

# Water Quality & Ecological Health Monitoring in The Lower Mekong Basin

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# Introduction

- The fundamental objectives of the Mekong Agreement: Providing safe and secure water to the people of the Mekong River Basin, and promoting sustainable use of water resources
- The water resource of the Mekong Rive provides the livelihood for most of the 60 million people who live in the Lowe Mekong River Basin, but this valued resource is increasingly being threatened as human populations grow and demand more water of high quality for domestic purposes and economic activities

# Introduction

- Mekong River Water is complex matrices that require careful use to ensure sustainable ecosystem functioning well into the future
- The management of the Mekong river water environments requires an understanding of the important linkages between ecosystem properties and the way in which human activities can alter the interplay between the physical, chemical and biological processes that drive ecosystem functioning

## Introduction

- MRC- monitored the water quality of the most of River since 1985 with the participation of Lao PDR, Thailand and Viet Nam and from 1993 also Cambodia.
- The WQMN consists of 87 monitoring stations across, Lao PDR, Thailand, Cambodia and Viet Nam.
- The four member countries participate by carrying out sampling at stations within their national territory and performing analysis in designated national laboratories. Overall coordination is provided by the MRC Secretariat in Vientiane, Lao PDR.

# MRC Water Quality Monitoring Programme

## Objectives:

- Provide an ongoing record of water quality of the River
- Characterize waters and identify changes or trends in water quality over time;
- Identify specific existing water quality trans boundary and basin wide issues
- Gather national priority information for specific management purpose.

# MRC Water Quality Monitoring Programme

## Sampling sites

- The water samples are collected at 87 permanent stations of which of 55 are primary stations and 32 secondary stations on the main stem and important tributaries of the Mekong River.
- Primary station: consist of trans-boundary stations which help to assess water quality of water sources at the boundary between two countries and basin-wide stations which focus on common water quality issues in the region.
- Secondary station: consist of stations helping to assess special problems at country level or local level. This group of stations have mainly national or local interest.

# MRC Water Quality Monitoring Programme

- Primary stations

No	Station name	River	No	Station name	River
	Lao PDR			Thailand	
1	Luang Prabang	Mekong River	1	Ubon	Nam Mun
2	Vientiane	Mekong River	2	Mun (Kong Chiam)	Nam Mun
3	Savannakhet	Mekong River	3	Ban Chai Buri	Song Khram River
4	Pakse	Mekong River	4	Chaing Sean	Mekong River
5	Ban Hatkham	Nam Ou	5	Nakhon Phanom	Mekong River
6	Se Bangfai	Se Bangfai River	6	Khong Chaim	Mekong River
7	Ban Kengdone	Se Banghieng River	7	Chaing Rai	Mae Kok
8	Ban Hai	Nam Ngum	8	Na Kae	Nam Kam
9	Sedone Bridge	Sedone River			
10	Houa Khong	Mekong River			
11	Houay Mak Hiao	Houay Mak Hiao			

# MRC Water Quality Monitoring Programme

- Primary stations

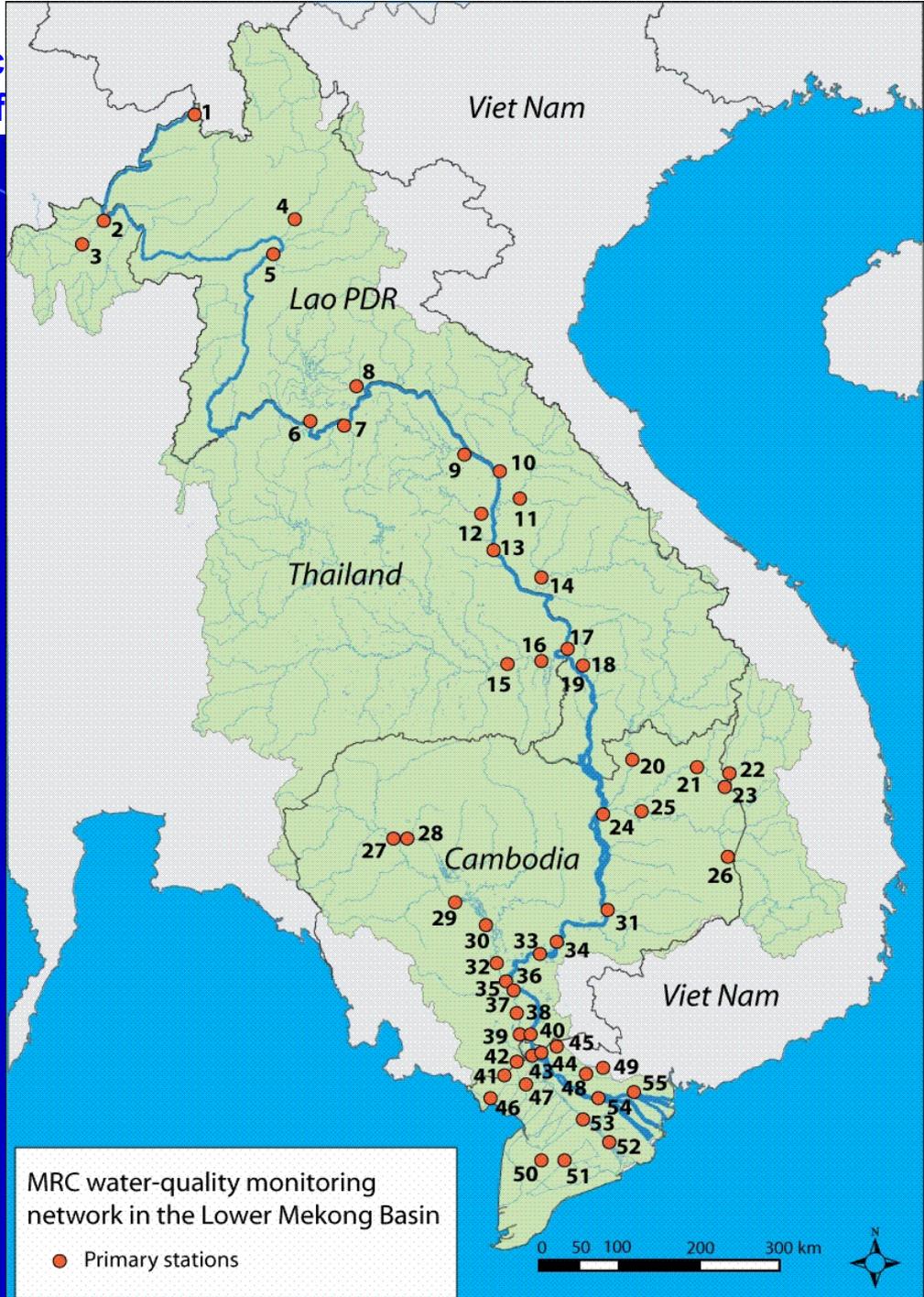
No	Station name	River	No	Station name	River
Cambodia			Cambodia		
1	Kratie	Mekong River	11	Stung Trieng	Mekong River
2	Kampong Cham	Mekong River	12	Siem Pang	Sekong River
3	Chrouy Changvar	Mekong River	13	Angdoun Meas	Se San River
4	Neak Loung	Mekong River	14	Phum Pi	Se San River
5	Kampong Luong	Tonle Sap Lake	15	Lumphat	Srepork River
6	Kampong Chnang	Tonle Sap River	16	Krom Samnor	Mekong River
7	Prek Kdam	Tonle Sap River	17	Khos Thom	Bassac River
8	Phnom Penh Port	Tonle Sap River	18	Backprea	Tonle Sap Lake
9	Takhmao	Bassac River	19	Phnom Krom	Tonle Sap Lake
10	Khos Khel	Bassac River			

# MRC Water Quality Monitoring Programme

- Primary stations

No	Station name	River	No	Station name	River
	Vietnam			Vietnam	
1	Tan Chau	Mekong River	10	My An	Canal No 28
2	Chau Doc	Bassac River	11	Tu Thuong	Tu Thuong Canal
3	My Thuan	Mekong River	12	Thong Binh	Thong Binh Canal
4	Can Tho	Bassac River	13	Vinh Thuan	Chac Bang Canal
5	My Tho	Mekong River	14	Ninh Quoi	Quan Lo - Phung Hiep
6	Dai Ngai	Bassac River	15	Cau So 13	Tri Ton Canal
7	Pleicu	Se San River	16	Vinh Dieu	T3 Canal
8	Ban Don	Sre Pok River	17	Tinh Bien	Vinh Te Canal
9	Kien Binh	Duong Van Duong Canal			

# Regional Workshop on Disc and Geomorphological Tools f





# MRC Water Quality Monitoring Programme

## Sampling regime:

- Water samples are collected on a monthly basis between date 14-18 at each of the sites.
- The water samples are taken about 30 cm, under the surface at the Middle of the stream.
- In the Mekong delta, where the tidal influence is anticipated to be significant, water samples are taken at high and low tide.
- Samples are transported in cool boxes with ice whenever available.

# MRC Water Quality Monitoring Programme

## Monitoring parameter

- The parameters the MRC monitors are the conventional physical - chemical measures
- These parameters were selected to cover eutrophication, chemical weathering and loss of organic matter

No	Parameters	No	Parameters	No	Parameters
1	Temperature	8	Potassium	15	Ammonia*
2	Conductivity	9	Calcium	16	Total Nitrogen
3	TSS	10	Magnesium	17	Total Phosphorous
4	pH	11	Chloride	18	Total Coli Form
5	DO	12	Sulfate	19	Chlorophyll
6	COD	13	Alkalinity		
7	Sodium	14	Total NO <sub>2-3</sub> -N		

# MRC Water Quality Monitoring Programme

## Analytical Method

- The laboratories frequently use the same analytical methods from Standard Methods for the Examination of Water and Wastewater that are equal to the ISO Method.
- However, due to the Laboratories, the analytical methods may be changed to fit with the laboratories' s facilities. If, non-standardised test methods are employed, these should be validated and compared against an international accepted standard in order to ensure comparable data.

# MRC Water Quality Monitoring Programme

## Water quality analysis laboratories and Quality Assurance/ Quality Control

- Laboratories participated the MRC WQMP:
  - Cambodia: Water quality analysis office, Department of Hydrology and River Work
  - Lao PDR: Water quality laboratory, Department of Irrigation
  - Thailand: Research and Water Quality Analysis Division, Department of Water Resources
  - Vietnam: Water quality and Environment centre, Southern Institute of Water Resources Planning – ISO-17025 Accreditation 2007-2008

# MRC Water Quality Monitoring Programme

## QA/QC programme

- In 2004, an effort to bring the laboratories closer to the requirements in the international standard ISO-17025 was made, EP/MRCS organized a training on QA/QC and ISO 17025
- Follow up the training project during 2005, 2006, 2007 and 2008.

# MRC Water Quality Monitoring Programme

## QA/QC programme

- 4 laboratories participated the Proficiency Testing Programme to evaluate the laboratory 's performance against other participating laboratories on the same set of standard in 2005,2006, 2007 and 2008.
- The laboratories in general have improved their quality control systems substantially,. In particular, MRC/EP now has much more information on the actual quality of the analyses.

# MRC Water Quality Monitoring Programme

## QA/QC programme

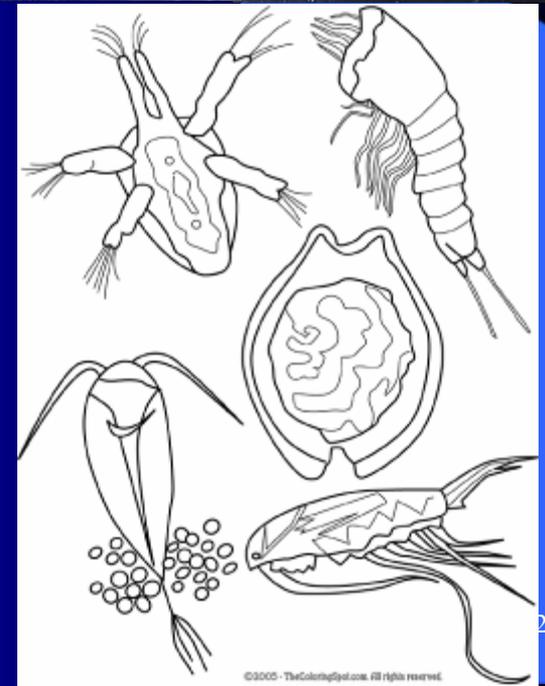
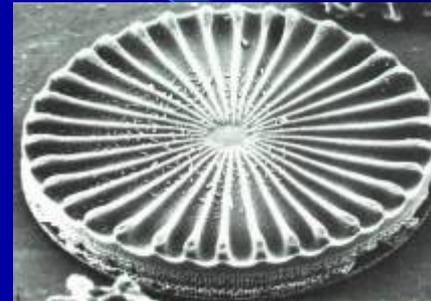
- To build on a mutual trust and the mutual interest of producing data of good quality, thus MRC should continue to support the external quality control; Participate to Proficiency testing study, CRM and hand-on assistance for the laboratories especially Cambodia, Lao PDR and Thailand.

## Future monitoring needs

- The baseline water quality monitoring must be maintained to facilitate the early detection of the threats, Some issues will require simply the maintenance of routine monitoring, whereas others will require focused efforts to target specific parameters and/or contaminants.
- Provide timely data to assure good water quality for the protection of aquatic life and human health.
- Understand the relationships between water quality conditions and the natural landscape, hydrologic processes and human activities within transboundary areas as well as the whole of the Mekong River Basin.
- Evaluate water quality together with biological parameters and water quantity changes,
- Improve water quality risk assessment, information and communication.
- Create joint water quality monitoring and scientific assessments for the whole Mekong River Basin for building trust and cooperation.

## Ecological Health Monitoring

- A routine EHM programme began in 2004, based on the four groups of organisms (littoral and benthic macroinvertebrate, zooplankton and diatom) and associated sampling protocols that proved most successful in the pilot, and continued annually through to 2007.



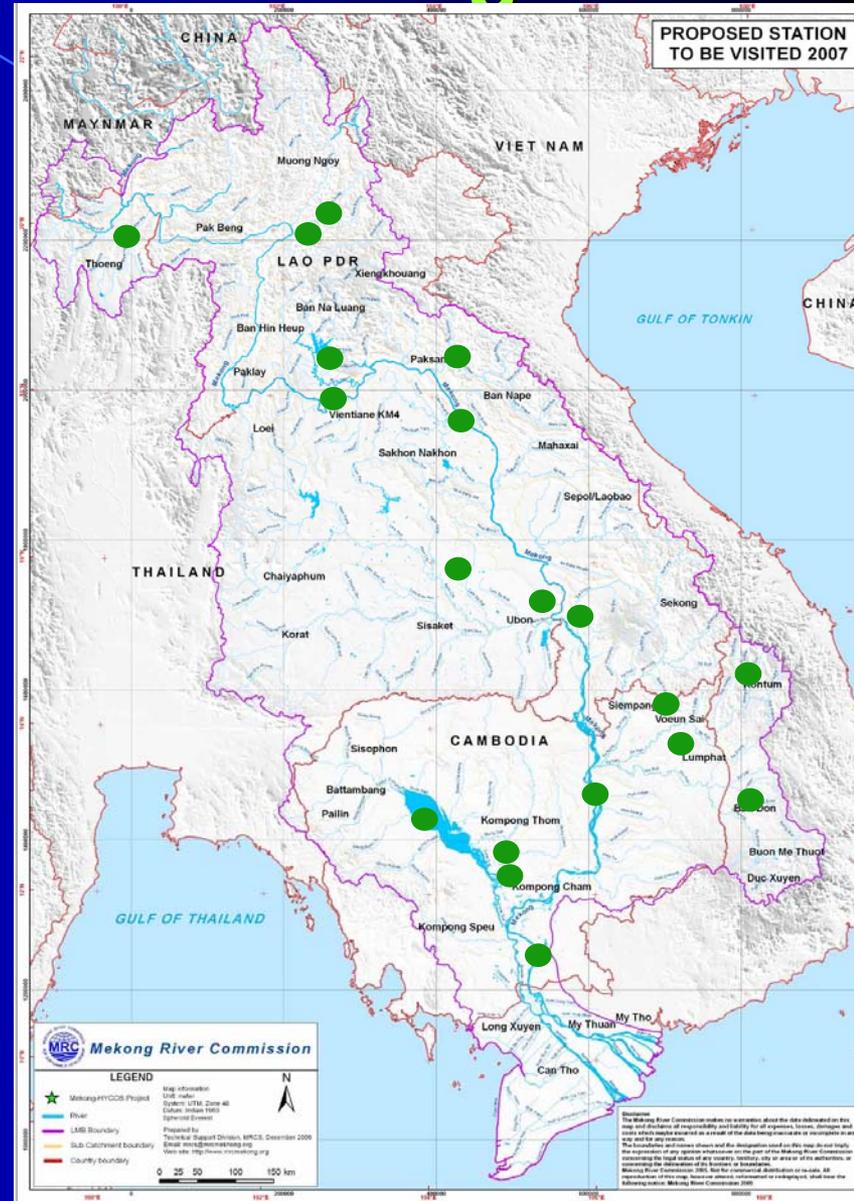
## Ecological Health Monitoring

- The overall objectives of this programme were to:
  - survey the priority biological groups at a set of sites of interest for management purposes, across all of the sub-areas of the LMB
  - choose a set of reference sites to create a biological benchmark against which data from any site in the LMB can be compared
  - specify characteristics of the biological groups that indicate harm to the aquatic ecosystem (biological indicators)
  - use values of the biological indicators measured at the reference sites to develop a set of guidelines to rate and classify the sites
  - prepare a ‘report card’ that provides non-specialists and the general public with information on the purpose and methods of biomonitoring, and indicates the current condition of the river’s ecosystems.

# Ecological Health Monitoring

## Sampling site 2004

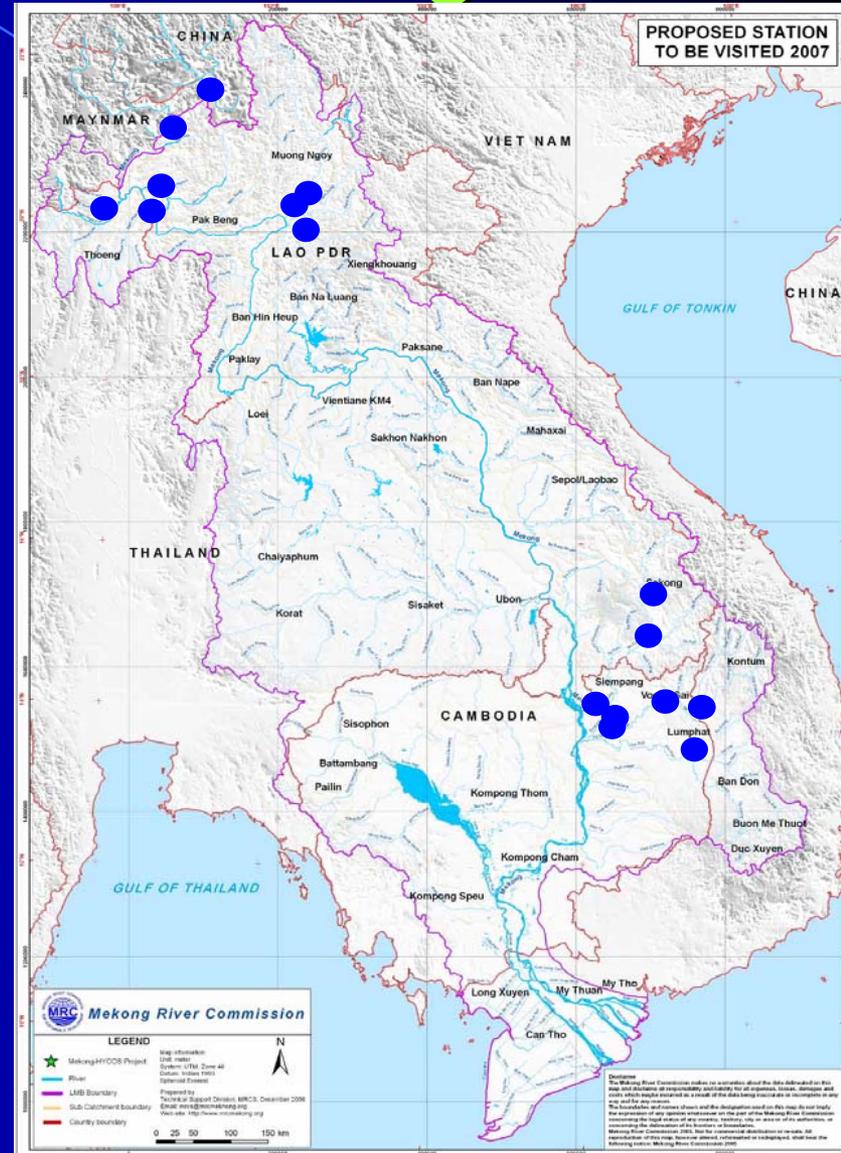
- The sites surveyed in 2004 were chosen to provide a broad geographic coverage across the Lower Mekong Basin. They included localities on the Mekong and its major tributaries, in each of the BDP sub-areas and MRC member countries.



# Ecological Health Monitoring

## Sampling site 2005

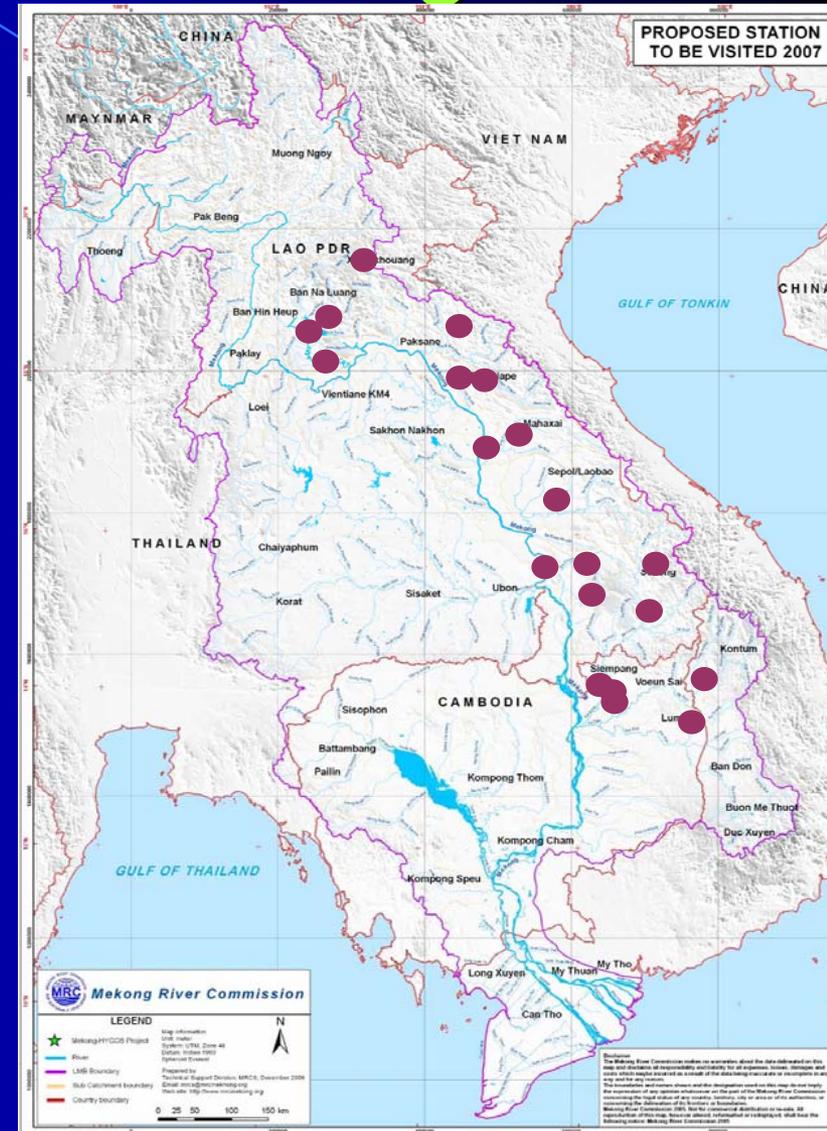
- The geographic coverage was more focused for the 2005 survey. The sites fell into two groups: (i) northern Lao PDR and the northern provinces of Thailand (mainly Chaing Rai), which lie in BDP sub-areas 1 (Northern Lao) and 2 (Chaing Rai), and (ii) southern Lao PDR and eastern Cambodia, which lie largely in sub-area 7 (Se San/Sre Pok/Se Kong).



# Ecological Health Monitoring

## Sampling site 2006

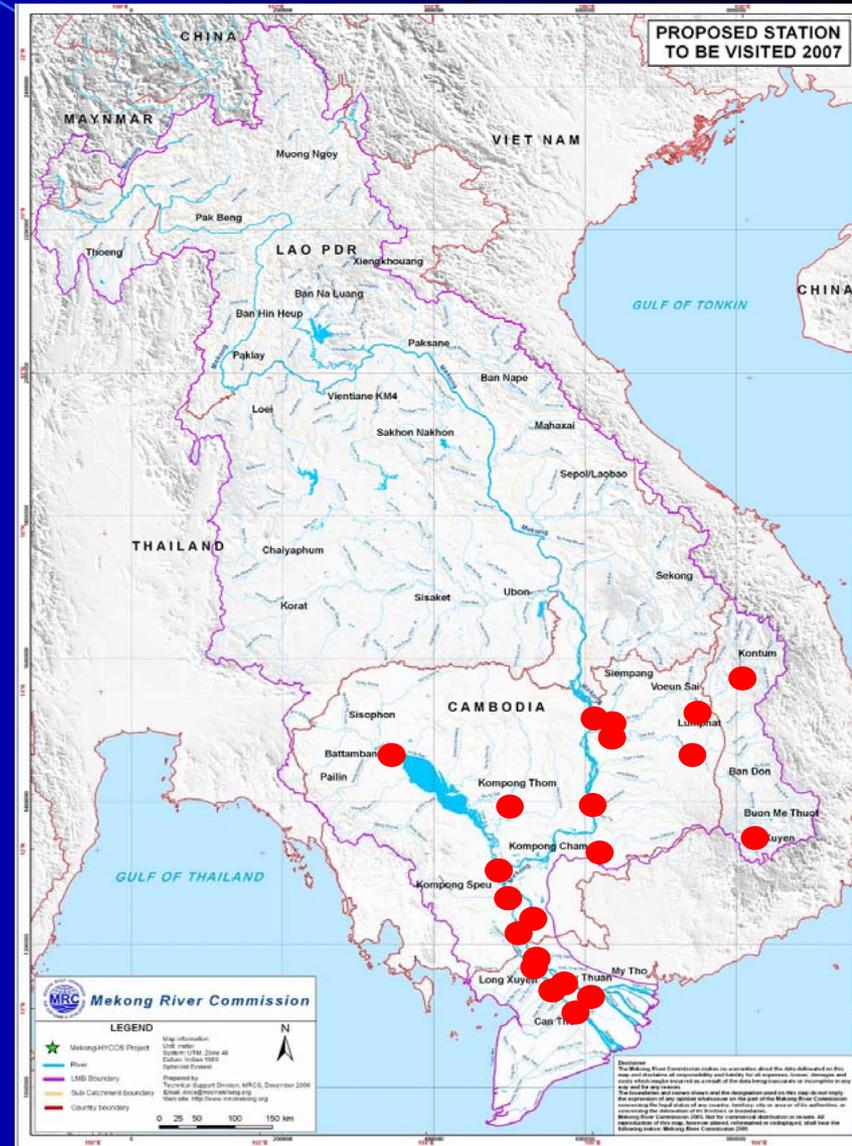
- The 2006 survey focused on the mainstream and its major tributaries downstream of the Ramsar site at Stung Treng in northern Cambodia. The survey included localities in sub-areas 6 (Southern Lao), 7 (Se San/Sre Pok/Se Kong), 8 (Kratie), 9 (Tonle Sap), and 10 (Delta).



# Ecological Health Monitoring

## Sampling site 2007

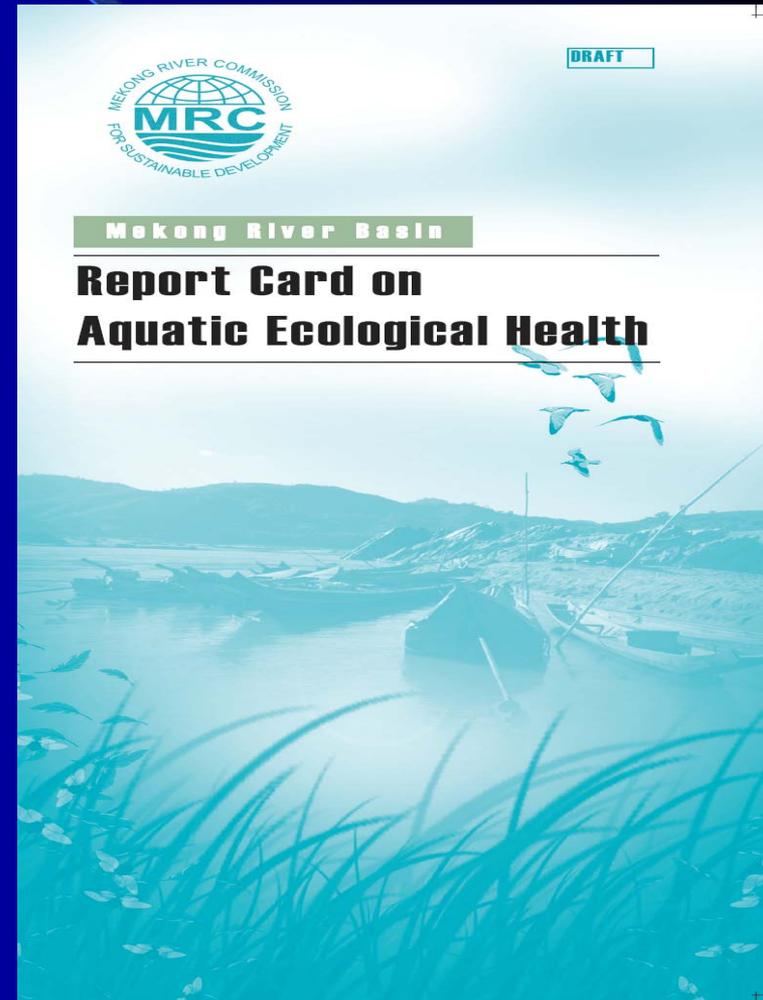
- Covered a large area of the LMB in central Lao PDR, and along the border of Lao PDR and Thailand. Sites from previous years were re-sampled in the Se Kong River in Lao PDR and Cambodia, and the Se San and Sre Pok rivers in Cambodia. The sites included fell in sub-areas 3 (Nong Khai/Songkram), 4 (central Lao PDR), 5 (Mun-Chi), 6 (southern Lao PDR), and 7 (Se San/Se Kong/Sre Pok).



# Ecological Health Monitoring

## Sampling site 2008

- EHM sampling and sample identification methods has been transferred to NMCs and line agency in the four member countries through separate training activities
- 10 sampling sites from previous years were re-sampled in each member countries during dry season 2008.
- The samples are is under progress of identification.



## Ecosystem Health Monitoring Planned

- o Implementation of EHM through continued field sampling of selected organism and physico-chemical parameters
- o Capacity strengthening of national institutions and line agencies on field sampling, identification, analysis and reporting through training, workshops and seminars
- o Produce a second report card on EHM
- o complement the MRC database with EHM data

**Regional Workshop on Discharge and Sediment Monitoring  
and Geomorphological Tools for The Lower Mekong River Basin.**



**Thank you for your attention**

