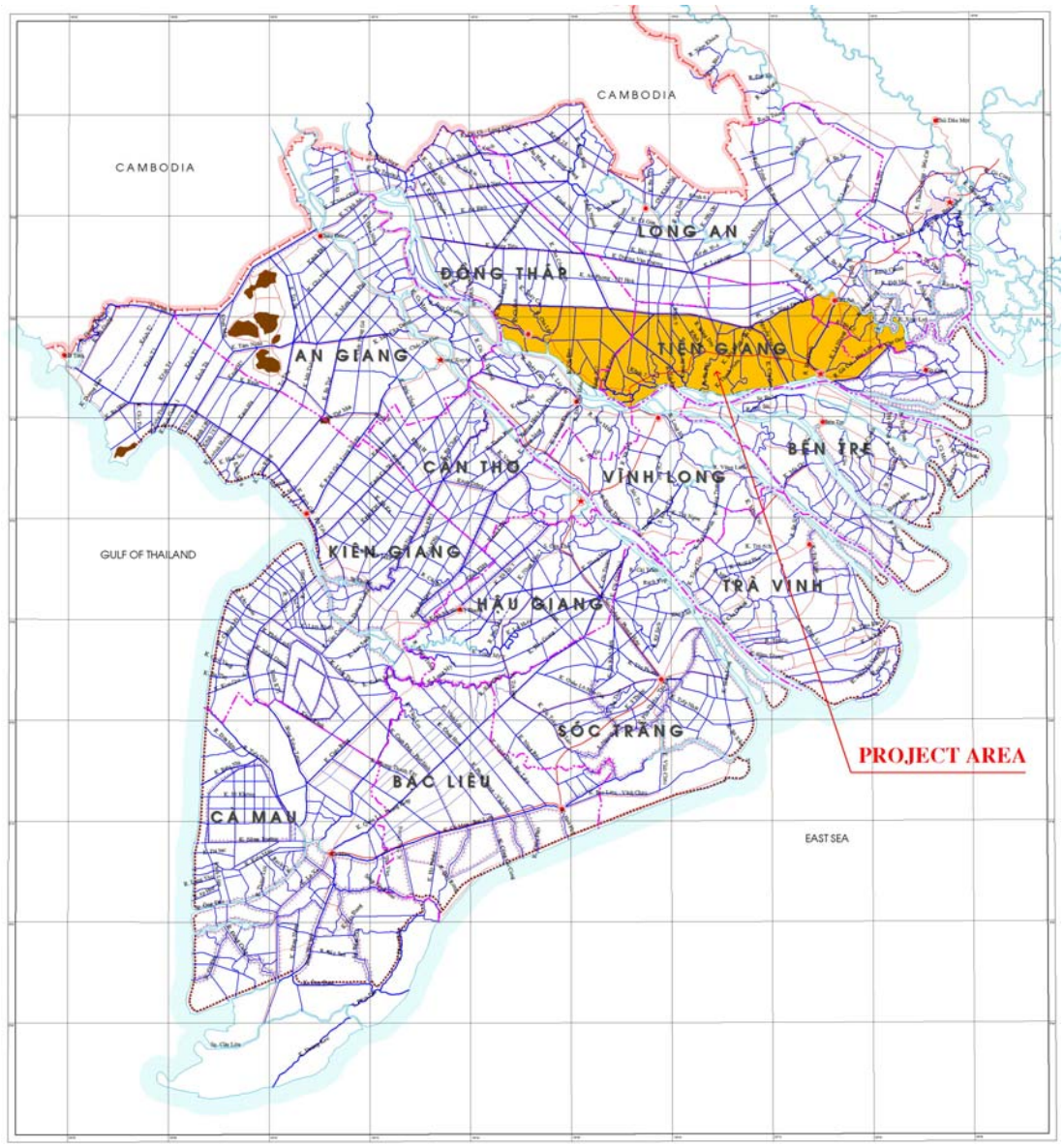


Figure 5.14 Mekong delta Vietnam: location of the Tien Giang area within the Plain of Reeds (PoR).