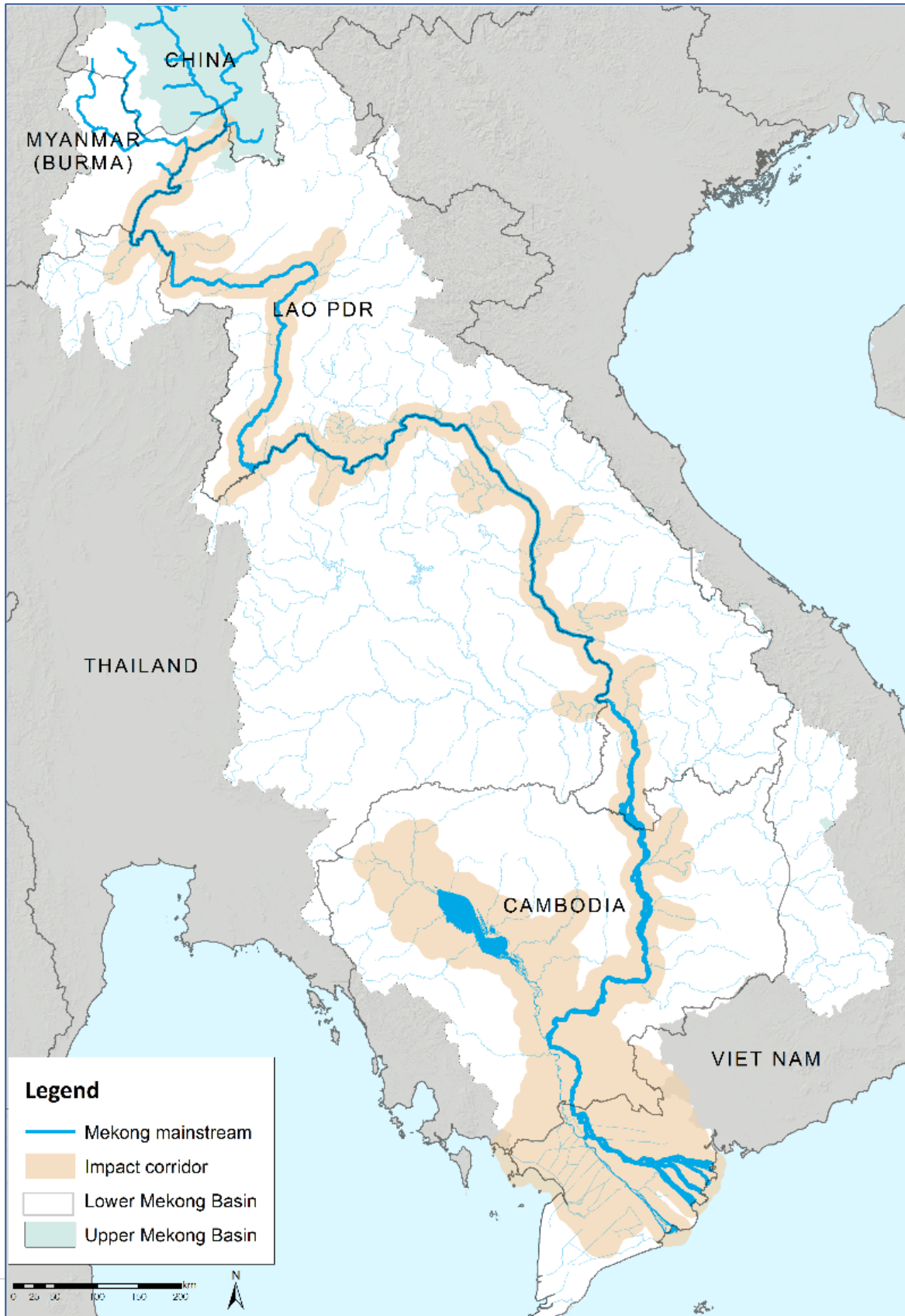


# TECHNICAL BRIEF

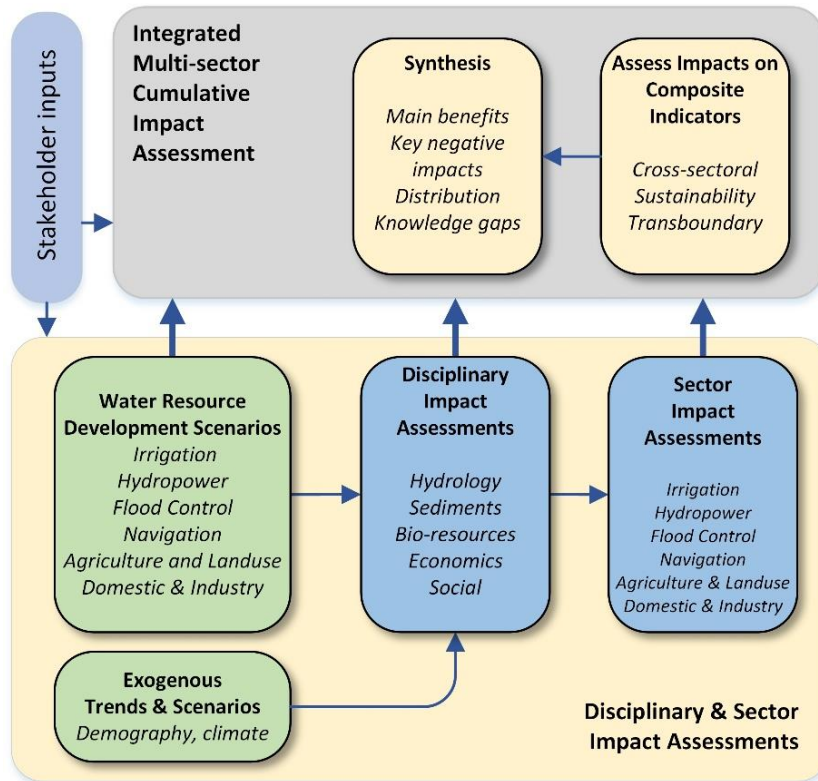
## OF THE MRC COUNCIL STUDY

### MAP OF STUDY AREA



## COUNCIL STUDY'S METHODOLOGY

The **overall unified assessment framework** of the Council Study is illustrated in the figure below.



*Council Study Integrated Assessment Framework*

The Council Study involved:

- Six Thematic Teams each representing a development thematic area or sector: Agricultural Landuse, Domestic and Industrial Water Use, Flood Protection Infrastructure, Hydropower, Irrigation and Navigation.
- Five cross-cutting Discipline Teams: Climate change, Modelling, Bio-resources (BioRA), Social and Economic.

The framework required structured liaison between the Thematic and Discipline Teams to coordinate technical inputs and integrate outputs and deliverables. To facilitate this, the major activities in the Council Study were arranged in a **general sequence**, as follows:

- The Thematic Teams formulated a suite of scenarios that integrated existing/planned developments for all of the Thematic Areas. These comprised two types of scenarios:
  - ✓ *Main development scenarios*, which encompass developments incorporated into the water-resource planning of Member Countries for the past (2007), and the near (c. 2020) and more distant (c. 2040) future. They also differ in terms of their climate (2040 and 2040CC) and the extent of floodplain settlement.
  - ✓ *Thematic sub-scenarios*, which incorporate sector-specific variations to the 2040 main development scenario for the purpose of assessing the positive and negative impacts associated with that sector.
- The Climate Change Team provided input on this aspect.
- The Modelling Team, through the use of the MRC Decision Support Framework (DSF), the Water Utilisation Program (WUP-FIN) and the eWater Source models, predicted the changes

in flow, hydraulics, sediment transport, nutrients and salinity intrusion as a result of the developments in the scenarios, and produced daily time series of flow, hydraulics, sediment, nutrients and salinity for required locations along the river system.

- The Biological Resources (BioRA) Team, using the DRIFT EFlows process, used the outputs from the Modelling Team to predict the resulting changes in habitat, biodiversity and other indicators of the river ecosystem, producing seasonal time-series of change in geomorphology, vegetation, macroinvertebrates, fish, herpetofauna, birds and mammals.
- The Social Team used the outputs from the Modelling Team and BioRA Team to predict the resulting changes in selected socio-economic indicators such as livelihoods, public health and nutrition.
- The Economics Team used the outputs from the Modelling, BioRA and Social Teams to predict resulting macro-economic impacts such as distributional analysis of benefits and costs for different communities, livelihood groups, countries and socio-economic strata.

### CROSS-CUTTING DISCIPLINE IMPACT ASSESSMENT

**Modelling** is at the core of the impact assessment: the Mekong Basin is a complex system and it is not possible to analyse and quantify development impacts without computer modelling. The core tool is **MRC DSF** (Decision Support Framework) that simulates basin-wide hydrological, flow and water quality processes as well as human interventions to them. The DSF has been updated with the Australian eWater SOURCE for water sediment and water quality modelling. DSF is coupled with the WUP-FIN (Water Utilisation Programme, Finland Component) modelling tools for integrated impact assessment focusing on The Great Lake (Tonle Sap), Cambodian floodplains, Vietnam Delta and the Mekong estuaries and coast.

The **bio-assessment** studies Mekong ecology and development impacts on it. The study topics include habitats, bio-diversity and ecosystem services (e.g. fisheries). The BioRA methodology relies on modelling results, expert knowledge and coding the knowledge into ecological systems analysis tool (*Downstream* Response to Imposed Flow Transformations, or **DRIFT**).

The **coastal assessment** reviews earlier studies and pilots 3D nested large scale modelling covering whole South Sea and focusing on the Mekong coast. The main study subject is changing Mekong sediment regime and its impact on coastal erosion. In addition water quality and fisheries productivity are included in the study.

Evaluation of **social and economic** consequences of water resources development is based on the MRC Socio-Economic Database, including Social Impact Monitoring and Vulnerability Assessment (SIMVA), and other household survey data as well as national and provincial datasets. Social assessment focuses on water security, food security, income security, health security, employment and gender. Economic assessment utilises social assessment and focuses on development costs and benefits on resources and sectors (e.g. hydropower, agriculture, ecosystem services) as well as national economies.

**Climate change** impacts are studied through the modelling component. Climate change exacerbates (increases) or mitigates (reduces) some of the impacts caused by changes in water use. The Council Study will identify the risks and opportunities that climate change provides in the context of basin development. The climate change discipline relies largely on the Climate Change and Adaptation Initiative (CCAI) results of MRC.

## 12 SCENARIOS OF THE COUNCIL STUDY

List of CS Scenario	Scenario Description
<b>Main Development Scenario (4 Main Scenarios)</b>	
M1 (2007)	<b>Baseline</b> , Early development scenario 2007
M2 (2020)	<b>Medium Term Plan</b> - Definite future scenario 2020
M3 (2040)	<b>Long Term Plan</b> - Planned development scenario 2040
M3CC (2040CC)	<b>Long Term Plan with climate change</b> - Planned Development Scenario 2040 with climate change of mean wetter and drier climate
<b>Sub-Development Scenario (12 Sub-scenarios)</b>	
C2 (CC2)	Planned Development 2040 with Wetter Climate
C3 (CC3)	Planned Development 2040 with Drier Climate
A1 (ALU1)	Planned development 2040 but with agriculture/land use (ALU) 2007 (M1) condition (M3CC with ALU condition as defined in 2007 (M1))
A2 (ALU2)	Planned development 2040 with the highest (maximum) level of agriculture expansion/land use changes (M3CC with the highest level (maximum) of ALU area expansion)
F1 (FP1)	M3CC with planned development 2040 with no flood protection infrastructure (FPF) or Bank Protection change from 2007 (M1) but include development in floodplain (urban and irrigation/agriculture Cambodia)
F2 (FP2)	M3CC with planned development 2040 with FPF (Urban protection at 1:100 ARP flood + floodplain management 1:10 ARP flood + Flood Plain delineation to maintain flood storage and flood conveyance)
F3(FP3)	M3CC with planned development 2040 with (With joint operation among mainstream dams and selected tributary dams for flood management and protection and multiple uses)
H1a	M3CC with planned development 2040 of other infrastructures but include only dams existed as condition of 2007 (M1)
H1b	M3CC with planned development 2040 of other infrastructures + Chinese dams and tributary dams but without LMB mainstream dams
H3	M3CC with planned development 2040 of other infrastructures + all mainstream dams with its mitigation measure and joint operation
I1 (IRR1)	Planned development 2040 of other infrastructures with the irrigation infrastructure as 2007 (M1) (M3CC without new IRR development beyond M1)
I2 (IRR2)	Planned development 2040 of other infrastructures with the highest (maximum) level of IRR development (M3CC with the highest (maximum) level of IRR development)

More Detail explanation about Main and sub-scenarios in the next pages.

## Main scenarios

	Development scenario	Time horizon	Primary interventions	Climate	Flood Plain Settlement
M1	Early development scenario	Up to 2007	Water resources infrastructure developed in the Lower Mekong Basin up to 2007	1985-2008	2007
M2	Definite future scenario	Definite future up to 2020	Early scenario plus water resources infrastructure developed, under construction and planned in the Lower Mekong Basin between 2007 and 2020	1985-2008	2020
M3	Planned development scenarios	Planned future up to 2040	Definite Future plus infrastructure planned for implementation in the Lower Mekong Basin between 2020 and 2040	1985-2008	2040
M3CC	Planned development scenarios	Planned future up to 2040	Definite Future plus infrastructure planned for implementation in the Lower Mekong Basin between 2020 and 2040	Mean warmer & wetter	2040

## Sub-scenarios

	Sub-scenarios	Level of Development for water-related sectors						Climate	Flood-plain
		ALU	DIW	FPF	HPP	IRR	NAV		
M3CC	Planned Development Scenario 2040	2040	2040	2040	2040	2040	2040	Mean warmer & wetter	2040
C1=M3	Planned Development 2040 No climate change	2040	2040	2040	2040	2040	2040	1985-2008	2040
C2	Planned Development 2040 + Wetter Climate	2040	2040	2040	2040	2040	2040	Wetter	2040
C3	Planned Development 2040 + Drier Climate	2040	2040	2040	2040	2040	2040	Drier	2040

	Scenario	Level of Development for water-related sectors <sup>1</sup>						Climate	Flood-plain
		ALU	DIW	FPF	HPP	IRR	NAV		
M3CC	Planned Development Scenario 2040	2040	2040	2040	2040	2040	2040	Mean warmer & wetter	2040
A1	Planned Development 2040 without ALU	<b>2007</b>	2040	2040	2040	2040	2040	Mean warmer & wetter	2040
A2	High level ALU implementation	<b>HIGH</b>	2040	2040	2040	2040	2040	Mean warmer & wetter	2040

	Scenario and sub-scenarios	Level of Development for water-related sectors						Climate	Flood-plain
		ALU	DIW	FPF	HPP	IRR	NAV		
M3 CC	Planned Development Scenario 2040	2040	2040	2040	2040	2040	2040	Mean warmer & wetter	2040
F1	Planned Development 2040 without FPF	2040	2040	<b>2007</b>	2040	2040	2040	Mean warmer & wetter	2040
F2	Planned Development 2040 with FP2	2040	2040	<b>FPF2</b>	2040	2040	2040	Mean warmer & wetter	2040
F3	Planned Development 2040 with FPF3	2040	2040	<b>FPF3</b>	2040	2040	2040	Mean warmer & wetter	2040

	Scenario and sub-scenarios	Level of Development for water-related sectors						Climate	Flood-plain
		ALU	DIW	FPF	HPP	IRR	NAV		
M3 CC	Planned Development Scenario 2040	2040	2040	2040	2040	2040	2040	Mean warmer & wetter	2040
I1	Planned Development 2040 without IRR	2040	2040	2040	2040	<b>2007</b>	2040	Mean warmer & wetter	2040
I2	Planned Development 2040 with IRR HIGH	2040	2040	2040	2040	<b>HIGH</b>	2040	Mean warmer & wetter	2040

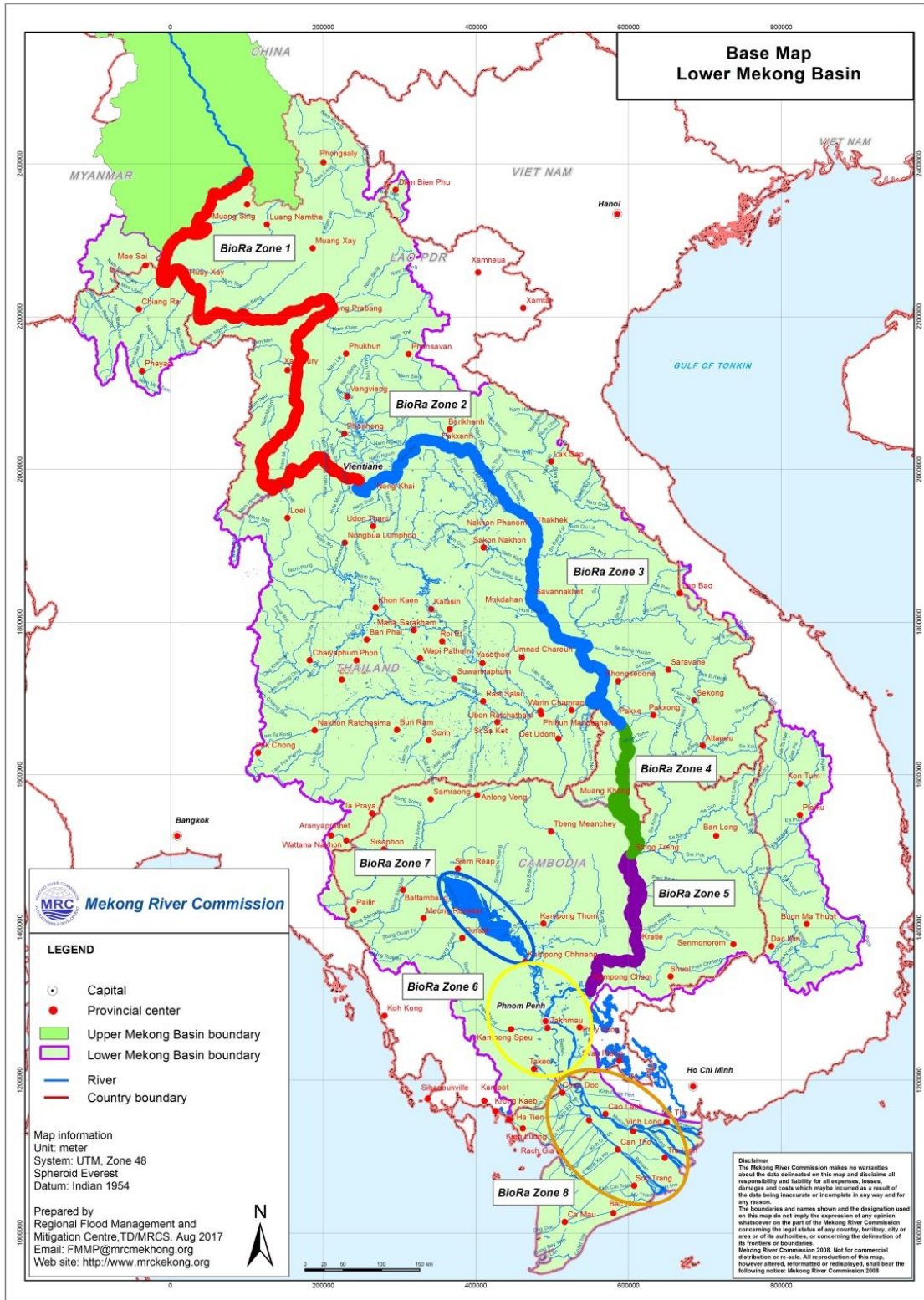
	Scenario and sub-scenarios	Level of Development for water-related sectors						Climate	Flood-plain
		ALU	DIW	FPF	HPP	IRR	NAV		
M3CC=H2	Planned Development Scenario 2040	2040	2040	2040	2040	2040	2040	Mean warmer & wetter	2040
H1a	Planned Development 2040 without HPP	2040	2040	2040	<b>2007</b>	2040	2040	Mean warmer & wetter	2040
H1b	Planned Development 2040 <b>(Chinese and tribary dam and No Mainstream dam)</b>	2040	2040	2040	<b>HPS1</b>	2040	2040	Mean warmer & wetter	2040
H3	Planned Development 2040 with HPS3	2040	2040	2040	<b>HPS3</b>	2040	2040	Mean warmer & wetter	2040

## ABBREVIATIONS AND ACRONYMS

AIP	: Agriculture and Irrigation Programme (of the MRC)
ALU	: Agriculture and Land Use
BDP	: Basin Development Plan
BDP2	: Basin Development Plan Phase 2 (2006 –10)
BDS	: (IWRM-based) Basin Development Strategy
BioRA	: Biological resource assessment team (under Council Study)
CCAI	: Climate Change and Adaptation Initiative (of the MRC)
CIA	: Cumulative Impact Assessment
CNMC	: Cambodia National Mekong Committee
CS	: Council Study
DMP	: Drought Management Programme (of the MRC)
EP	: Environment Programme (of the MRC)
FAO	: Food and Agriculture Organisation
FMMP	: Flood Mitigation and Management Programme (of the MRC)
FP	: Fisheries Programme (of the MRC)
HH	: Household
HP	: Hydropower
IBFM	: Integrated Basin Flow Management (MRC study)
IFAD	: International Fund for Agricultural Development
IKMP	: Information and Knowledge Management Programme (of the MRC)
ILO	: International Labour Organisation
IRR	: Irrigation
IWRM	: Integrated Water Resources Management
ISH	: Initiative for Sustainable Hydropower (of the MRC)
JC	: Joint Committee (of the MRC)
LMB	: Lower Mekong Basin
LNMC	: Lao National Mekong Committee
M&E	: Monitoring and evaluation
MEA	: Macroeconomic Assessment
MRC	: Mekong River Commission
MRCS	: Mekong River Commission Secretariat
MRC-SP	: MRC Strategic Plan
NMC	: National Mekong Committee
NMCS	: National Mekong Committee Secretariat
NAP	: Navigation Programme (of the MRC)
PMFM	: Procedures for Maintenance of Flow on the Mainstream
PWUM	: Procedures for Water Use Monitoring
SEDB	: Socio-economic database (of the MRC)
SEA	: Socioeconomic Assessment
SP	: Strategic Plan
SIMVA	: Social impact Monitoring and Vulnerability Assessment (conducted by MRCS)
SoB	: State of Basin report (of the MRC)
SocEc	: Social Assessment team (of the Council Study)
TCU	: Technical Coordination Unit (of the MRCS)
TNMC	: Thai National Mekong Committee
UMB	: Upper Mekong Basin
UN	: United Nations
UNDP	: United Nations Development Programme
VNMC	: Viet Nam National Mekong Committee

# BIORA ZONES AND FOCUS AREAS

For BioRA, the LMR was divided into eight BioRA zones, each represented by a Focus Area



BioRa zones

More detail in the table next page.



## BioRA zones and Focus Areas

BioRA zones		Representative Focus Areas		
No.	Location	No.	Location	FA coordinates (longitude; latitude)
Zone 1	Mekong River from the border with China to Pak Beng (confluence with Nam Beng)	FA1	Mekong River upstream of Pak Beng	19.8589; 101.0797
Zone 2	Mekong River from downstream of the Nam Beng to upstream of Vientiane	FA2	Mekong River upstream of Vientiane	18.2079; 102.1260
Zone 3	Mekong River from Vientiane to Nam Kam town (near confluences with Xe Bang Fei and Nam Kam)	FA3	Mekong River upstream of Xe Bang Fai	17.2066; 104.8061
Zone 4	Mekong River from Nam Kam to Stung Treng (Se San / Se Kong confluences)	FA4	Mekong River upstream of Stung Treng	13.5559; 105.9511
Zone 5	Mekong River from Stung Treng to Kampong Cham	FA5	Mekong River upstream of Kampong Cham	12.2980; 105.5926
Zone 6	Tonle Sap River at Prek Kdam, plus the Cambodian Floodplains excluding Zone 5 and 7	FA6	Whole area	11.87.87; 104.7827
Zone 7	Tonle Sap Great Lake	FA7	Whole area	12.8673; 104.0837 <sup>1</sup>
Zone 8	The Vietnamese Delta from the Cambodian/Viet Nam border to the sea	FA8a	FA8a: A heavily flooded area at the head of the Delta	10.6000; 105.4000 <sup>2</sup>
		FA8b	FA8b: A lightly flooded area between FA8a and FA8c	
		FA8c	FA8c: The coastal area	

<sup>1</sup> Marks centre point in Tonle Sap Great Lake

<sup>2</sup> Marks centre point in FA8a