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Environment Programme

PROCEEDINGS

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EXECUTIVE SUMMARY

To report and exchange information from the Water Quality Monitoring Network (WQMN) as well as results from the River Biological Assessment, Environmental Flow Assessment and Wetlands civilities, The MRC Environment Programme's Annual Technical Meeting, was held in Siem Reap, Cambodia, the 2-3 November 2005. Eighty-five participants attended including participants from four riparian countries, MRC staff and some international organization (WWF, WCS). The attendees (annex 3) reflected not only the technical agencies participating in these programmes, but also knowledgeable individuals from different organizations, who had a direct interest in the programme, or who had unique perspectives on the activities included in the water quality or ecological sectors. Four sessions were organized at the ATM; Water Quality Monitoring Session, River Biological Assessment and Environmental Flow Assessment, Wetlands, and Wetland Management. Summary of each session is as below.

The Water Quality Monitoring Network (WQMN) in the Lower Mekong Basin (LMB) has operated since 1985 with a total of almost 100 stations taking monthly samples of the rivers' water. It is one of the major environmental activities the MRC is engaged in. The network was recently revised to ensure that it covers important transboundary and basin wide aspects of water quality.

Investigation of ecological health monitoring of the LMB are important activities to protect and maintain the health of the river. This activity started in 2003 and current progress and status were reported on at the meeting. Four major organism groups (benthic diatoms, zooplankton, littoral macro-invertebrates and benthic macro-invertebrates) were monitored and assessed for a 3 years period with the support of physical and chemical measurements.

The concept of Environmental Flow has been implemented around the world especially in various water resource management projects aims for achieving sustainable development. The most popular one would be the project called Lesotho highland project in Lesotho, Africa. The environmental flow is the flow regime which is left to ensure a balance between environment protection and water resource development. The key objective of the environmental flow is set by the subsistence users, who depend on the river, its use and its resource.

The LMB is considered to be wetland. The wetland ecosystem provides a wide range of services and productivity for over 70 distinct ethnic groups, who have different languages and dialects with different culture and customs. These people are living in different level of socio-economic development in the four riparian countries. However, the majority of these groups of people share some similarities. The majority of the people are engaged in agriculture dependent on the wetland resources for livelihoods. Wetland Inventory aims to ensure the sustainable utilization of the wetland resources of the LMB by providing planners and decision makers with information on the spatial distribution of aquatic ecosystems and associated values in an appropriate and useful format. There is a need to know not only where wetlands are located, but how they can be valued for different purposes so that these values can be considered when making decisions about potential development and environmental change.

Social Impact Monitoring and Vulnerability Assessment activities include some key points:

- To understand how people interact with and use wetland resources, and in turn, how people are affected by the change in the resources
- To understand the human vulnerability linked to the change in the wetland resources
- Information on dependence was reviewed specifically for these purposes recognizing its much wider significance

The term 'human vulnerability' is broadly defined as a set of conditions and processes resulting from physical, social, economic and environmental factors, which increase the susceptibility of certain groups of people to the impact of changes in the productivity and services of the aquatic resources. In other words, it is the capacity of certain groups of people to be harmed by stresses of change in the aquatic resources. In short, it is a lack of security from environmental threats.

1. INTRODUCTION

The agenda of the workshop included topics such as implementation of the Water Quality Monitoring Network (WQMN), River Biological Assessment and Environmental Flow Assessment, Wetland activities and Wetland Management and Social Impact Monitoring.

In this report, a short summary of each section is provided. For further information, the Power Point Presentations from all sections are included in the CD. If you would like to have more copies of CD, please send your request to the Environment Programme, Mekong River Commission Secretariat at mracs@mrcmekong.org.

2. OPENING SESSION

On behalf of CNMC Mr Pich Dun welcomed all the participants to the workshop. The speech is presented in Annex 2. Following the welcoming speech, Dr Wijarn Simachaya, Director, Environment Division, representative for MRCS, opened the meeting. His speech is presented in Annex 2.

1. BASIN REPORT CARD

Dr Campbell updated the meeting on the status of the Interim Basin Report Card. He outlined the technical basis of the card, indicated the likely final results of the evaluation and explained the formats for presentation of the material to technical and general audiences.

Power point presentation:

[Powerpoint presentations\Basin Report Card.ppt](#)

2. SESSION 1: WATER QUALITY MONITORING AND ASSESSMENT

Suspended Sediment Data Analysis

The background to this study is the long-term record of suspended sediment that was initially examined about a decade ago. Because of the importance of suspended sediment both in erosion and sedimentation, and in geochemical transport in the river system, MRC decided that the complete data record should be evaluated.

Dr. Walling, the consultant engaged for this activity, carried out the following tasks:

- Continuity and adequacy of MRC's sediment record
- Examination of various loadings assessment algorithms and working assumptions
- Analysis of spatial and temporal trends of SS transport
- Draw inferences concerning erosion within the basin and patterns of transport and sedimentation, including the relationship between sediment in the Chinese section and the lower basin.

Walling outlined the many reasons why knowledge of sediment transport is essential for basin management. Mekong sediment data goes back many years however the data records tend to be discontinuous with low sampling frequency, and variations in monitoring practice from country to country. This limits the analysis to estimation of annual loads, however he has attempted to look at individual years rather than to lump all the data into a single data set. Where data are limited the usual practice is to use sediment rating curves (SSc versus discharge). However the usual log-log relationship tends to underestimate, therefore a “Solver” routine is used to provide a better regression for the rating curve. A significant question is the number of data points (sampling frequency) required to create a reliable rating curve, and what the uncertainty is. For Pakse, where there are adequate data, the best estimate of total load is 159 million tonnes for 1961. Using this data, different sampling frequencies were simulated (7, 14, 28 day sampling) from the full data record, and the loadings estimates compared for each simulated sampling frequency. It was found that sampling should be at least every 14 days to minimize the uncertainty in the estimate of the annual load. This means that stations with 20 samples per year can be used to provide reasonable sediment load estimates for the Mekong River.

The data suggest that there is not a large increase in sediment load from China to the Delta. This can mean that there is not much sediment input in the lower basin, or that sediment is being stored. At the Jinghong station in China there has been major increases in sediment load since the 1970's. At Nong Khai the load is often less than the load in the upper basin suggesting that sediment is being stored between Jinghong and Nong Kai (or the data are not correct).

Using TSS data from the WQMN, the effect of dams in China, especially dam closure in the early 1990's, suggest that there has been a reduced sediment load since that time. However, the full sediment record does not support this observation. There is no evidence that sediment loads in the lower Mekong have been reduced due to Chinese dams.

Key recommendations include the need to upgrade and standardize the sediment network, review the sediment network, and to exploit new approaches to data collection and analysis. Walling provided evidence that one cannot use WQMN TSS data to generate reliable sediment loads due, in particular, to the low frequency of TSS sampling (monthly) and because TSS sampling tends to ignore the sand fraction due to near-surface sampling under the WQMN programme.

Powerpoint presentation:

[Powerpoint presentations\Session 1\Suspended sediment data analysis.ppt](#)

Implementation of Water Quality Monitoring Network (WQMN) and Quality Assurance and Quality Control (QA/QC) in 2005

Hien outlined the modernization of the WQMN since 2001 both to improve data quality and data relevance, and to provide essential input to other MRC programmes such as the BDP and the WUP. This included network review, laboratory upgrading, training, quality control, and database assessment and verification. A special study

was carried out on the Se San River between Vietnam and Cambodia; the draft final report has been completed. For 2006 the WQMN will add two new parameters (chlorophyll A, and fecal coliforms), and will emphasize data assessment. The Regional Technical Advisory Group for water quality (RTAG) recommended some years ago that MRC should strengthen its activities in the field of data quality. Consequently, MRCS has undertaken a number of activities to strengthen QA/QC. This had included annual training, the use of an external expert in providing specific assistance to laboratory staff on an annual basis, examination of methods for standardization, calibration requirements, and an external Performance Evaluation process in which national laboratories participated in an international peer review of analytical performance. Additional attention must be paid to remaining QA/QC concerns.

Powerpoint presentations:

[Powerpoint presentations\Session 1\Quality Assurance and Quality Control.ppt](#)

Data Assessments

Since 2004 MRC has been providing annual short courses for national laboratory staff in the analysis and assessment of their water quality data. Each country provided a current assessment of selected components of national data collected under the MRC WQMN activity. The main observations are found in the handout provided at the meeting for each country.

Powerpoint presentations:

[Powerpoint presentations\Session 1\Water Quality Assessment in Cambodia.ppt](#)

[Powerpoint presentations\Session 1\Water Quality Assessment in Lao PDR.ppt](#)

[Powerpoint presentations\Session 1\Water Quality Assessment in Thailand.ppt](#)

[Powerpoint presentations\Session 1\Water Quality Assessment in Vietnam.ppt](#)

Water Quality Management in China and Implications for Water Quality Management of the Lower Mekong River Basin

This presentation focused on the role of the Ministry of Water Resources (MWR), the State Environmental Protection Administration (SEPA) and the linkages between them and with the provinces, for water quality management. Water quality is a very serious problem throughout China, although the available evidence for the Lancang River from Chinese sources suggests the quality is good – at least for the parameters that are regularly measured. Water quality management is frustrated in China by unclear mandates between the two main agencies, lack of accountability of provincial authorities for implementation of basin-wide pollution management plans, and poor levels of wastewater enforcement. Systematic biases in reported information on pollution loadings, underreporting by industry, and uncontrolled discharges from municipalities, compromise the ability to make accurate assessments of water quality. Both national agencies produce reliable laboratory data using common, nationally approved methods, and a QA/QC regime.

Table 1: Comparison between parameters used in China and those used by MRC.

Standard values for basic items of Environmental quality standards for surface water according to Standard GB3838-2002 “Environmental quality standards for surface water”, PRC.

Green = parameters used by MRC-WQMN

Unit : mg/L

Parameter Number	Parameter	Grade I	Grade II	Grade III	Grade IV	Grade V
1	Water temperature (°C) ¹	Temperature elevation ≤1, temperature fall ≤2				
2	PH Value	6---9				
3	Dissolved Oxygen ≥	Saturation rate 90% (or 7.5)	6	5	3	2
4	Permanganate indicator ≤	2	4	6	10	15
5	COD ≤	15	15	20	30	40
6	BOD ₅ ≤	3	3	4	6	10
7	Ammonia Nitrogen (NH ₃ -N) ≤	0.15	0.5	1.0	1.5	2.0
8	Total phosphorus as P ≤	0.02 (lakes, dams 0.01)	0.1 (lakes, dams 0.025)	0.2 (lakes, dams 0.05)	0.3 (lakes, dams 0.1)	0.4 (lakes, dams 0.2)
9	Total Nitrogen (for lakes and reservoirs)	0.2	0.5	1.0	1.5	2.0
10	Copper ≤	0.01	1.0	1.0	1.0	1.0
11	Zinc ≤	0.05	1.0	1.0	2.0	2.0
12	Fluoride (as F ⁻) ≤	1.0	1.0	1.0	1.5	1.5
13	Selenium ≤	0.01	0.01	0.01	0.02	0.02
14	Arsenic ≤	0.05	0.05	0.05	0.1	0.1
15	Hg ≤	0.00005	0.00005	0.0001	0.001	0.001
16	cadmium ≤	0.001	0.005	0.005	0.005	0.01
17	Chromium (6+) ≤	0.01	0.05	0.05	0.05	0.1
18	Lead ≤	0.01	0.01	0.05	0.05	0.1
19	Cyanide ≤	0.005	0.05	0.2	0.2	0.2
20	Volatile phenols ≤	0.002	0.002	0.005	0.01	0.1
21	Oils and grease ≤	0.05	0.05	0.05	0.5	1.0
22	Anion surface- active agents (or Anion detergent) ≤	0.2	0.2	0.2	0.3	0.3
23	Sulphides ≤	0.05	0.1	0.05	0.5	1.0
24	Fecal coliform bacteria (number/L) ≤	200	2000	10000	20000	40000

Notes (per J. Weng, MWR):

1. The limiting range of change in temperature of water environment by man-made sources averaged over one week: Maximum upward range of temperature is ≤1 °C, " Maximum downward range of temperature is ≤2 °C
2. Permanganate index is COD_{permanganate method}. This is used for ambient water assessment.
3. COD_{dichromate method} is used by MWR and SEPA for end-of-pipe assessment. It is not sensitive to lower ranges of COD, therefore the Permanganate Index is used for the lower ambient ranges. However in recent years, the level of COD is now so high in rivers, COD is not used as a routine ambient monitoring parameter together with the Permanganate Index.

Mr. Edwin concluded with his observation that, with emphasis on economic development in western China, together with the well-known problems of water quality enforcement, the water quality of the Lancang River is likely to deteriorate in the future. Table 1 shows the relationship between routinely monitored parameters in China, and those used by the WQMN. The WQMN includes a number of parameters that are not used routinely in China.

Powerpoint presentation:

[Powerpoint presentations\Session 1\WQ Management in China & Implications for LMB.ppt](#)

Development of WUP Water Quality Procedures

The Rules for Water Quality are being developed under the WUP programme with input from EP. The draft technical guidelines have been developed however the “Rule” has not yet been finalized. It is anticipated that this will be completed by July of 2006. According to a decision of the JC, the Rule will address water quality management in the basin. However, the scope of the rule is still under discussion. It has been agreed that emergency situations should be addressed within the Rule for Water Quality.

Powerpoint presentation:

[Powerpoint presentations\Session 1\Development of WUP Water Quality Procedures.ppt](#)

Discussion and other issues

Thailand:

- Suggested that each country should note how water quality management is carried out in each country. Each country should make recommendations based on their analysis of their data. Mr. Wijarn responded that a more comprehensive approach to water quality issues and management is premature at this time, but would be included in future work under the WUP, EP, etc.. This could be considered as a basis for the 2006 ATM.
- Requested information about the MRC data system and whether outside persons can access this? Mr. Hans noted that MRC is developing an “MRC Information System”. Mr. Hien noted that there was not now ability for external people to access the data.
- Are there linkages between data assessment results and the causal factors? Mr. Hien agreed that this was desirable but that it was difficult for countries to make these linkages at this time.
- Requested clarification of Lao as to why DO was so low in some of their results. Lao responded that this is a wetland station receiving domestic waste and having agricultural impacts. Low DO is expected during the dry season. This has a minimal impact on the Mekong main stem.

The Basin Report card needs technical input from the countries. Mr. Ian responded that the Basin Report Card follows from the instructions of the JC. He noted that the data were produced by each country with suitable quality control. Lumping of

information inevitably causes loss of specific information. Can MRC analyze all the water quality data from all countries and recommend sampling strategies related to land use activities? The suggestion is that MRC should provide a comprehensive report on water quality to the riparian countries. Mr. Hien noted that much of this has been done as part of the modernization of the WQMN, and that a comprehensive report is anticipated in 2006.

Lao:

- Noted that the causal factors need to be included in future analyses of water quality data. Mr. Hien agreed that this is useful, but is difficult, especially when the assessments are done country by country. Mr. Wijarn noted that another approach to causality being used is environmental risk assessment. He also noted that joint effort by adjacent countries on certain issues is useful.
- Asked why the basin diagnostic study results, such as the results from the Lao/China border, are not reported at this RTM. Mr. Ian noted that the diagnostic study was extensively reported at the 2004 RTM. Mr. Edwin noted that the toxic result obtained at the Lao/China border is not definitive, and only indicates that further work is needed to establish if the result is “real” or an artifact of the bioassay that was used.

Vietnam:

- expressed concerns about the technical approach to the data used in Basin Report card and how these data are interpreted and presented. Mr. Ian responded that the report follows the instructions of the JC in regards to reporting areas. The results are not meant to explain causal factors, but EP recognizes that identifying causal factors is an essential future step. He noted that the results are accurate reflections of aggregate aquatic conditions for the sampled sites for each of the sub-regions.
- VN also asked the process to ensure the quality of data as implementing the intercalibration sample analysis; Mr. Hien informed the implementation of QA/QC activities in WQMN and explained an example taken in analytical procedure to ensure the quality of data as analysis of quality control sample used for control chart.

Parallel session/panel discussion on Water Quality

Nov. 3: 09:15 – 10:30
Summary of Discussion

Moderator: Hien Pham, for more information, please contact
phamhien@mrcmekong.org
Rapporteur: Edwin Ongley

Eighteen persons participated in this discussion. Mr. Hien introduced the topic and invited discussion.

Water Quality Assessment:

Mr. Edwin introduced the topic by noting that assessment is an iterative process where one describes status and trends, then progresses to causal factors based on priorities established on the basis of the initial data assessment and priorities of each country.

Lao suggested that assessment should start with a simple approach, with discussion of methods, approach, status of 2005 or recent year's data, and perhaps not attempt to deal with the entire data record in regards to trends etc.. The results should be compared with national standards. It was noted that historical trends can be misleading as they can reflect the way in which data were collected and not necessarily a real trend.

Mr. Hien suggested that some parameters could be linked to land management issues such as salinity, or nutrients linked to caged fisheries. These would be linked to specific issues in each country. Stations selected for assessment should be focus on transboundary and at the end of tributaries connecting to the Mekong River.

Questions were raised about the Report Card methodology. This is not, however, an issue for the WQMN but is a larger EP issue and was not discussed further at this break-out session.

Thailand suggested that the requirements for reporting and assessment by national laboratories should not be too onerous as MRC pays only a small part of the total cost.

Summary:

- Assessment by MRC should be selective and not complicated
- It should focus on parameters that are related to causal factors that are important to the participating countries.
- Stations at boundaries are especially important as these will define transboundary conditions.
- The assessment should include both an index approach, and the ability to compare water quality with national standards.
- Many concerns were raised about the methodology used in the Report Card approach.
- The assessment methodology must be able to take into account unique geochemical and physical situations such as the geochemical and tidal regime that is unique to the Delta.
- Assessments by each national laboratory should follow a framework that is more standardized. This would have to be developed by MRC.
- The contract between MRC and national laboratories should specify what outputs are required.

Monitoring and Analysis:

Questions were raised about the future of water quality monitoring and if these would take into account emerging concerns such industrialization.

Questions were raised about the linkage between the network and emerging issues. MRC noted that the revision of the network took into account present and anticipated land uses and the stations selected according to these.

Thailand and Viet Nam suggested that for QA/QC system MRC should use of national experts and they also requested MRCS to support the laboratories to obtain the certification of IS 17025 provided by national authorized organizations.

The Break-Out session was concluded at 10:30 AM.

3. SESSION 2: RIVER BIOLOGICAL ASSESSMENT AND ENVIRONMENTAL FLOW ASSESSMENT

River Biological Assessment

Biological monitoring is used worldwide for the ecological health assessment of rivers. It has been selected for the Ecological Health Monitoring Programme with the aim to assess and monitor the long-term ecological health of the lower Mekong River, as a response to article 3 of the 1995 Agreement “To protect the environment, natural resources, aquatic life and conditions, and ecological balance of the Mekong River Basin from”. The Ecological Health Monitoring Program of MRC initiated in 2002 and the results of this programme will be contributed to the Basin Report Card. Four major organism groups (benthic diatoms, zooplankton, littoral macro-invertebrates and benthic macro-invertebrates) were monitored and assessed for a 3 years period with the support of physical and chemical measurements. Biological indicators describe both past and present pollution and can detect impacts that are often of concern to the general public and may be missed by standard chemical tests and. The biological indicators will be analyzed for each community by a PC-Ord programme. For more information on this issues, please contact monyrak@mrcmekong.org

Powerpoint presentations:

[Introduction to Ecological Health Monitoring](#)

[Powerpoint presentations\Session 2\Physical and chemical parameters.ppt](#)

[Powerpoint presentations\Session 2\Diatoms.PPT](#)

[Powerpoint presentations\Session 2\Littoral Macro-invertebrates.ppt](#)

[Powerpoint presentations\Session 2\Main Channel Macro-invertebrates.ppt](#)

[Powerpoint presentations\Session 2\Zooplankton.ppt](#)

Environmental Flow Assessment

The concept of Environmental Flow has been implemented around the world especially in various water resource management projects aims for achieving sustainable development. The most popular one would be the project called Lesotho highland project in Lesotho, Africa. The environmental flow is the “flow regime which is left to ensure a balance between environment protection and water resource

development”. The key objective of the environmental flow is set by the subsistence users, who depend on the river, its use and its resource.

When we talk about environmental flow for the Lower Mekong Basin, we talk about holistic approach and efforts to apply environmental flow assessment. The holistic approach for environmental flow assessment was developed in early 90’s in order to advise environmental flow for fish biology. The aim of holistic approach is to manage health of the river ecosystem. In late 1990s the economics components has been included to allow the prediction of cost and benefits from economic perspectives and now environmental flow is an integral part of IWRM and part of the efforts to address sustainable use of rivers.

In MRC context, the environmental flow initiative is a part of the Integrated Basin Flow Management Project (IBFM). There are 3 phases; overview on hydrology of the river is the Phase 1, Phase 2 is the comprehensive study on the river to gather environment and social information and Phase3 is the detailed field based study to fill the gaps from Phase 2.

Dr Jackie King has extensive background on the application of environmental flow assessment around the world especially in South African Context. She has been advising the MRC WUP and EP during the last two years on the implementation of Integrated Basin Flow Management Project (IBFM). For more information on this issues, please contact **Worawan@mrcmekong.org**

Powerpoint presentations:

[Powerpoint presentations\Session 2\Environmental flows, Jackie King.ppt](#)

[Powerpoint presentations\Session 2\Environmental flows, Worawan.ppt](#)

**4. SESSION 3: WETLANDS: WHAT ARE THEY? WHERE ARE THEY?
WHAT ARE WETLANDS WORTH? WHO MANAGES THEM?**

Social Dimensions of Wetlands - Human Dependence on Aquatic Resources in the Lower Mekong Basin:

The LMB is considered to be wetland. The wetland ecosystem provides a wide range of services and productivity for over 70 distinct ethnic groups, who have different languages and dialects with different culture and customs. These people are living in different level of socio-economic development in the four riparian countries. However, the majority of these groups of people share some similarities. The majority of the people are engaged in agriculture dependent on the wetland resources for livelihoods.

Social dimensions of wetlands in the context of this paper focus on what the literature review says regarding people’s dependence on aquatic resources.

People in the LMB depend on aquatic resources in many ways. But most commonly quoted include:

- High employment in agriculture including aquaculture
- Very high subsistence-based dependence on fish, plants, etc.

- Important sources for food security
- Importance sources for GDP, national economies, trade, incomes
- Other employment in river-based activities (transport, trade, tourism, hydropower, etc.)

In brief, the literature review on vulnerability and dependence on aquatic resources conducted by a team of consultants contracted by the environment programme, MRCS, conclude that there is a clear and widespread dependence on the LMB aquatic resources. The literature review confirms the importance of aquatic resources to people in terms of food security and livelihoods, which implies that livelihoods and food security of the people in the Basin will change, if there are changes in availability, diversity and quality of the riparian aquatic resources.

Information on Social Dimensions of Wetland and Social Impact Monitoring, please contact lilao@mrcmekong.org

Monitoring of change in social conditions linked to changes in aquatic ecosystems:

This activity is a part of the overall environmental monitoring system including water quality and ecological health monitoring. It's official title is "Development of Social Impact Monitoring System", the purpose of which has been to make it possible to follow trends in how changes in the Basin environment have impacts on social and economic conditions in the Basin. The system is to be developed so *that it can provide regular information of the status of the basin* through a series of indicators and other measures reflecting aspects of livelihood changes *linked* to environmental changes.

The development of this system begins in March 2004 with drafting of a concept paper serving as the basis for further development through consultations at individual, national, and regional levels involving National Mekong Committees, relevant line agencies, international organizations, NGOs, independent social-environmental specialists, and MRCS staff.

Through the consultations, two composite sets of indicators were agreed on. These are so called 'pre-determined indicators' and 'local indicators'. The pre-determined indicators refer to those that can make use of the existing data, can provide historical trends, will continue, is cost effective. However, these are influenced by multi-factors, i.e not precisely linked to the biophysical environmental change due to the fact that existing data were collected for different purposes and hence do not fit this purpose well.

Key aspects of pre-determined indicators include health, livelihoods, and vulnerability. This is because of the high dependence of the people in the LMB on the aquatic resources; consequently, they suffer when water and its related resources are degraded. In total, 33 indicators were chosen for this first phase of the activity.

In terms of local indicators, these will be developed through fieldwork at the household/village level, based on local knowledge, real local conditions, with participatory approaches, but may or may not available nationally.

In short, some information on changes in social conditions linked to changes, to some extent, in biophysical environment over the past decade/s will be available by the end of 2005. The social impact monitoring systems including the local indicators will be further developed

Human vulnerability to changes in aquatic resources:

Dramatic understanding and progress of vulnerability assessment has been made. However, much of such progress is made in developed countries and little is in developing countries such as those under the Lower Mekong Basin. A key problem is that how the vulnerability assessment strategies and methodologies cope with different socioeconomic, political, and geographical contexts. Different contexts may need different approaches. There has been evidence that certain types of threat have impacts on developed economies but are essentially non-existent in developing countries, such as trade cycle fluctuations, stock market plunges, technological obsolescence, and product cycles. But it is noted that in general, threat is more prevalent in rural areas of the Third World than in developed economies (Fafchamps 1999: 4). Logically it is assumed that there are also differences between *ethnic minorities, rural and urban, poor and rich, men and women*, etc, in terms of *vulnerability, threats, and coping abilities and strategies*.

Information presented here derived mainly from a review of grey literature in the four countries in the LMB conducted between June-September 2005 by a contracted consultant team. It is a phase of the vulnerability assessment (VA), Environment Programme, Mekong River Commission Secretariat, initiated in the mid of 2004.

The objective of the VA has been to provide information on the dependence of certain groups of people on the water and its related resources (aquatic resources) in the Lower Mekong Basin, and vulnerability to changes in such resources.

The term 'human vulnerability' is broadly defined as a set of conditions and processes resulting from physical, social, economic and environmental factors, which increase the susceptibility of certain groups of people to the impact of changes in the productivity and services of the aquatic resources. In other words, it is the capacity of certain groups of people to be harmed by stresses of change in the aquatic resources. In short, it is a lack of security from environmental threats. Can we predict what might happen to certain groups of people in the future?

The review was carried out by a team of 4 national experts guided by one international consultant. The focus was on the four riparian countries (Cambodia, Laos, Thailand, and Vietnam). More than 2,000 published and unpublished literature was reviewed, of which around 300 determined most relevant. Sources of the include FAO, WFP, World Bank, UNDP, ADB, University of Sussex, AIT, UNICEF, IUCN, MRCS, related line agencies, NGOs and others.

Four national and one international report on the review were prepared. A regional report synthesizing findings of these reports is also provided. Annotated bibliography was also made available at MRCS.

The literature review identifies that in the context of the LMB, vulnerability as an activity is quite recent, and not widely known although this notion has been in place elsewhere in the world much far longer. Actions and studies have concentrated on food insecurity, vulnerability to floods, and droughts (E.g. WFP VAM, FAO FIVIMS, ADPC). Meanwhile, little studies on social vulnerability to the change in aquatic resources have been conducted. Further, less study in the context of livelihoods vulnerability of ethnic minorities has been done and understood. A few academic institutions such as Cantho University, Chulalong Korn University, National University of Laos, SEI-Asia, partners of the Sumernet, are developing methodologies on this subject as well. However, due to the differences in purpose, the definitions and methodologies are different. But MRCS could build on what has already been achieved by these organizations to meet its objectives.

Stress sources identified by the review include unsustainable practices (eg. over fishing, habitat destruction), conversion of land to other uses, pollution and water quality and quantity (eg. use of pesticide in some cases, drying up of some small stream in the dry season), natural variability (eg. floods, droughts). These result in the multiple scenarios of stresses such as loss of access to common property resources, decline of fisheries, loss of livelihoods opportunity, and alteration in seasonal water levels, forest degradation, and reduction in biodiversity, food insecurity, and health problems.

Groups who are most likely to be vulnerable identified by the review include, but not limited to, the landless, the poor farmers, the fishermen, the fish processors, chronically food insecure, the transient food insecure, people in remote rural areas with difficult accessibility. But very little information was found on when, where, why, degree, and how many. Coping mechanisms are used but such information is little available.

Need more specific data and information on who is vulnerable to changes in aquatic resources, how many are the vulnerable people, where are the vulnerable people, when are they more vulnerable, and why are they vulnerable?

In short, the existing data/information does not link human vulnerability to changes in aquatic resources. To meet the objective of MRCS, there is a need to establish such linkages, implying a design of new practical methodology for 'human vulnerability to changes in aquatic resources'. Collaboration with organizations that have similar activities and interests in the region such as WFP, FAO, and the Sumernet is helpful.

For more information on Wetland, MWBP Project and Wetland Classification, please contact **charlotte@mrcmekong.org**

Powerpoint presentations:

[Powerpoint presentations\Session 3\Wetlands in the Environment Programme.ppt](#)

[Powerpoint presentations\Session 3\Social dimensions of Wetlands.ppt](#)

[Powerpoint presentations\Session 3\Wetland classification and mapping in the LMB.ppt](#)

[Powerpoint presentations\Session 3\Wetlands as transboundary resources.ppt](#)

[Powerpoint presentations\Session 3\Monitoring of changes in social conditions.ppt](#)

[Powerpoint presentations\Session 3\Wetland Economic Valuation.ppt](#)

[Powerpoint presentations\Session 3\Human vulnerability to changes in aquatic resources.ppt](#)

[Powerpoint presentations\Session 3\WWF - Value of floods.ppt](#)

[Powerpoint presentations\Session 3\WWF - The Wetlands Alliance.ppt](#)

5. SESSION 4: HOW CAN WE MANAGE WETLANDS AND BIODIVERSITY FOR ALL?

Basic institutional and legal frameworks have been set up and formulated in member countries in supporting the implementation of the Ramsar and CBD. The actual implementation has made progress to some extent. Nevertheless, there is a need to improve some aspects which would include: capacity building, law enforcement, financial support, information exchange, research and development, mandates and responsibilities, coordination and collaboration, political support and monitoring.

The aim of this field under the Environment Programme is to ensure the sustainable utilization of the wetland resources of the LMB by providing planners and decision makers with information of aquatic ecosystems and associated values in an appropriate and useful format.

Environment Division, MRCS has to work closely with member countries and other conservation partners. These include (i) working with national line agencies to designate, delineate, and management different types of PAs, (ii) working with NGOs to incorporate biodiversity indicators into this coverage, (iii) working within GMS framework, and with ADB and UNEP to identify hotspots biodiversity development.

Powerpoint presentations:

[Powerpoint presentations\Session 4\Legal and institutional frameworks - CBD & Ramsar.ppt](#)

[Powerpoint presentations\Session 4\Wetlands, Protected Areas, Biodiversity & Development.ppt](#)

[Powerpoint presentations\Session 4\Community involvement in Protected Area Management.ppt](#)

[Powerpoint presentations\Session 4\Species Conservation Action Plans.ppt](#)

6. PANEL DISCUSSION

As a conclusion of the meeting a panel discussion was held at the end of day 2, in which one representative from each session was invited to be in the panel. The discussion was facilitated by Dr Wijarn Simachaya, Director, ENV, and MRCS. The key conclusions and messages from this panel discussion are summarised below.

Hien, Programme Officer, ENV, MRCS suggested that the annual reports of the Water Quality Monitoring Network should be shorter, and include only the issues related to water quality data assessment.

Peter-John, representative from MWBP, was pleased about the partnership with MRC and that wetland issues are an important activity of the MRC Environment

Programme. He expressed that he would like to see greater participation of MWBP staff in the future, and possible further linkages, for example regarding bio-monitoring Programme.

Supatra, national expert of ecological health monitoring, declared that the results for the ecological health monitoring are very promising. She recommended to establish a long-term monitoring in which more sites should be covered and these should include some sites with potential ecological risks.

Lilao, programme officer, ENV, MRCS, was concerned that the communication of some of the findings are very technical, and he suggested to reduce the use of technical abbreviations. He also suggested to include more of social aspects in ecological health monitoring.

Eric from WWF pointed out that WWF has a lot of interest in MRCs work, especially the work carried out by the Environment Programme, and that they are in particular interested in the capacity being developed in ecological health assessment. He suggested that MRC should convene more thematic meetings rather than programme-based meetings. MRC and WWF would continue the collaboration on this matter.

Sokha, Deputy Director, Department of Environmental Pollution Control, Ministry of Environment, Cambodia, suggested that MRC should start to produce regional reports with the results from the Water Quality Monitoring Network. He encouraged MRC to assist the countries in setting up mechanisms for protecting the environment in the future. He suggested that MRC should review what needs the countries have and then provide what is needed. Sokha pointed out that the riparian countries are concerned about the input from the countries to the Basin Report Card.

The suggestions and recommendations from the other participants in the meeting are summarized below:

- It was suggested that MRC should combine the regional reports for ecological health monitoring, and also to produce an overview for ecological health monitoring that could easily be read and understood by everyone.
- A better overview of the issues covered in the Annual Technical Meeting was desired. The secretariat should advise the countries on what requires immediate action. The Environment Programme needs a close coordination with WUP and BDP. Policy and regulation issues were suggested to be presented by riparian staff starting from next year.
- It was pointed out that environmental issues are broad and that MRC should concentrate on Water Quality Monitoring and decision support, and perhaps address emergency issues. It was suggested that the work should be coordinated, and a question was raised why IUCN cannot do all the wetland work.
- The MRC should speed up the production of the Basin Report Card.
- Wetland issues are complicated, and MRCS should try to produce a good map of the wetland areas. Regarding this, the question was raised on how MWBP and MRC can avoid duplication.

- Coordination issues needs closer work within the secretariat. Most important is the data provided to other programmes and governments.

7. CLOSING REMARKS

Dr Wijarn Simachaya, Director, Environment Division, representative for MRCS, closed the meeting by thanking the participants for their interest and participation in the Annual Technical Meeting 2005. (Annex 2)

ANNEX 1: WORKSHOP AGENDA

AGENDA

ENVIRONMENT ANNUAL TECHNICAL MEETING

2-3 NOVEMBER 2005, Siem Riep, Cambodia

Wednesday 2 November:

08:15 - 08:45	Registration	
08:45 - 09:05	Welcome and Opening	Pich Dun/Wijarn
09:05 - 09:20	Introduction to the Session and Theme	Hans Guttman
09:20 – 09:35	Basin Report Card	Ian

Theme 1: Mekong River Health:	<i>Water Quality Monitoring and Assessment; River</i>
Session 1: 09:35 – 12:20	<i>Biological Assessment; Environmental Flow Assessment</i>
Chairman: Head of Thai Delegate	Moderator: Hien/ Rapporteur: Edwin

Session 1: Water Quality Monitoring and Assessment

09:35-09:40	Introduction to Session 1: WQ Monitoring and Assessment	Hien/ Edwin
09:40-09: 55	Suspended Sediment Data Analysis	Prof. DeWalling
09: 55-10:05	Implementation of WQMN in 2005	Hien
10:05-10: 15	QA/QC activity	Vivi
10: 15-10: 30	Coffee/Tea break	
10:30-10:40	Water Quality Assessment in Cambodia	So Im Monichot
10:40-10:50	Water Quality Assessment in Lao PDR	Chanpenh
10:50-11:00	Water Quality Assessment in Thailand	Pornsak
11:00- 11:10	Water Quality Assessment in Vietnam	Khoi
11:10- 11:40	Water Quality Management in China and Implications for Water Quality Management of the Lower Mekong River Basin	Edwin
11:40-11.55	Development of WUP Water Quality Procedures	Khuon Koma
11.55-12:20	Questions & Discussion and wrap-up	Edwin
12:20-13:30	Lunch	

Theme 1: Mekong River Health: Session 2: 13:30 – 17:00	<i>Water Quality Monitoring and Assessment; River Biological Assessment; Environmental Flow Assessment</i>
Chairman: Head of Laotian Delegate	Moderator: Monyrak/ Rappoteur: Arouna

Session 2: River Biological Assessment and Environmental Flow Assessment

13.30-13.35	Introduction to Session 2: River Biological Risk Assessment	Monyrak
13.35-13.50	Expert presentation	Bruce
13.50 – 14.10	Physical and chemical parameters	Supatra/Sok
14.10 – 14.30	Diatoms	Tatporn
14.30 – 14.50	Littoral and rock macro-invertebrates	Chinda/Bunnam
14.50 – 15.10	Main channel macro-invertebrates	Duc
15.10 – 15.30	Zooplankton	Thi Mai Linh
15.30 – 15.45	Coffee/Tea break	
15.45 – 16.10	Questions& discussion and Wrap Up	Bruce

16:10 – 17:00 Environmental Flow Assessment

The session will provide the concept of Environmental Flow which has been implemented around the world. This concept is being applied in the integrated basin flow management project of the MRC. It is to develop an understanding of the LMB from the perspective of various disciplines.

16:10 – 16:15	Introduction to the session 2: Environmental Flow Assessment	Worawan
16:15 – 16:30	Environmental Flow Assessment in the Lower Mekong Basin	Jackie
16:30 – 16.50	Questions& discussion and Wrap Up	Jackie/ Worawan

16.50-17.00	Key Messages and Conclusion of Theme 1	Hans
17.00-19.00	Cocktail Reception	

Thursday 3 November

Theme 2: People and Aquatic Ecosystems Session 3: 08.45-12.00	<i>Wetlands - what are they? Where are they? What are they worth? Who manages them? How can we manage wetlands and biodiversity for all?</i>
Chairman: Head of Cambodian Delegate	Moderator: Hans/ Rappoteur: Keu Moua

Session 3: Wetlands: What are they? Where are they? What are wetlands worth? Who manages them?

8.45-08.50 Introduction to Theme 2 and Session 3

Wijarn

The presentations in this theme will focus on the activities of the Environment Programme component 'People and Aquatic Ecosystems' with complementary presentations from guest speakers working on closely related activities.

<u>Main meeting room</u>		9:00 – 10:15 Room A
This introductory session will outline wetland and aquatic ecosystem activities in the Environment Programme of MRCS and will highlight the different meanings on 'wetlands' from ecological and spatial definitions, to social and economic level, each of which will be elaborated on in the remainder of the day.		Panel discussion on Water Quality Water quality issues of the Mekong River & LMB and role of WQMN in the water quality management works in the LMB
08.50-9:00	Wetland and aquatic ecosystem activities in the Environment Programme of MRCS	
	Hans	
9:00-9:25	Social dimensions of Wetlands	
	Lilao	
9:25-9.45	Wetland classification and mapping in the LMB	
	Charlotte	
9:45-10:00	Wetlands as Transboundary Resources	
	Monyrak	
10:00-10:15	Questions & clarification	

10.15-10.30 Coffee/Tea break

10:30-12:00 Main meeting room		
What is wetlands worth? Who manages them?		
Wetlands can be valued in different ways using different criteria. This session will outline some of these, discussing in particular the economic and social dimensions to wetland biodiversity.		
10:30-10:35	Introduction to session and speakers	Charlotte
10:35-10:50	Monitoring of changes in social conditions linked to changes in aquatic ecosystems	Lilao
10:50-11:05	Wetland economics and the EP wetland valuation activities	Srey Sun Leang
11:05-11:20	Human Vulnerability to Changes in aquatic resources	Lilao
11:20-11:35	Value of floods from WWF Living Water Initiative	Eric
11.35- 11.50	Wetland Alliance	Eric
11:50 – 12.00	Questions and clarification	

12:00-13:30 Lunch

Theme 2: People and Aquatic Ecosystems Session 4: 13.30-15.30	<i>Wetlands - what are they? Where are they? What are they worth? Who manages them? How can we manage wetlands and biodiversity for all?</i>
Chairman: Head of Vietnamese Delegate	Moderator: Charlotte/ Rapporteur: Oudomsack

Session 4: How can we manage wetlands and biodiversity for all?

13:30-13:35	Introduction to session 4	Charlotte
13:35-13:50	Legal and Institutional frameworks for protection of Biodiversity and Aquatic resources in the LMB: Situation analysis on implementation of CBD & Ramsar.	Keu Moua
13:50-14:05	Wetlands, Protected Areas, biodiversity hotspots and development: balancing infrastructure development and biodiversity conservation.	Charlotte
14:05-14:20	Community involvement in Protected Area and biodiversity management in Lao PDR.	Mike
14:20-14:35	Species Conservation Action Plans for biodiversity conservation in the LMB.	Alvin
14:35-14:50	Protected Area Development in Lao PDR	Bounphan
14:50-15:15	Questions& discussion and Wrap Up	
15:15-15:30	Key messages and conclusion of Theme 2	Hans
15:30- 15.45	Coffee/Tea break	
15.45-16.45	Panel Discussion	Wijarn

15:45-16:45 Panel Discussion

Reporter: Hans Guttman

One representative from each session is invited to be in the panel. The discussion will be facilitated by Dr Wijarn, Director, ENV, MRCS. The key conclusion and messages from each session will be recap here and the attempt to distribute and integrate this information in order to improve programme's implementation from various perspectives will be discussed.

Panel Members are: Mr. Hien (MRCS), Ms. Supatra, Mr. Lilao (MRCS), Mr. Eric (WWF), Mr Peter-John Meynell (MWBP), Repr from Ministry of Environment, Cambodia

16.45-17.00 Closing

Wijarn

ANNEX 2: SPEECHES AS OPENING AND CLOSING SECTIONS

Welcome Remarks
By H.E Mr. Pich Dun (Deputy Secretary General of CNMC)

On behalf of the Cambodia National Mekong Committee I warmly welcome you to Siem Riep, Cambodia for the MRC Environment Programme's Annual Technical meeting. It is my great pleasure to welcome you to this meeting organized at the magnificent, nice, and peaceful Angkor Complex, the best great know for grandeur and majesty located here in Siem Riep town.

Excellencies Ladies and Gentlemen; I would like to welcome to the Second Environment Annual Technical Meeting. This meeting today will be a great opportunity for all of us to discuss and share our experiences on the Lower Mekong Basin environment issues including the programme implementation aspects. The MRCS Environment Programme has implemented a number of activities with regards to the implementation of Articles 3 and 7 of the 1995 Agreement on Sustainable Development of the Lower Mekong Basin. The Mekong River offers considerable opportunities to support the economic development of its riparian countries. The sustainable development is on the top agenda of the MRCS to ensure that the development is being promoted in the sustainable way while the environment is well taking care of. The Environmental monitoring and assessment is a crucial component of sustainable development, and particularly so for the Mekong River basin as its inhabitants are highly dependent on the basins natural resources. The member countries are committed to promoting balanced sustainable development to provide benefits for the current generations whilst preserving the resources and development options for our future generations. The work of the MRC Environment Programme is directly contributing to the achievement of this common goal.

I am very grateful that such an important event as the Environment Annual Technical Meeting is organized here in Siem Riep. Siem Riep is known for the very famous and majesty magnificent Angkor Complex. The Tonle Sap Biosphere and other Tonle Sap initiatives to protect environment and water related resources for livelihood of the basin population are well recognized in its management. The Tonle Sap, Cambodia, is the most important inland wetland in Southeast Asia. The large wetland system supports one of the world's most productive freshwater fisheries and the ecosystem is essential to the survival of many globally significant species. Although the lake provides for a huge population, human population and development pressures are increasing. Those number of Tonle Sap Management Projects aim to enhance systems and develop the capacity for natural resource management coordination and planning, community based natural resource management, and biodiversity conservation in the Tonle Sap biosphere reserve. In Environment Programme Implementation, the concern about Tonle Sap issues has been considered as well. Some aspect of environmental monitoring and assessment including a number of tools developed for wetland management will be presented and discussed at this meeting, today.

It is with great interest I note that much of the work undertaken has been done using multi-nationalities teams. The teams worked well together and this now a good basis for further development of national capacities in these areas. We hope to see more of this approach in future work.

Excellencies, Distinguished Participants, Ladies and Gentlemen,

It is almost 10 years since the Mekong Agreement was signed and it is time to begin to take stock of the achievements. It is with great satisfaction that I note that MRC is progressing well in implementing the key articles of the Agreement. The BDP is completing its first phase and the WUP will soon have achieved all its milestones. The EP, WUP and the BDP will continue to work together and support each other to ensure that the statement of the 1995 Agreement has been well understood and interpreted and also well implemented to ensure the sustainable development of the Lower Mekong Basin.

Again, Excellencies Ladies and Gentlemen, It is great opportunities today to have all of you here. This will be a great opportunity to discuss and share experiences with regards to the environment issues and management of the Lower Mekong Basin. I appreciate your acceptance to participate in this meeting. I hope all of us will be grateful with the outcomes and also the result of the discussion today.

I would like to express my gratitude to welcome all of you today again and I hope you will enjoy our town; Siem Riep and the beautiful compound of Angkor Complex. Thank you and have a good time in Siem Riep.

Opening Remarks
By Dr Wijarn Simachaya, Director Environment Division, MRCS

First of all, On behalf of Mekong River Commission, I would like to extend the warmest welcome to the representative from the Swedish government, the delegation members from Laos, Thailand, Cambodia and Viet Nam, and all distinguished guests. It is honored to meet all of you here at the Annual Technical Meeting today. I also would like to congratulate of the holding of the Annual Technical Meeting with the participation of so many representatives of the governments, International Organizations as well as from Civil Society and Academies.

The Annual Technical Meeting is essential for continued dialogued and sharing experiences on environment and water resource management. The Environment Programme is one the Core Programmes of MRC and has two major aims, firstly to fulfill the articles in the Agreement related to the protection of the environment and maintaining the ecological balance of the Basin. Secondly, the Programme also supports the other Core Programme through provision of the environmental data and development of tools for environmental planning and management. Assessment and monitoring of water quality and ecosystem health form an important basis data provision. The Programme also works to improve environmental policy and management through advice to and promotion of cooperation among environmental agencies, directly supporting the Basin Development Plan for development initiatives in the Lower Mekong Basin. Through compilation of existing knowledge and facilitation of research activities it also promotes a better understanding of the environmental and ecological aspects of the Basin.

Environmental monitoring is a crucial component of sustainable development, and particularly so for the Mekong River basin as its inhabitants are highly dependent on the basins natural resources. Over the coming decades we will see rapid development in the region providing much needed economic and social development. It is therefore comforting to know that the member countries are committed to promoting balanced sustainable development to provide benefits for the current generations whilst preserving the resources and development options for our future generations. The work of the MRC Environment Programme is directly contributing to the achievement of this common goal.

As you know, the water quality of the Mekong River is an issue of concern to all countries who share the Mekong River's water. The Water Quality Monitoring Network in the Lower Mekong Basin has operated since 1985 with a total of almost 100 stations taking monthly samples of the river's water. It is one of the three major environmental monitoring activities the MRC is engaged in. The network has now been revised to ensure that it covers the important transboundary and basinwide aspects of water quality. This monitoring is crucial to ensuring the development activities in the basin do not result in unacceptable deterioration of the river's water quality, jeopardising other uses of the water. This meeting will be reporting on the results of analysis of the regular monitoring data.

Ladies and Gentlemen, In order to get a more complete picture of the environmental health of the river the Environment Programme has initiated assessment of the Mekong's ecological health using bio-assessment techniques. The particular

techniques used and the results from a basinwide assessment will be reported on in this meeting. The assessments, combined with the water quality data, will provide an overview of the basin's ecological health, which will be presented in a MRC Basin Report Card today.

Environmental Risk Assessment determines if adverse ecological effects occur or are occurring as a result of human activities. Data, information, assumptions and uncertainties are evaluated and used to help understand and guide environmental management. Environmental Risk Assessment is a valuable tool to identify future risks and necessary environmental monitoring programs in the Lower Mekong Basin.

In the end we need to know how changes in the environment affect people. To this end a social impact monitoring system is being developed and will complement the chemical and ecological monitoring of the Mekong River's waters. These monitoring programmes will improve our understanding of the quality of the natural environment in the Lower Mekong Basin and ensure that we have a comprehensive overview of the environmental condition of the basin.

The link between the people and the river is being elucidated through various initiatives implemented by Environment Programme, MRCS. The concept of maintaining the flow regime in the river for the environment protection purpose or environmental flow concept is widely accepted and applied around the world. Environment Programme established one of the initiatives to manage the river flow regime to ensure that the link between people and river's flow regime is emphasized. The holistic environmental flow assessment that will be presented today is showing the efforts to understand the link between the people and the river, also ensure the prediction on how the river could change with flow changes and how those changes impact people and their livelihood.

Ladies and Gentlemen, the impacts from environmental changes in some occasions cause transboundary effects to the neighboring country. Environment Programme is assisting the MRC member countries in developing the Guideline for Transboundary Environmental Impact Assessment to ensure that the cross border environmental impacts are well managed and prevented by using environmental impact assessment as a tool. Development projects can however change the river hydrology and impact the resources, people and economies the river supports. A framework for EIA in a transboundary context would benefit the MRC by helping individual countries co-operate with each other when a development likely to have transboundary environmental impacts is planned with the aim of preventing, minimizing and managing transboundary impacts.

One of the most important issues that Environment Programme, MRCS is implementing at this moment by coordinating with other partners such as IUCN is the wetland biodiversity management project. Increasingly, evidence indicates that wetland resources are of particular importance to poorer groups, with significant implications for poverty reduction strategies, food security planning and rural to urban migration and employment. These will become even more significant if wetland resources are reduced. Rural livelihoods are founded on the integrated use of a wide range of natural resources, adapting to the seasonal changes of flooding and recession. Beside effective programme implementation, MRCS and Mekong Wetland

Biodiversity Programme have collaborated to ensure that the result from the programme implementation will be fully integrated into the national policy to ensure the sustainable development taking place.

Distinguished Participants,

The MRC programme is implemented simultaneously to assist the member countries to successfully implement the 1995 Mekong Agreement, and to achieve the vision of “an economically prosperous, socially just, environmentally sound Mekong river basin”.

This meeting will contribute to a better understanding of the environmental health of the river, and will provide information which will help MRC and its member countries to fully implement the 1995 Agreement. Our challenge is to facilitate balanced and sustainable development in this region, and we require the knowledge and data from all MRC programmes to fulfil our role and to meet that challenge.

Distinguished guests, ladies and gentlemen, your comments today would help us to better implement the Programme. Your constructive input and contribution to discussions at this important meeting are highly appreciated. With these words I declare the meeting open and wish you all a very interesting and fruitful discussion. Thank you.

Closing Remarks
By Dr Wijarn Simachaya, Director Environment Division, MRCS

Excellencies, Experts, Ladies and Gentlemen,

In my capacity as Director of the MRC Environment Programme it is my great pleasure to give some concluding remarks to this annual Regional Technical Meeting. We began the week with the second meeting of 2005 of the Regional Technical Advisory Group for the water quality programme, and we have now concluded two days of meetings dealing with the broader aspects of the Environment Programme. The Environment Programme has expanded over the years from a major emphasis on water quality that began in 1985 to now include biological assessment, risk assessment, environmental flows, and an extensive set of interactions between EP and other parts of MRC. Our programme has moved, over the years, from operating largely in isolation from the other parts of MRC, to an integrated programme that provides inputs to the BDP and the WUP, and which operates in partnership with national Mekong Committees.

We have, therefore, had presentations over the past week on a number of quite new initiatives for which we are developing new methods that will provide not only new understanding of the Mekong system and which will add to the ability of MRC to assist national authorities to manage the basin. The water quality diagnostic study is the first study of environmental contaminants in the lower Mekong system and has demonstrated that there is now no concern about contaminants, however we must remain vigilant on this issue. The river biological assessment is the first major attempt to provide information on how the river ecosystem is responding to environmental and natural factors. The work on environmental flows assessment is the first such programme on a large tropical river and has captured the attention of the World Bank as a methodology that permits better management judgements on river basin development.

EP is a partner in the implementation of the Mekong Basin Wetlands Project with IUCN and the GEF. This is another area where EP has moved outside its narrow niche to participate in a much wider study with significant environmental and socio-economic impacts. EP is working in partnership with the WUP in a variety of areas, including the development of Rule for Water Quality, and Integrated Water Quality Management. These are win-win relationships for EP and its partners as it brings a much broader spectrum of expertise to bear on the issue.

Having said all this, there remains much to be done. As we look ahead there are major challenges in Mekong basin management on the horizon. One of these is the potential impact of climate change. Thus far, this is not factored into the flow management options developed by the WUP, yet there is increasing evidence that the source of the Mekong is seriously threatened by global warming. Given that 45% of the flow comes from Laos, we need to know more about the potential impacts of climate change within the basin. Failure of the monsoons would have a devastating impact on the lower Mekong basin. Climate change may also have major impacts on land use and water demand in the Greater Mekong Sub-region. Another issue that we share with the Fisheries Programme are the consequences of introduced species used in fish culture. What will this mean for food supply, for water quality, and for

sustainability? There is much we do not know about Tonle Sap Lake. Indeed, some of the basic science that supports aquatic management planning, has never been done. Not all of these are specifically the responsibility of MRC or of the EP. However, one of the roles of EP is to raise these issues to the attention of partners working in the basin, and to place these in perspective relative to basin development issues.

The discussion periods that we have participated in over the past few days have produced some specific recommendations for EP. These are very useful as we consider our 2006 programme. I have some thoughts on future issues that I would like to share with you:

I agree that we need to provide more comprehensive assessment of water quality together with an assessment of causal factors. This should be useful not only to governments but also to the public. It is our intention to pursue this in 2006.

We need to continue to provide for a high level of participation of national experts in areas such as the technical criteria that we are using to provide assessment information. It is vitally important that MRC is able to pursue assessment in the absence of politicization of the technical results.

There is a need to make much more of our data accessible to the public and to external agencies.

I also believe that EP has to think very long-term. For example How to make core activities of MRC such as data collection, sustainable over the longer term to ensure that these activities are positioned to provide accurate and continuous information to basin managers.

We need to pay more attention to the likely long-term changes in the Upper Mekong basin, what this may mean for the lower basin, and how we should engage the Chinese government on these issues. This is not, of course, just an EP responsibility.

In recognizing the need to fill the major gaps in our understanding of the science of basin management, we must however also recognize that we cannot know everything. Therefore, it follows that we have to carefully assess how much we need to know to make reasonable and informed judgements on basin management, but without turning MRC into a basic research organization.

We need to carefully examine some of the long-term issues such as climate change and what this may mean for basin management over the longer term. How can we move to “adaptive” management that can accommodate environmental change?

In conclusion, I want to thank those who have prepared and made presentations and to all the participants for their contributions to the discussions. I appreciate your insight and knowledge on these many issues and I can assure you that EP will take into account your many comments and recommendations. I hope you have had an enjoyable time here in Siem Reap, and on your behalf I wish, especially, to thank the Cambodian National Mekong Committee for their excellent organization of the logistics for this meeting.

With your agreement, I now declare this meeting closed. Thank you everyone and have a safe trip to your home countries.

ANNEX 3: LIST OF PARTICIPANTS

LIST OF PARTICIPANTS

Name	Position/Institution
Cambodia	
H.E. Pich Dun	Deputy Secretary General, CNMC
H.E. Kol Vathana	Deputy Secretary General, CNMC
Mr Heng Phearith	EP Coordinator, CNMC
Mr Chrin Sokha	Deputy Director, Dep. of Env. Pollution Control, MoE
Ms Nhim Sophea	Vice-Chief, Office of Water Quality, MOWRAM
Mr So Im Monichoth	Deputy Director of Hydrology and River Works Department
Mr Heng Nareth	Director of Pollution Control Department, MoE
Mr Houng Sounthan	National WUP Coordinator, CNMC
Mr Sok KHom	EP Officer, CNMC
Ms Po Salina	Technical Officer of Water Quality Laboratory, MOWRAM
Lao PDR	
Mr Lonkham Atsanavong	EP Coordinator, LNMC
Mr Chanthavong Saignasith	General Director, LNMC
Mr Kongngneum Chounlamonty	WUP Coordinator, LNMC
Mr Sangkhane Thiengthammavong	Deputy Director of Division, LNMC
Mr Phetsamone Southalack	BDP Coordinator, LNMC
Mr Phonepaseuth Phouliphanh	AIFP Coordinator, LNMC
Dr Bounnam Pathoumthong	National Expert on Ecological Health Monitoring
Mr Chanda Vongsombath	National Expert on Ecological Health Monitoring
Mr Khampeth Roger	Deputy Director of LARREC
Mr Khamhou Tounalom	Technician, Ministry of Industry and Handicraft
Ms Chanpenh Inmatong	Quality Manager of Water Quality Laboratory
Thailand	
Ms Pakawan Chufamanee	EP Coordinator, TNMC
Ms Sopha Nopsiri	Quality Manager, Water Quality Laboratory
Mr Pornsak Jevasuwan	Director of Water Analysis and Research Division, Department of Water Resources
Mr San Kemprasit	Chief Engineer in Water Resources System Development
Ms Supranee Runghirumviroj	Senior Hydrologist, DWR
Ms Ruamporn Ngamboriruk	Senior Policy and Plan Analyst, DWR
Ms Araya Nuntapotidech	Head of Regional Environment Office, Ministry of Natural Resources and Environment
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Name	Position/Institution
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Ms Nguyen Thi Ky Nam	EP Coordinator, VNMC
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Ms Dao Thi Thu Ha	Quality manager, Water Quality Laboratory
Mr Pham Kim Phuong	Director of Analysis and Experiment Center, Department of Science and Technology
Mr Nguyen Viet	Deputy Chief, Water Resources Department, MARD
Mr Nguyen Van Thang	Ha Noi Resources
Ms Nguyen Thi Lan Huong	Vietnam Environment Protection Agency, MONRE
Mr Nguyen Thi Binh	Deputy Director, Sub-National Agriculture Planning and Projection Institute, MARD
Mr Pham Trong Thinh	Deputy Director, Sub-Forestry Inventory and Planning Institute, MARD
Mr Tran Quoc Bao	Deputy Director, National Center for Monitoring of Water Environment and Fisheries Epidemic Prevention of South Vietnam
Ms Trinh Thi Long	Deputy Chief, Southern Research Institute for Water Resources, MARD
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Mr Do Van Hung	Deputy Director, Department of Agriculture and Rural Development
Mr Pham Ngoc Loi	Department of Agriculture and Rural Development
Mr Pham Anh Duc	National Expert, VNMC
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Name	Position/Institution
Other	
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ANNEX 4: DIALOGUE ON FLOODS (Report by WWF)

Values and Functions of the Mekong Floods - Developing Information for a Balanced Dialogue through Local Experience

A Contribution to the Dialogue on Water Food and the Environment Vientiane, Lao PDR, 26 – 28 October, 2004

Introduction

For many people living in the Mekong River Basin annual flooding is a normal part of life. Although these floods are sometimes dangerous and damaging, there is an understanding of the importance of annual flooding events. Because the Mekong flood plains remains still relatively intact and population of the lower Mekong basin is concentrated along the river and its tributaries, the beneficial aspects of the floods are well known to many stakeholders who view the annual flood cycle as an important part of the river itself. This is highlighted by Cambodia's Tonle Sap Great Lake which provides a wealth for fishery and agriculture resources through its links to annual flood cycle of the Mekong River. This was clearly the message portrayed by participants of a workshop conducted by WWF in 2002 on the economic values of floods. Since that time various activities have been conducted in attempts to better understand these processes. During this workshop various stakeholders from the fisheries and environmental sectors exchanged experiences on the many benefits provided by the annual floods of the Mekong.

Beyond the small group who found agreement on the value of floods, there is another group who has a different point of view concerning floods and the rivers that are their source. This group sees a force that destroys private property and public infrastructure, endangers lives and ruins livelihoods. They see water that if properly managed could provide irrigation in times of drought and reliable transportation for growing economies.

This being the case, there is a need to improve the exchange of information on the values of floods, as well as to expand the dialogue to other stakeholders who are also involved in the planning and management of the Mekong River and its important water resource. For this reason a workshop was held as part of WWF's contribution to the Dialogue on Water, Food and Environment to exchange information on recent activities and developments related to the value and functions of the floods in the Mekong River Basin, as well as develop a framework for continued exchange of information.

The Workshop

The overall goal of the workshop was to develop a balanced understanding of the role and values of floods along with their impacts in the Mekong basin. Specific objectives were aimed at gaining a better understanding of knowledge on the subject and to encourage improved exchange information in the future, as well as raise awareness of the issue. These included the following:

Pool existing knowledge and information on flood benefits (and costs) in the Mekong Basin, with particular reference to fisheries.

Establish mechanisms for interaction, collaboration and cross-fertilization of ideas between local-level groups.

Identify knowledge gaps and methods for addressing them.

Raise the profile of the issue on local, national, and basin scales and facilitate the generation of further dialogue on the subject.

In order to fulfill the objectives of the Dialogue, the participants represented a wide range of institutional stakeholders from national governmental organization and regional representation of international organizations. This included a wide range of technical specializations ranging from environmental conservation to natural resources management to economic development. This diversity among the participants invited active dialogue among potentially adversarial points of view on the subject of floods and flooding events. The diversity also, however, ensured that the workshop represented a wide spectrum of opinion and didn't merely "rubber stamp" the views of WWF or other in the environmental or fisheries sectors.

Workshop Proceedings

The workshop consisted of a series of activities intended to build consensus and develop a framework for dialogue based on examples of activities conducted at the local level from around the region. These presentations provided examples of a range of important issues related to the values and functions of the Mekong floods based on recent local examples. Based on these examples workshop participants brainstormed scope of issues related to the floods and agreed on the importance of continuing to exchange information on the subject. A range of stakeholders including researchers, development agencies, governmental policy makers and planners, conservation organizations, as well as local people were identified as those who should be engaged on these issues in the future.

Key achievements and outputs of the workshop include:

This "list of Common Understanding about Flood" includes the areas of acknowledging the benefits of floods, management for "living with floods", and communication and dialogue on the value and function of floods (see box below)

Recommendations to broaden and continue the "dialogue" on the benefits of floods

Agreed action points for collaborative production of promotional materials

Common understandings:

Flooding in the lowlands in the lower Mekong River Basin is a natural phenomenon that is essential to food security and biodiversity.

Floods can be destructive, especially in the case of extreme events. Moderate floods have obvious and crucial benefits in rural areas of the Lower Mekong Basin, but are often disruptive or destructive in urban areas.

The people of the Lower Mekong are highly dependant on the benefits of the floods which are closely linked to the flood cycle. This includes both the need for high and low parts of the flood cycle as well as the 'flood pulse'.

In the Lower Mekong Basin, flood management should focus on trying to manage the benefits/increase the benefits of the flood, rather than controlling or preventing the flood.

Flood management should be reviewed and focused more on getting human establishments in urban and rural areas to be more transparent to floods. This should build on traditional coping strategies to develop modern approaches for living with floods, within this, flood-preparedness is a key consideration.

There are clear differences between stakeholders in perception and definitions regarding the flood cycle and floods. There is a lack of terminology to distinguish between ‘good’ and ‘bad’ floods. Effective dialogue will require agreement/understanding on common definitions.

This workshop supports the “living with the floods” concept.

Values and functions of Mekong Floods should be addressed in an informed and collaborative process between all stakeholders.

The participants attending this workshop agree to actively communicate the positive benefits of floods (and the flood cycle) and to encourage dialogue on the values of floods and wetland resources

Participants all agreed that the message of the value of the floods dialogue is important and should be promoted throughout the basin. Those who should receive this information include local and national planners and policy makers, development professionals and technical specialists, as well as the donor community. WWF and the MRC Flood Management and Mitigation Programme (FMMP) were identified as the lead institutions for follow-up. This follow up should include making the results of this workshop known to a wider audience by making presentations at interested forums and through use of the internet. It was also agreed that a promotional information package would be developed for dissemination. This will be done by a volunteer task force including WWF, AIT Aqua Outreach, World Fish Center, and the UNDP/MRC/IUCN Mekong Wetlands Biodiversity Programme.

Conclusions

The workshop was not only successful in meeting its objectives and achieving its outputs, but it was also valuable in that it made significant progress in mainstreaming the issue of the “values of floods”. During the proceedings of the workshop, participants that were potential opponents on various issues related flood cycles and their role in livelihoods. Although it was hoped that consensus would be possible during the workshop, this was achieved to a greater degree than expected. Although some participants had expressed unfamiliarity with the topic of the workshop prior to the event, everyone left the workshop confident that common ground had been found concerning the issue of the value and function of the flood-cycle in the Mekong basin.

The workshop also reinforced WWF’s Living Mekong Programme’s ability to a leading role in this approach to addressing this issue in the Mekong Basin. The results of the workshop confirm that WWF should continue to address the issue of better understanding the value of floods, and to pursue the promotion of this issue in the future.