



**3<sup>rd</sup> Regional Stakeholder Forum on the Basin  
Development Plan Forum Proceedings**

# **Consultation Proceedings**



**29-30 July 2010  
Vientiane Lao PDR**

*Decoding the development scenarios and strategy for basin development:  
What does the future hold?*



# Mekong River Commission

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The opinions and interpretations expressed within are those of the authors and presenters and do not necessarily reflect the views of the Mekong River Commission.

## LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AFD	Agence Francaise de Developpment
ASEAN	Association of South East Asian Nation
BDP	Basin Development Plan
BDP2	Basin Development Plan Programme Phase 2
CFs	Community Fisheries
CNMC	Cambodia National Mekong Committee
DFS	Definite Future Scenario
DOE	Department of Environment
DOS	Development Opportunity Space
DWR	Department of Water Resource
DWMU	District Watershed Management Unit
DWREO	District Water Resource and Environment Office
ESCIR	Ecosystem Study Commission for International Rivers
FFS	Foreseeable Future Scenario
FWUC	Farmer Water User Committee
GDP	Gross Domestic Product
GMS	Greater Mekong Sub-Region
IMT	Irrigation Management Transfer
IWMI	International Water Management Institute
IWMU	Integrated Watershed Management Unit
IWRM	Integrated Water Resources Management
KRA	Key Result Areas
LMA	Land Management Authority
LMB	Lower Mekong Basin
LNMC	Lao National Mekong Committee
LWR	Law on Water Resource
MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mines
MONRE	Ministry of Natural Resource and Environment
MOWRAM	Ministry of Water Resource and Management
MRC	Mekong River Commission
MRCS	Mekong River Commission Secretariat
MRD	Ministry of Rural Development
NGOs	Non-Governmental Organizations
NNRBC	Nam Ngum River Basin Committee
NNRBDSP	Nam Ngum River Basin Development Sector Project
NNRBMC	Nam Ngum River Basin Management Council
NWRC	National Water Resource Strategy
PIMD	Participatory Irrigation on Management and Development
PMFM	Procedure for the Maintenance of Flows on the Mainstream
PNPCA	Procedures for Notification, Prior Consultation and Agreement

PMQ	Procedures for Water Quality
RBC	River Basin Committee
RBM	River Basin Management
RBO	River Basin Organisation
RSAT	Rapid Strategic Assessment Tool
SCIRIP	Steung Chinit Irrigation and Rural Infrastructure Project
SEA	Strategic Environmental Assessment
SRBMC	Sub-river Basin Management Committee
TSA	Tonle Sap Authority
WREA	Water Resources and Environmental Administration
WWF	World Wildlife Fund

## **PREFACE**

It is with great honour and appreciation that I continue to have the opportunity to present reports, which synthesise important outcomes from our stakeholder engagement processes within the Basin Development Programme. From 29-30 July 2010, the MRC and partners organised the 3<sup>rd</sup> Regional Stakeholder Forum on the Basin Development Plan (BDP) for the Lower Mekong Basin (LMB) in Vientiane, Lao PDR.

Over the last few years the MRC has organised two other such Forums that provided valuable input into our process moving forward to develop the BDP. This year has been no exception as we are nearing the final stages of development of that plan. The focus of the Forum was on “Decoding the Development Scenarios and Strategy for Basin Development: What does the future hold?” Over 260 participants from diverse background joined together to discuss important topics such as what do the results of the development scenarios assessments tell us and what does the IWRM-based Basin Development Strategy say. The Forum enabled interactive discussions on a number of key topics that delved deeper into these overarching questions such as what are the opportunities and risks of mainstream hydropower dams or what options exist for sustainable agriculture development. Furthermore, the Forum provided an understanding of the increasing role of river basin organisations (RBO) in the Mekong Basin, which have been formed or are in the process of being formed. The MRC recognises that many of these topics are important to a variety of stakeholders, and providing the opportunity for them to be discussed and debated is of highest importance for the MRC.

The MRC appreciated the frank and constructive atmosphere created by the Forum participants in their sharing of valuable knowledge on the Mekong resources and of their different perspectives on water resources developments in the Mekong Basin. Many useful comments and recommendations were provided to improve the assessment of the development scenarios and the preparation of the IWRM-based Basin Development Strategy.

Considering the river as a connected system and recognising the value of cooperation are crucial in determining our way forward. I have been encouraged with the new prospects for cooperation that the delegates from China have shared during this meeting and their engagement throughout the whole BDP Forum. Finally, the MRC recognises that basin planning will only be effective with ownership and implementation at the national and local levels. River basin management and the role of the RBO are high on the agenda of all LMB countries. What lies ahead of us is to strengthen river basin management and RBO, drawing on sharing of experiences and joint learning that have started in the Basin. The MRC continues to be willing to provide a facilitation role for this joint learning.

Sustainable and equitable development of the Mekong water and related resources requires the reaffirmed strong commitment of cooperation, for integration of the Basin’s sustainability in national planning and decision-making, and for working together to find innovative benefit sharing mechanisms. The Forum participants contributed greatly to these discussions and the willingness of all who participated is greatly appreciated.

Jeremy Bird  
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Mekong River Commission Secretariat

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## EXECUTIVE SUMMARY

The 3<sup>rd</sup> Regional Stakeholder Forum on the Basin Development Plan took place in Vientiane, Lao PDR, from 29 – 30 July 2010. The Forum brought together more than 260 participants from diverse stakeholders, including representatives of the Governments of the Mekong River Commission (MRC) Member Countries and Dialogue Partners, universities, research institutions, NGOs, civil society groups, representatives from communities, river basin organisations, and development partners, and project developers.

The 3<sup>rd</sup> Regional Stakeholder Forum is part of a series of regional multi-stakeholder forums organised by the BDP Programme to engage stakeholders at the regional level to provide inputs into planning and decision-making on water and related resources development. The 1<sup>st</sup> Forum, “Working with the MRC for sustainable development of the Mekong” was held in March 2008 in Vientiane, Lao PDR, and promoted an open dialogue among 120 stakeholders on critical issues in the Mekong Basin, and how the MRC through its mandate and the basin development plan process should address these issues. The 2<sup>nd</sup> Forum, “Unfolding perspectives and options for sustainable water resources development in the Mekong Basin” was held in October 2009 in Chiang Rai, Thailand, with over 250 participants who actively shared their perspectives on opportunities and risks of water related development and challenges for transboundary water management in the Mekong Basin. The Forum discussed the scope and methodologies for the assessment of basin-wide development scenarios, and how the resulting information can be used to prepare a Strategy for Basin Development that will reflect agreed options and guidance for basin development.

The Theme of the 3<sup>rd</sup> Forum was “Decoding the development scenarios and Strategy for Basin Development: What does the future hold?” The objectives of the Forum were to: i) discuss the results of the basin-wide scenario assessment for the finalisation of the assessment; ii) discuss the draft IWRM-based Basin Development Strategy and provide inputs for decision-making by the Lower Mekong Basin countries; iii) facilitate a critical dialogue on the future of River Basin Organizations (RBO) in the Lower Mekong Basin to support the implementation of the Basin Development Strategy; and iv) continue strengthening partnerships between the MRC and stakeholders.

The Forum acknowledged the new information provided by the assessment of the considered basin-wide development scenarios and identified the main shortcomings to be addressed. A solid baseline for the ecosystem is needed to assess the environmental impacts of scenarios, which demonstrates understanding of how the many ecosystem units and habitats function together. The participants called also for a further improvement of the social assessment of the scenarios, as they wanted to understand the real impacts on local communities. Moreover, the scenario assessment must include meaningful and practical measures to mitigate the impacts of developments and their risks to affected communities. This is particularly urgent for the impacts of the ongoing developments in the Definite Future Scenario, which are inevitable: the MRC could facilitate specific agreements between the countries as to how to minimise those impacts to maintain and improve livelihoods. Options for alternative development scenarios need to be explored and researched to inform the IWRM-based Basin Development Strategy. The participants found that the SEA of the Mainstream Hydropower Dams contains valuable information to strengthen the scenario assessment and the IWRM-based Basin Development Strategy.

The Forum provided some major directions for the further preparation of the IWRM-based Basin Development Strategy. The concept of the ‘development opportunity space’ must be revisited. The concept as described is too complex and is misunderstood as a list of projects that do not give serious consideration to poverty and the environment. One of the speakers argued that that a development space driven by ecological and livelihoods limits would produce quite different scenarios for diverse Basin stakeholders to consider. Some participants mentioned that the development opportunity space needs to be reconsidered in terms of enhancing food and livelihood security for the poor. According to others, the Strategy would need to focus on defining the enabling framework and actions that are needed to move the identified development opportunities and associated risks towards sustainable development. This may require the preparation of a strategy on basin management to ensure sustainability of basin development. Participants found that the Strategy does not sufficiently build on the findings of the SEA of Mainstream Hydropower Dams, including its avoidance, mitigation and enhancement framework.

The Forum acknowledged that ownership and implementation of basin planning at the national and local levels is crucial. There are increasing needs for RBO to manage the water resources in critical tributary basins of the Mekong and guide and coordinate the planning and water resources development by sector agencies. Therefore, river basin management and the role of RBO are high on the agenda of all Lower Mekong Basin countries. The implementation of the IWRM-based Basin Development Strategy offers an opportunity to strengthen existing RBO and establish new ones. Existing RBO may take a lead role in the implementation of the Strategy in their river basin. That could include the harmonization of an existing river basin plan with the directions of the Strategy and/or the identification of those additional actions needed to supplement current national plans for the river basin in order to implement the Strategy. This will provide opportunities for the RBO to engage and interact with line agencies and other stakeholders and produce a broader and much strengthened approach to land, water and related resources planning in their river basin. In the process, new tools can be used, such as those that promote the sustainability of hydropower development.

The MRC will continue keeping Basin stakeholders informed of the developments of the Basin Development Strategy and inviting stakeholders to regularly engage in commenting and inputting into future drafts. Given the interconnectedness of the river, more efforts are needed for cooperation and coordination among diverse stakeholders. Local knowledge of communities and local non-government groups can assist in contributing to information being generated by the MRC. Therefore, more outreach to the public through stronger partnerships with civil society and the media is needed. The on-going cooperation and prospects for scaling up transboundary cooperation with China is welcomed. The Forum agreed that frank, critical and constructive discussion and recommendations need to be mainstreamed into all work of the BDP and the MRC as whole.

## 1. Key messages



*The MRC Member Countries confirmed their commitment to moving forward with a Basin Development Strategy that serves as a framework for future negotiation and cooperation in water resources development and management.* The 3<sup>rd</sup> Basin Development Plan Forum provided a platform for debate and discussion on the scenario assessment and made recommendations for its improvement to serve sound decision-making. The IWRM-based Basin Development Strategy aims to assist the MRC Member Countries to continue to discuss and arrive at the best joint decisions on the development of the Mekong River and related resources. The Forum confirmed that the Mekong is at crossroads and the decisions today would lead to very different futures for the Mekong Basin. Thus, placing importance on sound science and analysis in the development of the BDP was stressed. The Forum confirmed the need to better understand the transboundary implication of national development plans. The report of the Strategic Environment Assessment provides a large amount of information that can significantly contribute to the BDP and decision-making as a whole. The Forum as a whole was encouraged by the large delegation and participation by China indicating their commitment to working together with the MRC Member Countries to protect the Mekong River and further share and understand the data being collected across the whole of the Basin.

*With the expectation that the Procedures for Notification, Prior Consultation and Agreement (PNPCA) process for the first LMB mainstream dam will commence in the near future, the inclusion of affected people and communities as well as other stakeholders is crucial in decision-making processes, including the finalisation of the Basin Development Plan.* Given the interconnectedness of the river, more efforts are needed for cooperation and coordination among diverse stakeholders. The use of local knowledge by communities and local non-government groups can assist in contributing to information being generated by the MRC. Therefore, more outreach to the public through stronger partnerships with civil society and the media is needed. The on-going cooperation and prospects for new areas with China is welcomed. The Forum agreed that frank, critical and constructive discussion and recommendations needs to be mainstreamed into all work of the BDP and the MRC as a whole.

***IWRM terminology is widely used but its understanding and the capacity to implement IWRM-based Basin Development Strategies and plans is still lacking. IWRM capacity needs to be built to capture the informed opinions of all stakeholders on what would be an acceptable level of basin development.***

The danger in using fancy terms such as IWRM without consideration of what it means continues to plague the region. The IWRM-based Basin Development Strategy is based on: i) balancing social/economic/environmental issues; ii) treating the basin as an interconnected whole; and iii) balancing country benefits. However it is less clear as to whose voices are integrated into the planning; what kind of development is envisaged; and what planning is there for those affected by dams?

***More attention is needed to ensure avoidance and mitigation measures are in place including how they will be financed.*** Mitigation strategies are still lacking in the Basin Development Strategy, especially within the Definite Futures Scenario (DFS). Mitigation must be planned within the broader Mekong sustainable development and reasonable and equitable utilisation framework. The BDP must include meaningful and practical measures to mitigate the impacts of developments and their risks to affected communities. Although the impacts of the DFS can be considered as a given, it is the responsibility of the MRC to seek and facilitate agreements as to how to minimise those impacts. Follow-up activities relating to mitigating the impacts on sedimentation, biodiversity, and ecosystems, and the risks due to upstream dam operations and major flood events, could cause significant damage to human life, and the economies of downstream countries. The Forum agreed that it is important that: i) environmental flows are calculated; ii) benefit sharing mechanisms are put in place; iii) acceptable mechanisms are put in place to address emergency events (such as insurance, dam breaks, emergency flow release, etc); and iv) mitigation initiatives are measured at critical points through the basin. This would require the completion and signing of the procedures for addressing those concerns and, as appropriate, the introduction of an insurance scheme.

***Changes associated with the various scenarios are expected to be inevitable over the next decades and therefore, measures are required to maximize opportunities and minimize negative impacts. There is recognition that the DFS will have certain impacts and outstanding issues will need to be addressed.*** The DFS will cause significant changes in flows and related impacts, such as reduction in flooded areas and fisheries, sediment entering wetlands, and increased social impacts, in particular, due to hydropower development in the Upper Basin along the Lancang-Mekong River. There are expected to be economic benefits from on-going hydropower developments, but also from reduced flood damages, increased reservoir fisheries and navigation and reduced salinity intrusion. Increases of dry season flow will provide opportunity to source ambitious irrigation expansion plans in the LMB in the Foreseeable Future Scenario (FFS).

***The 20-Year Plan Scenario with eleven mainstream dams is expected to create the highest economic benefits to all LMB countries. However, this scenario will create also the highest negative transboundary impacts on capture fisheries, environmental hotspots and flagship species.*** An additional 3.5 million vulnerable people will be put at risk of losing their livelihoods over and above those under the DFS. In particular, the two most downstream mainstream dams in Cambodia would cause large negative impacts on capture fisheries and vulnerable people, especially in Cambodia and

Viet Nam. Therefore, the 20-Year Plan Scenario without the Cambodia mainstream dams poses a major trade-off for Cambodia – there would be no revenue generation from exporting electricity but would be conserved the large capture fisheries.

***Ownership and implementation of basin planning at the national and local levels is crucial.*** Basin Planning will only be effective with ownership and implementation at national and local levels. River basin management and the role of RBO are high on the agenda of all LMB countries. There is now a need to strengthen these institutions, drawing on lessons learned and past experiences to ensure joint learning within the Basin. New tools can inform that process, such as those that promote the sustainability of hydropower development.

***China's engagement in the BDP2 Regional Forum was welcomed. China made a commitment at the meeting to ensure that the dams in the upper Mekong would not have negative downstream impacts. Further strengthened cooperation and sharing of data were areas discussed by the Chinese delegation.*** During the floods in 2008 and the drought in 2010, China was blamed for releasing and storing water respectively. However, at the Forum, China emphasized that the reservoir for the Xiaowan Dam is supposed to only store water during the flood season and provide additional water during the dry season in the Lower Mekong Basin. He also outlined three guarantee measures with regard to water management of the reservoir: i) a method of staged water conservation – the normal pool water level of the Xiaowan Reservoir is 1,240 meters and the staged method was adopted early on. Conservation of water during the 2009 flood season reached the dead water level of 1,166 meters and during the 2010 flood season – between 1,166-1,240 meters; ii) the impoundment of the reservoir is to be carried out in strict accordance with the fixed flow to try to preserve the natural flow process of the river channel in the preliminary impoundment process; and iii) if the outflow fluctuates, a joint operation and regulation would be conducted so that the downstream reservoirs (Manwan, Dachaoshan and Jinghong) re-regulate the outflow of the Xiaowan Reservoir so that the outflow can meet the integrated water requirements of the LMB. In conclusion, China confirmed their view that there have been no adverse downstream impacts from the three Chinese dams built along the Lancang River to date. China expressed interest and willingness to conduct joint research with partners in the LMB.

***The Forum appreciated the efforts made by the BDP2 on the hydrological assessment. However, more work is required to strengthen other assessments to provide a full and accurate picture for scenario development and analysis.*** The hydrological analysis can and is being further strengthened although it is already significantly more advanced than other critical aspects of the analysis. For example, whilst the predicted changes from the current models are sufficient for BDP2, improvements are needed in the future in the areas of: flooded areas upstream of Kratie, Cambodia; salinity impacts associated with sea level rise; improved climate change predictions and scenario improvements; better resolution of flooded areas in the Viet Nam Delta; and diurnal variations and better power simulations. The BDP provides an optimistic view about the assessment of more water in the dry season. However extreme or emergency cases are not well assessed. There is too much of an assumption that people will shift to dry season crops, notwithstanding that this will lead to other associated problems.

The lack of social issues incorporated into the BDP assessments was stressed and participants wanted to understand more fully the likely impacts from the development scenarios on local communities. The

livelihoods of millions of people are affected by the reduction of wetlands and fisheries. At the same time the scenarios would create significant economic development (e.g. new jobs). Where is the plan within the Basin Development Strategy to help the people who have lost their livelihoods during this transition period? Whose responsibility is it to help the people? These were some of the important questions raised by civil society participants that need further discussion.

***Identifying and understanding options for alternative development scenarios needs to be further researched and explored.*** The analyses undertaken by BDP are limited to national plans and proposals currently on the table by the Member countries. Forum participants believed that more work is required to identify and assess other development scenarios, which should also be included in the BDP Strategy. The World Wildlife Fund (WWF) suggested that there are many such alternatives that could be considered, including small hydro, high-head medium dams (which China has been developing to some extent) coupled with different types of facilities e.g. turbines. Implementation of sustainability assessment tools was also advocated, such as the Hydropower Sustainability Assessment Protocol and the Rapid Strategic Assessment Tool (RSAT) which have important prospects for identifying needs and ensuring sustainability of projects and basin-wide management.

***The Development Opportunity Space (DOS) remains a concept that is not well defined or understood. The complexity of the DOS concept combined with a lack of clear definition creates confusion in the use of the DOS within the BDP. The seeming disconnect between development projects and measures to mitigate their negative effects may be misread as the DOS giving license to development.*** Several speakers stressed that the DOS is too hydrologically driven: the concept of 'development space' appears to be based on water being stored and extracted in a manner that each country benefits whilst flows into the Delta are kept sufficient to prevent further saline intrusion. A development space driven by ecological and livelihood limits would produce quite different scenarios for the Basin stakeholder group to consider. A number of courses of action were suggested, including: a development space better reflecting the need to enhance food and livelihood security for the poor; and the Millennium Development Goals, food security, and IWRM principles of not compromising the sustainability of vital ecosystems. There are also opportunities to learn from existing dams to ensure that impacts from DFS dams are properly mitigated and tradeoffs equitably managed before committing to any more. However, it was recognized that large stakeholder forums are not an ideal vehicle for formulating scenarios and BDP were urged to take these ideas forward.

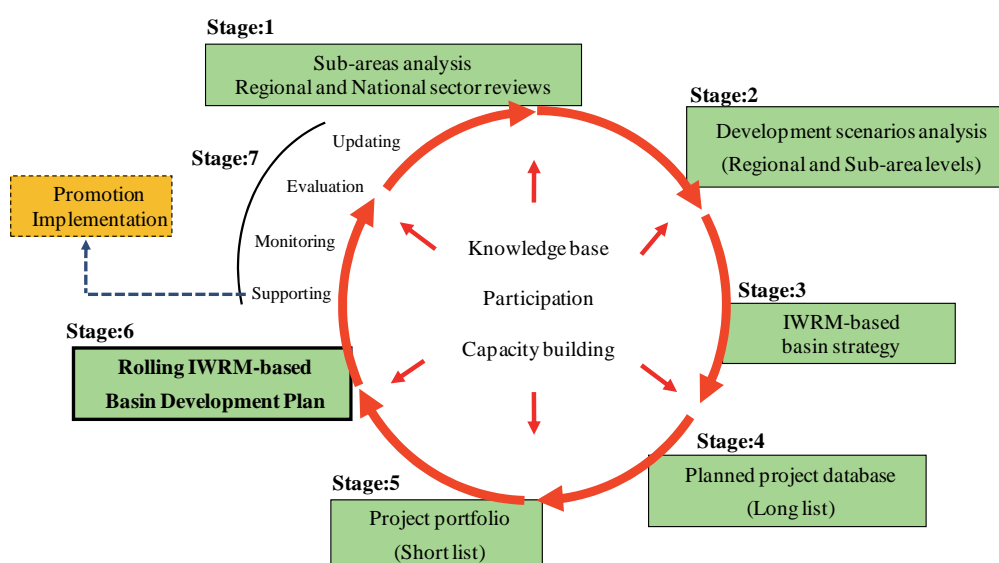
***The MRC is committed to continue keeping Basin stakeholders informed of the developments of the Basin Development Strategy and inviting stakeholders to regular engage in commenting and inputting into future drafts.*** The Regional Technical Working Group and the National Advisors will discuss and work hard to address all the inputs made in the Forum. The target of getting the Strategy approved by the end of 2010 may not be met but MRC will continue to post developments on the MRC website, and all stakeholders are invited to provide inputs. In addition, the BDP2 finishes at the end of 2010. At the same time, the MRC is completing its 5-year Strategic Plan. The IWRM-based Basin Development Strategic and the MRC Strategic Plan 2011-2015 are two key directional documents, which will guide the MRC over the next five years. The MRC will continue to take the BDP process forward, will implement a learning by doing process and will aim to fill the knowledge gaps in order to take the planning process to the next level.

## 2. Background

### 2.1 The journey of the Basin Development Plan Programme

The 1995 Mekong Agreement aims to “promote, support, cooperate and coordinate in the development of the full potential for sustainable benefits to all riparian countries and the prevention of wasteful use of the Mekong River Basin waters....”. The main goal of the MRC Strategic Plan for 2006-2010 is “more effective use of the Mekong’s water and related resources for poverty alleviation while protecting the environment”. In light of these key aims and goals, and with the acceleration of water resources development, in particular, hydropower development, which is primarily driven by market forces and the private sector, the importance of developing an integrated Basin perspective is a key need for the Mekong River Basin.

The Basin Development Plan Programme Phase 2 (BDP2) began its journey in 2007 and was designed to provide an integrated basin perspective, and to build consensus among the riparian governments and stakeholders on the common directions for sustainable development and management. The MRC believes that this can only be achieved through meaningful participation of diverse stakeholders to help inform the process and ensure that the planning cycle (see Figure 1) is developed in a manner that informs and facilitates effective use of water resources.



**Figure 1: The BDP planning cycle**

The approach that the BDP2 has employed to get to where it is today has been informed by the numerous meetings and, in particular, the two previous regional forums that have been organised. The 1<sup>st</sup> Regional Stakeholder Consultation on the BDP was held in March 2008 in Vientiane, Lao PDR, and emphasized the importance of the BDP process being grounded in knowledge of the river, opportunities and challenges of the current and anticipated water resources development in the Mekong Basin. Furthermore, a thorough understanding of the challenges of implementing Integrated Water Resources Management (IWRM) was required in order to develop a relevant basin strategy. Therefore,



the approach defined and pursued over the last two years has been aimed at bringing synergies at different levels of the Basin – from sub-basin to sub-area to national and finally to the basin level (see Figure 2). Through the development of basin scenarios, a basin development strategy would be formulated, and which would be implemented in national planning and then at local areas (e.g. sub-areas and tributaries). In defining scenarios that respond to urgent questions such as: “What are the implications of combined nationally planned water resources developments, especially of the mainstream dams and to what extent further development is balanced and mutually beneficial?”, the MRC organised intensive discussions in the sub-areas among relevant sectors and at the regional level. The 2<sup>nd</sup> Regional Stakeholder Forum specifically discussed scenario assessment methodologies and the incomplete Consultation Draft 1 of the Basin Development Strategy. This has been a very intensive and participatory process. Emanating from the 2<sup>nd</sup> Forum was the key question of how the BDP would capture the opportunities and mitigate the risks resulting from current regional development trends and plans.

Another challenge that has guided us in our journey to this Forum has been in determining the elements that address IWRM challenges in the Basin. Again, the MRC has been challenged to build a common understanding of IWRM challenges in the Basin; to understand national policies, institutions and efforts for IWRM, analyse the main transboundary issues in water and related resource development in the LMB; and understand the concept of ‘development opportunity space’. In the 1<sup>st</sup> Stakeholder Forum participants discussed the importance of national sovereignty, which is an issue with respect to aligning national water policies with a Basin Strategy. Participants emphasized that the Strategy should be seen as a broad planning framework to allow flexibility in implementation by the countries.

Stakeholders indicated that the IWRM-based Basin Development Strategy should draw together various objectives within each sector into a single integrated Strategy for development and management of the Mekong’s water and related resources. The question asked was: “how can this be achieved and the current draft of the Strategy attempts to answer this?” One challenge that was strongly raised was that of climate change. Climate change is a key development issue and should be addressed as part of the development process. Another challenge raised was the importance of sound knowledge and credible tools. Data has been generated and shared among the Member countries, and incorporated into the MRC Knowledge Base and Tool Box. Finally, ensuring meaningful participation in basin planning was an important area for the BDP2. The BDP Stakeholder Participation and Communication Plan (SPCP) and Stakeholder Analysis were completed and enabled many participation mechanisms to be put in place. For example, sub-area analysis and IWRM planning with provincial and district agencies, RBC and others has been carried out and there have been numerous consultations, meetings, forums and transboundary dialogues. The question of “how can we ensure that participation of communities that are directly affected are included; and if the messages from these Forums will have a role in influencing decision- making” still remains a challenge. Furthermore, “are these forums and meetings the only and the best approaches to employ?” and “how can we ensure that representational bias and power-related issues will be avoided?”

That journey provides the foundation for the 3<sup>rd</sup> Regional Stakeholder Forum.

## Why conduct a Scenario Assessment?

- To provide an appreciation of how different water-related developments within the basin impact economic, environmental and social objectives of the LMB countries.
- To provide pictures of opportunities and risks of current and future developments to the LMB countries.
- To identify shared goal for Basin development so as to enable choices between different types of development.

## The Considered Scenarios

No.	Short Title	Full Title	Interventions/Projects
2000	Baseline Situation	Baseline Scenario	Year 2000 (77 main canal including 16 existing hydropower & dams)
	1	1B	
2015	Definite Future Situation	Upper Mekong Dam Scenario	Baseline scenario to include 8 hydropower dams in LMB and 2015 LMB (2015-2020) additional hydropower dams in LMB and 2008 in upper and flood meadows
	2	2B15-LMB	
	3	3B15-LMB	
2030	Forecastable Future Situation	LMB 2030 Year 2030 Scenario	As 2000-2027 into LMB plus 11 LMB interventions in LMB
	4	4B30-LMB	
	5	5B30-LMB	
	6	6B30-LMB	
	7	7B30-LMB	
	8	8B30-LMB	
	9	9B30-LMB	
	10	10B30-LMB	
	11	11B30-LMB	
	12	12B30-LMB	
2050	Long term future situation	LMB Long-term Development Scenario	2030-2057 plan all water infrastructure developments in LMB
	13	13B50-LMB	
	14	14B50-LMB	

**Baseline situation:** benchmark against which to assess scenarios.

**Definite situation:** will definitely happen in the near future, new benchmarks against which to assess foreseeable future scenarios.

**Forecastable future situation:** considers a sensible time frame in which to develop an agreed position for basin development and management planning.

**Long-term future situation:** is to understand the trend.

## Scope of Assessment

- Triple bottom line** i.e. to embrace economic, social and environmental cumulative impacts.
- Limited to **key transboundary impacts** of different developments at basin scale.
- Is expressly **NOT** to endorse specific projects, which will require detailed studies and transboundary approval through MRC procedures.

## Possible Changes and Impacts in the Definite Future

Flows and water levels in the mainstream will change significantly in the northern part of the LMB due to proposed hydropower developments in the Upper Mekong Basin (UMB).

Dry season flows will increase about 700 m<sup>3</sup>/s.

Significant reduction in wet season flows will decline natural flooding areas about 250,000 ha while volume of reverse flows into the Tonle Sap will reduce by 2.5 km<sup>3</sup> (8% compared with 300% of natural year-to-year variation).

Substantial reductions in sediments entering the mainstream system from the UMB and 3S basin by dams will effects in channel morphology which will be noticed in upstream reaches first in the next 15-20 years and in downstream reaches at later dates.

Changes in flows, natural flooding and nutrients would

Scenario	Inundated forested (ha)	Marshes (ha)	Inundated grasslands (ha)
Baseline	498,138	537,875	431,080
Definite future	495,851	522,618	413,420
Reduction	2,287 (0.5%)	15,257 (3%)	17,660 (4%)

diminish areas and productivity of wetlands, habitats, diversity of species and capture fisheries.

The areas affected by salinity intrusion in the Mekong Delta will decrease mainly as a result of substantial increase of dry season flows.

The development will create employment and economic benefit in the LMB countries by USD \$11,700 million. Increases of dry season flow also provide opportunity to source ambitious irrigation expansion plans in the LMB in the Foreseeable Future.

However, almost 900,000 people would be at risk due to loss of livelihoods e.g. assess to natural resources and capture fisheries.

**“These changes are inevitable but measures are required to maximize opportunities and minimize negative impacts”**

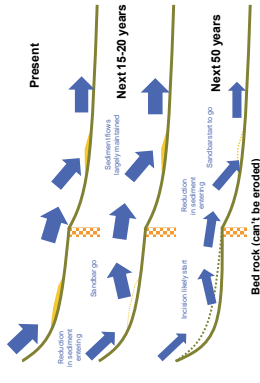
## Possible Changes and Impacts in Foreseeable Future

All 20-Year Plan scenarios in the Foreseeable Future would cause small changes to the flow regime, flooding and salinity intrusion, compared to the Definite Future.

The main reason for this result is that there are considerable synergies between the hydropower and irrigation sectors: the increases in dry season

flows caused by the many new dams in the LMB 20-Year Plan Scenarios will be reduced by the large increases in irrigated agriculture.

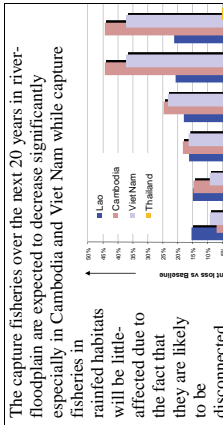
Sandbars in the upstream reaches of the LMB, especially Vientiane to Nong Kai will erode significantly and bed levels may begin to fall due to reduction of entering sediment in the Definite Future.



The number of highly affected “environmental hotspots” increases to 5 under the LMB 20-Year Plan Scenario without mainstream dams and to 14 under LMB 20-Year Plan Scenario with all 11 mainstream dams.

The main impacts of mainstream dams are i) blocking of fish migration routes, and ii) submerging of sandbars, rapids and deep pools which are important habitats for various aquatic animal.

Negative impacts increases and benefits reduce with more mainstream dams in the downstream of the LMB, especially the proposed 2 mainstream dams in Cambodia.



The capture fisheries over the next 20 years in river-floodplain areas expected to decrease significantly, especially in Cambodia and Viet Nam while capture fisheries in rainfed habitats will be little affected due to the fact that they are likely to be disconnected with the mainstream.

The expansion of reservoirs will lead to an increase in fisheries production and catch. With all 11 LMB mainstream dams, the economic benefits would be highest. But there would also be high transboundary negative impacts. The livelihoods of 4 million of vulnerable resource users would be at risk.

Country	DF	20Y	WFO	WFO	WFO	WFO	20Y
Lao	6,595	11,468	17,636	18,927	22,632	22,588	
Thailand	1,095	2,750	3,913	3,970	4,223	4,410	
Cambodia	693	1,446	1,351	2,237	1,143	2,237	
Viet Nam	3,317	3,711	3,828	4,142	3,741	4,151	
<b>Total</b>	<b>11,700</b>	<b>19,596</b>	<b>26,729</b>	<b>29,277</b>	<b>31,739</b>	<b>33,386</b>	

## Impacts of Climate Change and Long-term Development

Climate change would not significantly modify flow regime in the mainstream in the Foreseeable Future. However, it would increase frequency and intensity of floods and droughts. Significant changes will appear in the Long-term future.

By 2030 and 2060, the sea level rise in the Delta could increase around 17 cm to 30 cm, respectively. This will increase salinisation and crop damage through flooding unless a detailed structural and non-structural response is developed

Consideration may be given in particular to:

- The links between increased extreme floods and droughts and responses in both operational and planning terms.
- The need to understand better the impacts of climate change and sea level rise on livelihoods and agriculture such as changing cropping patterns and consumptive demands.

The Long-Term Development Scenario shows that there is sufficient storage potential in the LMB to meet long-term demands and the proposed developments will have marginal further impacts on the rivers flow and environment, social and economic factors.

Figure 2: Assessment of basin-wide development scenarios

## **2.2 The objectives of the 3<sup>rd</sup> Regional Stakeholder Forum**

The BDP planning process is a continuous journey and the 3rd Regional Stakeholder Forum aimed to provide stakeholders with updated information on where the planning process is today. The main objectives of the Forum were to:

- Discuss the results of the basin-wide scenario assessment for the finalisation of the assessment;
- Discuss the draft IWRM-based Basin Development Strategy and provide inputs for decision-making by the LMB countries;
- Facilitate a critical dialogue on the future of RBO in the LMB to support the implementation of the Basin Development Strategy; and
- Continue strengthening partnerships between the MRC and stakeholders.

## **2.3 Forum proceedings**

This Report provides a summary of the Forum and aims to:

- Serve as a reference for both the Forum's participants and other stakeholders interested in the BDP process; and
- Build a good understanding of the Basin and the complexities being addressed by the BDP process, other MRC activities and other stakeholders' activities.

This Report aims to follow the Forum Programme and summarizes the key messages from the various presentations and discussions.

### **3. Opening remarks**

The 3<sup>rd</sup> Regional Stakeholders Forum was opened by H.E. Madame Khempheng Pholsena, Minister to the Prime Minister's Office, Head of the Water Resources and Environment Administration (WREA) and Member of the MRC Council for Lao PDR.

Mme Pholsena emphasised the importance of this 3rd Forum as a way to help governments and the people of the Mekong countries make the right choices. She stressed that Basin Development Planning is not an easy process, as it requires a clear understanding of both opportunities and risks that different water options bring to the country and its people. It also requires an open sharing of views for constructive debate. Finally, she stressed the importance of the Basin Development Strategy as an essential step forward to foster cooperative actions for sustainable development and management of the Mekong River Basin.

Mr. Huang Yiyan, Director of the Ministry of Foreign Affairs and Head of the Delegation from China was in Lao PDR for the first time and felt that he was able to obtain a strong feeling about the people living along the river. Now, for the first time, he had a full picture of the Mekong River. Mr. Huang stressed the importance of China's relations with the MRC as an important dialogue partner.

Mr. Jeremy Bird, CEO of the MRC Secretariat discussed the critical stage that BDP is at with regard to discussing the results of the scenario assessments and their implications for opportunities and risks. Therefore, it is critically important that at this Forum, the scenario assessment results are reviewed to determine the key issues relating to sustainability and equity, two terms that were discussed frequently during the 2<sup>nd</sup> Stakeholder Forum in 2009. Hydropower is very topical and a dominant element in future water resources management in the Mekong. There needs to ensure that benefits from other sectors – fisheries and agriculture for example - are recognised. Finally, Mr. Bird stressed the importance of reflecting on the Basin Development Strategy at hand and provides views so it can be improved.

## **4. Session 1: Basin-wide development scenario-assessment – towards consensus on acceptable levels of water resources development in Lower Mekong Basin**

### **4.1 Session objectives**

The objectives of this session were to:

- Present the results of the basin-wide development scenario assessment and seek critical feedback from stakeholders;
- Compare the pros and cons of the considered scenarios;
- Discuss the options for the sharing of benefits, risks and impacts; and
- Debate the acceptable levels of water resources development in the Lower Mekong Basin.

This plenary session provided critical analysis on various aspects of the development scenarios assessment including a reminder of the scope and approach used; a window into the hydrological and environment assessments; and a view towards strengthening of exchange among Mekong countries to promote joint sustainable development.

Three parallel sessions were also organised to provide space for dialogues on specific aspects of what the basin-wide development assessments mean for critical issues namely expansion of irrigation, opportunities and risks of mainstream hydropower dams and development and management options for the Mekong Delta.

### **4.2 Development scenarios assessment – what do the results tell us?**

Dr. Thanapon Piman, the Senior Modeller of the BDP2 team, presented an overview of the approach, data and tools used, and an overview of the results of the assessment. Dr. Piman reminded participants of the scope of the assessments – to embrace the triple bottom line (environment, social and economic), to determine cumulative impacts at different levels in the basin and to focus on key transboundary impacts as agreed assessment criteria to enable decision-making. The scope does not include the endorsement of specific projects which would be subject to more detailed studies and national and/or transboundary approval.

A review was made of the findings identified from each of the scenarios in the assessment report. In summary, the DFS will cause significant changes in flows and related impacts such as reduction in flooded areas, sediment entering wetlands, reductions in fisheries and increased social impacts, in particular, due to hydropower development in the Upper Basin along the Lancang-Mekong River. There are expected to be economic benefits from the mainly new hydropower developments but also from reduced flood damages, increased reservoir fisheries and navigation, and reduced salinity intrusion. Increases of dry season flow will provide opportunity to source ambitious irrigation expansion plans in the LMB in the Foreseeable DFS. Accordingly, all of these changes are expected to

be inevitable over the next decades and therefore, measures are required to maximize opportunities and minimize negative impacts.

The 20-Year Plan Scenario without mainstream dams is expected to create substantial net economic benefits from water resources developments (NPV \$USD 19,596 million) and will add relatively small negative transboundary impacts to the Definite Future situation. However, the 20-Year Plan Scenario with eleven mainstream dams is expected to create the highest economic benefits to all LMB countries (\$USD 33,386 million). However, this scenario will create the highest negative transboundary impacts on capture fisheries, environmental hotspot and flagship species. An additional 3.5 million vulnerable people will be put at risk of losing their livelihoods over and above the Definite Future situation. The 20-Year Plan Scenario with the six mainstream dams in the northern part of Lao PDR shows less negative transboundary impacts compared with all eleven mainstream dams. However, the impacts on the flagship species, the giant catfish and fluctuations in flow downstream will be most impacted and are of highest concern with this scenario. In particular, the two most downstream mainstream dams in Cambodia would cause large negative impacts on capture fisheries and vulnerable people especially in Cambodia and Viet Nam. Therefore, the 20-Year Plan Scenario without Cambodia mainstream dams poses a major trade-off for Cambodia – there would be no revenue generation for exporting electricity, but would conserve the capture fisheries.

The 20-Year Plan Scenario without the two mainstream dams between Thailand and Lao PDR is expected to slightly reduce economic benefits (with NPV \$USD 3,000 million) in Thailand and Lao PDR, compared to those with all eleven mainstream dams.

The Mekong Delta Flood Management Scenario demonstrates that in the longer term, severe negative transboundary impacts between Cambodia and Viet Nam, which may occur in the event of: a) Viet Nam opting to use its existing infrastructure to protect currently deep flooded land beyond the early floods to accommodate the interests of its increasingly affluent population; b) continued development in the largely undeveloped Cambodian floodplain; and c) potential impacts of climate change.

Finally, the Long-term Development Scenario shows that there would be sufficient storage potential in the LMB to meet long-term demands of consumptive water use and that further changes on the flow regime will be marginal but that further negative transboundary impacts will occur. The Very High Long Term Development Scenario with economic developments increased up to the full potential will have severe impacts, in particularly to areas downstream of the LMB (in Viet Nam and Cambodia). Within this timeframe (over the next 50 years), the uncertainties that could affect assessment results also increase i.e. changes in climate, land use, policy, economic, technology, among others.

Climate change is not expected to significantly increase the annual average wet and dry season flows within the foreseeable future (next 20 years) but impacts will be visible in longer term. The frequency and intensity of floods and droughts may increase and the threats posed to the Mekong Delta by sea level rise are expected to be more severe causing an increase in flooding, crop damage and salinity intrusion.

Dr. Anthony Green, Modeling Advisor for the Integrated Knowledge Management Programme at MRC reviewed the certainty and uncertainty of the hydrological assessments of the BDP2. He discussed the need for an approach that is: a) realistic; b) focuses on those parts affecting decisions; c) understood and open to all countries; and d) can be done in the time available. He referred to the hydrological changes as: a) high flows and floods; and b) low flows but also questioned how sediment, nutrients and water quality, carbon and ecology, social and climatic issues are affected. The findings from the hydrological analysis indicate that dry season flows will increase; flooded areas and the Tonle Sap reversal will be affected but only by small amounts and dominated by the definite future; the effect on flows of the mainstream dams in the LMB will be small; and climate change will need adaptation measures especially in the Viet Nam Delta due to sea level rise. What would invalidate the findings and change the conclusions made by the BDP2? For example, is the 1985-2000 representation providing enough of an extreme? Is the model input and calibration sufficient? Are hydropower operations for dams (especially the Chinese dams) appropriate within this basin? Is the climate change simulation realistic? In conclusion, Dr. Green stressed that the hydrological analysis and modelling can and is being further strengthened but is already significantly more advanced than other critical aspects of analysis. The predicted changes to flows and flooded areas etc. from the current models are sufficient for BDP2. However improvements are needed in the future in the areas of: flooded areas upstream of Kratie; salinity impacts with sea level rise; improved climate change prediction; better resolution of flooded area in the Delta; diurnal variations and better power simulation; and in the case of emergencies.

Mr. Marc Goichot, Sustainable Infrastructure Senior Advisor presented a paper on “Ensuring Ecosystem Integrity and Maintaining Ecosystems Services: A Review of the BDP Environment Assessment”. This review challenges the pertinence of the method used to address the key functions of the ecosystems and how to measure and consider its integrity in the development of the MRC’s BDP Scenarios. In his view, the role of connectivity between the different units of a river system is not adequately addressed, and this will undermine efforts to protect them as well as maintain the benefits to people dependent upon them. Without connectivity, ecosystems will collapse.

According to the authors, some dimensions of ecosystems are not sufficiently or appropriately addressed in the BDP Scenarios. For example, alluvial channels are the result of a combination of ecosystems differing from one another by age, structure, composition, and they all evolve with different time scales. River flows maintain this dynamic assemblage of ecosystems. With limited data and understanding one can question the simplification process necessary to feed a scenario approach. A proper ecological management requires an integrated and basin wide dynamic approach.



Furthermore, key gaps in the assessments have been identified by the authors, along with important “bias” in the interpretations. This includes a gross underestimation of the cumulative impact of Lower Mekong mainstream dams on the stability of the Mekong Delta, on the inevitable evolution from

straight to sinuous and/or meandering channel forms on bank erosion, as well as the ecological impacts of winnowing of the sand layers on bedrock sections directly downstream main stem dams, and the potential impact of the incision of the river bed on the water table.

In the spirit of the precautionary principle, Mr. Goichot invited BDP2 to better highlight the risks and uncertainties associated with the accuracy of the forecasts in the scenario summary tables, and the strategic guidance; and furthermore to state the potential range of consequences of a forecast error on scenarios. A better integration of key lessons from other river basins is needed, and to make space for innovative technologies in hydropower development that can be much more sustainable than current practice in the Mekong Basin.

The current state of development versus ecosystem integrity discussion of the Lower Mekong does not necessarily call for a fatalistic and reactive approach to environmental impacts. This could and should be seen as an opportunity that will create significant “win wins” for people and the environment.



Mr. Zhou Sinchun from the Ecosystem Study Commission for International Rivers (ESCIR) made a presentation on strengthening cooperation among riparian countries to promote basin-wide joint sustainable development. Mr. Zhou presented an overview and procedures and management of hydropower development in China. He also outlined the recent cooperation between ESCIR and the MRC since 2009, which has resulted in five different engagements including China's involvement in the

Strategic Environmental Assessment (SEA). In discussing opportunities for future cooperation with the MRC, Mr. Zhou indicated interest in continuing to engage in the SEA, providing technical exchange visits, and identifying new areas such as agriculture, fisheries, navigation, and environmental protection among others.

Mr. Zhou also presented specific details about the impoundment of the Xiaowan Dam along the Lancang River in China. Mr. Zhou emphasized that the reservoir for the Xiaowan Dam is supposed to store water during the flood season and provide additional water during the dry season in the Lower Mekong Basin. He also outlined three guarantee measures with regard to water management of the reservoir: a) a method of staged water conservation – the normal pool water of the Xiaowan Reservoir is 1,240 meters and the staged method was adopted early on. Conservation of water during the 2009 flood season reached the dead water level of 1,166 meters and during the 2010 flood season – between 1,166-1,240 meters; b) the impoundment of the reservoir is to be carried out in strict accordance with the fixed flow to try to preserve the natural flow process of the river channel in the preliminary



impoundment process; and c) if the outflow fluctuates, a joint operation and regulation would be conducted so that the downstream reservoirs (Manwan, Dachaoshan and Jinghong) reregulate the outflow of the Xiaowan Reservoir so that the outflow can meet the integrated water requirements of the Lower Mekong River.

In conclusion, ESCIR confirmed their view that there are no adverse impacts in the downstream from the three Chinese dams built along the Lancang River to date. They are interested and willing to conduct joint research with partners in the Lower Mekong Basin.

### 4.3 Plenary discussion

Many different questions were put forward to the plenary speakers. A summary is provided below.

The first discussion question was related to how to determine the best strategy to manage the changes in flows. Within the MRC, there are two procedures that can assist in this area. The first is the Procedure for the Maintenance of Flows on the Mainstream (PMFM) and the second is the Procedure for Water Quality (PWQ). The four MRC countries have agreed to these procedures but the technical guidelines are not yet finalised. The results of the scenario conducted within BDP2 are contributing to the development of these technical guidelines. A follow-up question was raised with regard to our knowledge of daily variability of the flow regime. Daily fluctuation depends on how hydropower is operated and what will happen after the life of the hydropower project. There is a lack of knowledge to integrate daily variability into the assessments before we think about the consequences. These issues are extremely important with regard to social and ecological terms. There are still many uncertainties about the mainstream dams and change is already happening and thus a plan must be put in place.



The second discussion was around the use of different climate change scenarios. A question was raised as to why the low greenhouse gas scenario was chosen for these scenarios instead of the high greenhouse gas scenario; and that by choosing this scenario all threats may not have been captured. In response, the MRC indicated that a choice was made to carry out scenarios based on high and medium greenhouse gas (it is not considered low by MRC). This choice was based on consultations with the countries of which

a focus on medium greenhouse gas was suggested first. The MRC is in the process of developing a programme on climate change and will be working on climate change scenarios further.

Another area of discussion around climate change emerged with regard to hydropower vs. climate change. One participant indicated that the issue of hydropower development is more important than climate change. For example, in the case of the Tonle Sap in Cambodia, how are floods defined? The fluctuation of the water in the Tonle Sap is considered natural; the lake is not considered a floodplain and among local people, this is not considered as floods. It was the opinion of the participant that

talking about floods in the Tonle Sap context is not helpful or informed. In response, the MRC indicated that hydropower generally has a higher impact than climate change however climate change adds additional pressures, which need to be considered. These include effects from evaporation, temperature, and increase in power consumption for air conditioners, for example. The more climate change is researched, the more impacts are identified. If we simply look at changes in flows on the mainstream (e.g. the DFS), hydropower is the dominant impact. The MRC has recognised that floods have benefits and impacts. It is not always assumed that floods are disruptive.

The third discussion was around the extent to which the MRC can play a role in national development decisions in each of the countries. The case proposed was that of the Tonle Sap development in Cambodia. In response, the MRC indicated that the scenario development has brought together all the water related plans for the countries to see how they impact upon food security, poverty reduction and other issues. Therefore, the consensus among the countries is expected to be reflected in the BDP, which can then form the linkage to the country plans.

A fourth area of discussion was around the lack of social issues incorporated into the BDP assessments. A request was made for more information about the impacts on communities. People depend upon the ecosystems for their livelihoods and therefore the impacts on the ecosystem are *de facto* impacts on the people, for example with regard to the fisheries.

A fifth area of discussion was around other alternative means to harnessing energy from the mainstream, which was proposed in the presentation by WWF. The mandate for the BDP analysis has been limited to proposals on the table rather than looking at a range of alternatives. Have alternatives been fully researched? If that is not the case, should we therefore be stressing that this is a need? WWF indicated that there are many opportunities for alternatives. These include small hydro, high-head medium dams of which China has been developing to some extent; more attention to the types of facilities e.g. turbines. In collaboration with the ADB and MRC, WWF has been developing the new Rapid Strategic Assessment Tool (RSAT), which has important prospects for identifying needs.

Key points from the plenary session:

- 1) There is a need to focus more on social impacts, especially in disaggregating information on gender and human health;
- 2) More consideration is needed for addressing extreme cases of impacts such as from climate change, dam failure, etc;
- 3) There is a need for more consideration of GHG emissions in scenarios;
- 4) There is a need to improve knowledge of sediment movement, climate change impacts, impounded water quality and stratification;
- 5) The impacts to the overall ecosystem – the four dimensions of stream corridors (not only on lateral and vertical links, but also those between surface and groundwater) need to be considered;
- 6) Environmental impact data could be presented in a more integrated manner e.g. visual indicators should be used to build up confidence;
- 7) Considering impacts over the 50-year period is not long enough, for example, studies of the Nile River have been for the last 500 years;

- 8) A better understanding of proposed dam operations are crucial to improving scenarios – e.g. the differences on LMB flows arising from 2 or all 10 turbines in operation during peak season and the potential downstream water level fluctuations of 4-5 meters;
- 9) Are we in danger of tying ourselves to 50-year old technology? It is important to look at new technology that is being used around the world and this is not currently addressed in the Plan; and
- 10) The livelihoods of millions of people are affected by the reduction of wetlands and fisheries. At the same time there is significant economic development (e.g. new jobs). Where is the plan to help the people who may have lost their livelihoods during this transition period? Whose responsibility is it to help potentially impacted communities?

#### **4.4 Theme 1: Expansion of irrigation in the Lower Mekong Basin**

*Irrigation expansion or other opportunities for sustainable agriculture development – lessons learned from the Mekong River Basin, Dr. Andrew Noble and Dr. Hoanh Chu Thai from the International Water Management Institute (IWMI)*

IWMI presented the importance of the diverse change drivers that will influence agriculture in the Mekong and of rain-fed agriculture. There needs to be a rethinking of irrigation and agriculture must provide ecosystem services. The change observed by IWMI is not only about climate but also related to population growth, food consumption patterns and preferences, urbanisation, economic growth, foreign investment, hydropower development and others. There are limits to growth in food production and also uncertainty. In suggesting a way forward, IWMI presented four key strategies: 1) modernisation of irrigation schemes is needed to meet tomorrow's needs. In particular, smart irrigation technologies, old and new, will be essential and surface irrigation schemes could be used to recharge aquifers or fill immediate storage structures; 2) there is a need to look beyond conventional Participatory Irrigation Management (PIM) and Irrigation Management Transfer (IMT) recipes. The private sector could assist in improving water delivery and irrigation departments could outsource irrigation services, create public-private partnerships or provide incentives for irrigation officials to act as entrepreneurs in publicly managed operations; 3) farmers' initiatives should be supported, in particular more use of locally adapted irrigation technologies to scavenge water from surface sources and wastewater and groundwater using cheap motorized pumps. New models are needed for managing groundwater in areas where 'individual' pump based irrigation has largely replaced centralised surface irrigation; and 4) there is a need to diversify and increase the players involved in the irrigation sector. Engaging with the private sector, embracing commercial agriculture in private, private-public partnerships are all essential. There is a need to look beyond rice in production systems and provide educational opportunities in this area.

*More water to the Northeast – Views from communities for improved use and management? Dr. Jongdee To-Im, Mahidol University and Somkhit Singsong, Haui Sam Mo Sub-Basin Working Group*

This presentation focused on the role of Thailand's River Basin Organisations. The presenters discussed the importance of RBO in Thailand and the obstacles to water management. Problems lie in

that institutional arrangements to manage water are not properly set-up and structured and rules and regulations are not well implemented. Furthermore, RBO are considered weak due to lack of government support. There is a lack of understanding among people that does not match the demand for natural resources and efforts to conserve the environment. Studies conducted by the presenters found that there were many environmental, engineering and agriculture issues found in trying to understand the underlying reasons for poor water management. The real problems do not lie in issues associated with water quantity, but instead in the lack of good management based on a systems thinking process that clearly aims to understand the real environmental situation.

***Key factors affecting the expanding irrigation in Cambodia, Mr. Dararath Yem, Environment and Water Resources Management Advisor***



This presentation discussed the importance of enhancing agricultural productivity to contribute to poverty reduction in rural areas. A number of measures were identified such as improving soil quality, enhancing agriculture technology, increasing access to markets, supplying sufficient water to fields through improved and expanded irrigation systems and improving and revising the legal framework. Agricultural productivity cannot be increased unless irrigation is expanded to ensure a sufficient and effective water supply. Also, expanded irrigation will greatly improve food security, poverty reduction and economic growth provided that the above key factors are carefully considered.

**Group One: Summary of discussions on irrigation expansion**

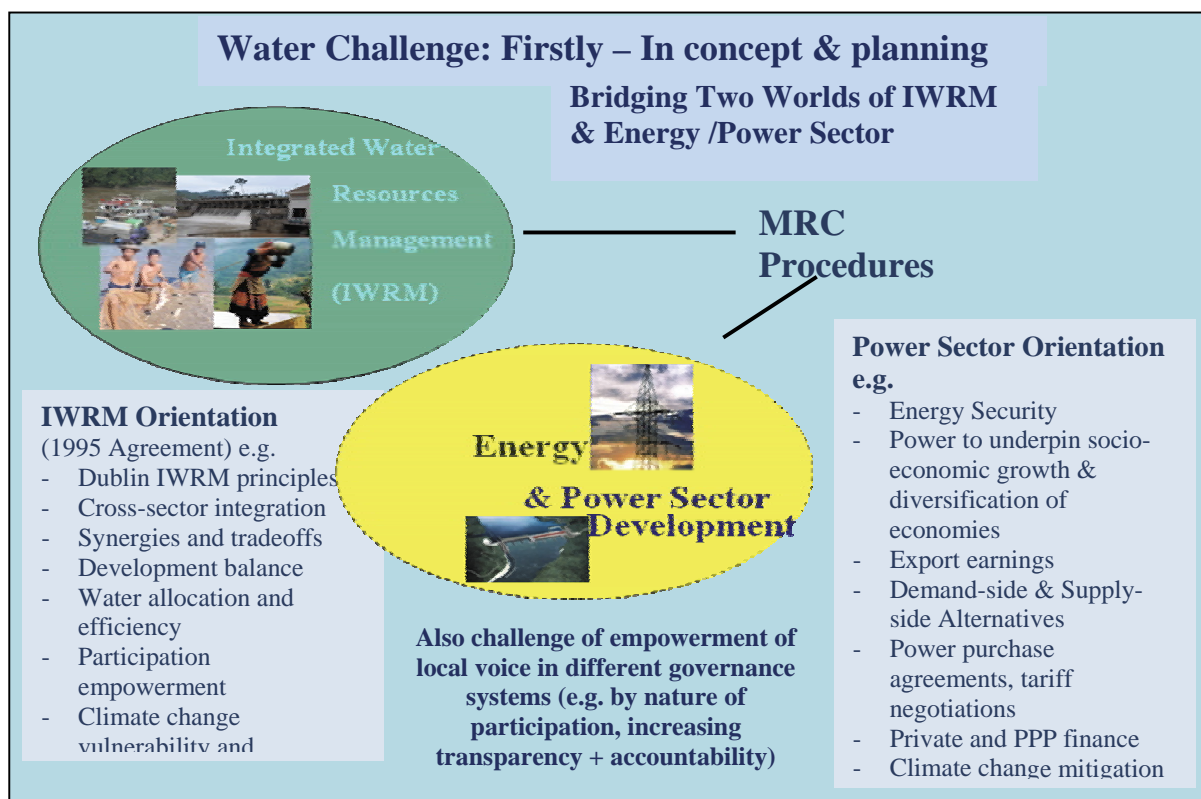
- 1) The scope of BDP is the basin scale but implementation is at a local scale; therefore there is a need to look into the local scale in terms of knowledge and livelihoods;
- 2) The BDP is an integration of national plans from the four Lower Mekong countries – some aspects of the national plans, for example agriculture, need to be reviewed before integrating every national plan into the BDP. There is a need for reliable data and information for the BDP to access and use;
- 3) With regard to the scenarios, the BDP provides an optimistic view about the assessment of more water in the dry season. Some question how to handle extreme cases. It cannot be assumed that everyone will shift to dry season crops as this will lead to other problems;
- 4) What is the limitation of agricultural production? The region will be faced with problems of water if farmed areas shift, as lowland soil is different from upland soil. There is a need to think of options other than rice; and
- 5) More irrigation may result in more debt to the farmer. Therefore there is a need to rethink the way in which irrigation is managed. One direction is to support smallholder irrigation. On the other hand, in Cambodia, smallholder irrigation cannot solve the problems associated with livelihoods but needs to shift towards agro-industries.

## 4.5 Opportunities and risks of mainstream hydropower dams

*Opportunities and risks of proposed hydropower schemes on the Lower Mekong Basin mainstream: Considerations of avoidance, mitigation and enhancement measures and links to the MRC PNPCA, Mr. Larry Haas, Chief Technical Advisor, Initiative on Sustainable Hydropower, MRC*

The presenter provided background on the Strategic Environmental Assessment (SEA) of the mainstream dams, opportunities and risks, avoidance, mitigation and enhancement and links to the MRC project-specific PNPCA.

The SEA was authorised by the Joint Committee in 2009 and was carried out between May 2009 and August 2010. It was a consultative process with a number of multi-stakeholder meetings, including China as a strategic partner in technical exchanges. The presenter noted the wider challenge that is faced with bridging the two areas of IWRM and the energy/power sector (see Figure 3). The IWRM arena is where the MRC situates its work and focuses on issues of cross-sector integration, synergies and trade-offs, balanced development, among others. But the power sector arena, which is focused on energy security, power to underpin socio-economic growth and diversification of economies, power purchase agreement, among others, is one in which the MRC needs to enter and understand if it is to fully address and make decisions around mainstream Mekong dams. Mechanisms are needed to integrate IWRM and the energy/power sector.



**Figure 3: Water challenge – In concept & planning**

The SEA focused on three stages – baseline assessment, impact assessment, avoidance, mitigation and enhancement and produced a series of reports and presentations detailing development opportunities and risks framework and quantitative and qualitative assessments of impacts (both positive and negative). The overall picture that emerges related to the proposed LMB mainstream hydropower is:

- Significant development opportunities (power and economic benefits mainly) and adverse impacts across other development sectors – as well as natural, bio-physical and social systems particularly fisheries and sediment;
- Synergies and tradeoffs across economic sectors need to be considered;
- Ongoing discussions of relative scale and significance of opportunities/risks and valuation (plus the uncertainty dimension including natural systems and species with some threshold effects or tipping points);
- Concern over net poverty impacts in all countries (despite high economic benefits) reflect distributional issues; and
- Apart from scale and significance, distribution of opportunities and risk is a central question for:
  - Regional distribution (between countries);
  - National distribution (between sectors); and
  - Local distribution (affected communities and beneficiary communities).

The SEA process offered four strategic options as indicated in the Figure 4.

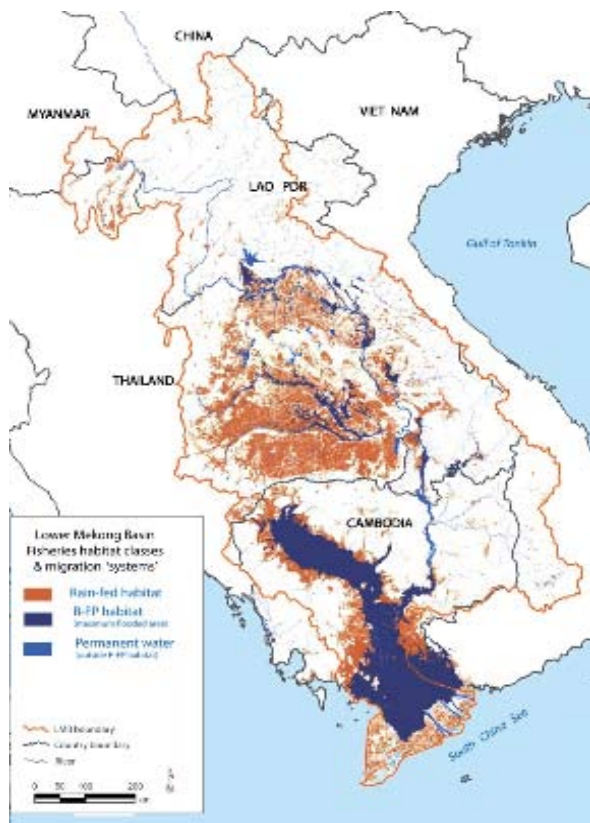
Overall Strategic Options	Energy & Power Avoidance Considerations	Energy & Power Mitigation Considerations	Energy & Power Enhancement Considerations
Decide not to proceed on mainstream	Focus: alternatives (for energy supply and potential export revenue foregone)	Alternatives to mainstream hydropower (65,000 GWh)	n.a
Defer decision on mainstream	Until key uncertainties are sufficiently resolved + arrangements in place to manage risks acceptably	Focused on understanding implications for project design, operation and costs	Focused on understanding institutional arrangements, power + revenue, equitable distribution of costs & benefits related implications
Proceed with caution on a phase basis	By dam group / location + Project-specific avoidance (local and Transboundary)	Implementation with reinforced national regulatory / safeguard systems, bilateral agreements emerging from negotiation, and transboundary cooperation  (e.g. as under 1995 Agreement, accepted Guidance, best practice and project-specific PNPCA agreements)	
Proceed with all projects	Project-specific avoidance (local and Transboundary)		

**Figure 4: Strategic options & AM & E considerations - Illustration from the energy and power theme perspective**



The SEA has a primary link to the MRC Procedure on PNPCA and the BDP. The SEA will be presented as a piece of technical work that can feed into both of these processes.

***The BDP fisheries assessment and the future for the Lower Mekong Basin fisheries, Mr. Kent Hortle, Chief Technical Advisor, Fisheries Programme, MRC***



**Figure 5: Capture fisheries yield based on habitats from GIS and flood**

Full development within the Mekong Basin (2030) is likely to cause a large impact on river-floodplain fisheries. These impacts will mainly occur in Cambodia, and within each country on poorer people dependent on riverine resources. Irrigation may increase fisheries yields in rain-fed habitats, but intensification may reduce yields (see Figure 5).

Most of the effects will be felt in Thailand irrigated areas and differing levels of effects in the other LMB countries. There may be some gains in reservoir fisheries, mostly in Lao PDR and in the Viet Nam highlands.

Aquaculture could largely compensate for the losses of fisheries at a basin-wide level however it will not directly replace most of the capture fisheries losses. Cambodia is particularly at risk, with little replacement based on trends. Many people cannot switch from capture fisheries to rice-field fisheries and aquaculture because of site issues, capital costs, constraints of land and water, lack of knowledge and gender issues. Lowland rice farmers will generally benefit from aquaculture whilst fisheries in reservoirs require specialised equipment and knowledge.

For river-floodplain impacts, the presenter indicated that there is a: i) lack of information on specific impacts of many of the dams; ii) lack of baseline information on fish species composition and life histories; and iii) lack of information on interactions, time-scales and recovery.

The impacts of changes in flooded areas are considered small and assumed to be proportional to change. These are multiplied by 'all other' impacts which are relatively large. As stated above, the 2030/20-year scenario causes the maximum impact whilst all other scenarios are less (see Figure 6).

<b>2030-20Y full development – hypothesized Impacts on catches</b>				
<b>Present</b>	<b>Baseline Yr 2000</b>	<b>Remaining Flooded Area</b>	<b>Remaining Catch after ‘all other’ Impacts</b>	<b>Remaining Catch Overall</b>
Lao	100%	81%	20%	16%
Thailand	100%	78%	75%	59%
Cambodia	100%	94%	40%	37%
Vietnam delta	100%	99%	60%	59%
<b>Total (weighted)</b>	<b>100%</b>	<b>93%</b>	<b>47%</b>	<b>44%</b>
<b>000 TONNES</b>	<b>Baseline Yr 2000</b>	<b>Remaining Flooded Area</b>	<b>Remaining Catch after ‘all other’ Impacts</b>	<b>Remaining Catch Overall</b>
Lao	92	75	18	15
Thailand	117	91	88	69
Cambodia	565	529	226	211
Vietnam delta	260	258	156	155
<b>Total</b>	<b>1,035</b>	<b>953</b>	<b>488</b>	<b>450</b>

**Figure 6: 2030-20Y Full development – hypothesised impacts on catches**

The presenter suggested that there needs to be a separate full assessment and management plan by differing habitats affected (e.g. river floodplains, rainfed, reservoir) to fully understand the fisheries situation. Mitigation of the loss of fisheries requires a lot more work as well and many examples provided in the presentation continue to show that there will be a downward trend in managing the fisheries.

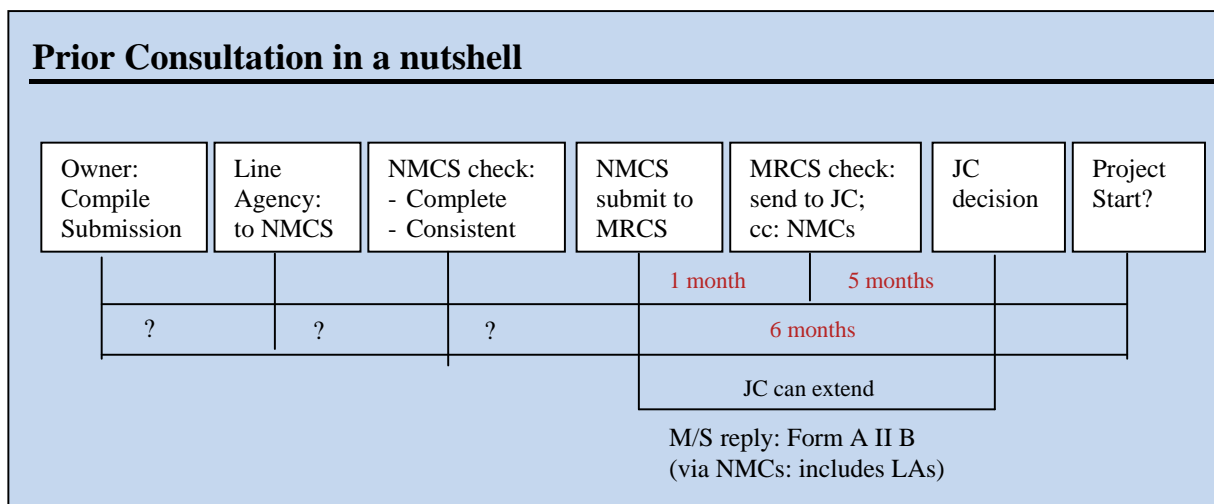
The Fisheries Programme at MRC is working to improve the impact prediction on fisheries. Several studies are being conducted such as a review of project environmental and fisheries monitoring data for the LMB dams; a survey of dam impacts in the LMB over a broad scale (Thailand – through household surveys); and repeated surveys of pre-dam site (repeat of the 1960s-70s Mekong fisheries studies sampling).

***The role and implementation of the MRC Procedures for Notification and Prior Consultation and Agreement (PNPCA), Ms. Birgit Vogel, Chief Technical Advisor, Mekong IWRM Project, MRC***

The presenter provided an overview of the PNPCA process. The process is very important for joint decision-making and the implementation of integrated planning approaches. It is relevant in the Mekong Basin due to the fast-paced economic development including hydropower generation. The MRC PNPCA Procedures were approved in 2003 and the associated technical guidelines in 2005. The presenter explained the importance of notification, which involves providing timely information on a proposed water use on the Mekong tributaries including the Tonle Sap and the Mekong Mainstream – intra-basin use during the wet season. The intention is to register proposed water uses and take note of comments to achieve an overview on future infrastructure development. As of July 2010, 33 tributary notifications have been made.



Prior consultation not only includes notification but also providing data and information to the Joint Committee via the MRCS, holding discussions among the riparian countries and an evaluation of impact of the proposed water uses. Agreement is then sought between the riparian countries. The prior consultation process is not the right to veto or the right of a riparian country to use water without taking into account the rights of other riparian countries. The timeframe for prior consultation is planned for six months and is facilitated by the MRCS.



**Figure 7: Prior consultation process**

Tributary hydropower dams are subject to notification to the MRC JC while mainstream hydropower dams are subject to prior consultation. The aim is for the MRC JC to arrive at an agreement between the countries. So far, no development that required prior consultation has taken place in the framework of the MRC. However, prior consultation on a mainstream hydropower dam is expected soon.

## Group Two: Summary of discussions on hydropower opportunities and risks

Development of hydropower in the LMB is ongoing. The SEA mechanism has provided a useful tool for guiding that development in a more sustainable manner. The SEA provides a framework so that the EIA can be enriched. The MRC also has developed a transboundary toolbox so that these issues can be taken into consideration. There are specific guidelines related to different sectors, which are on the MRC website, but these only have legal effect to the extent that the countries place importance upon them and use them.

Participants were interested in further understanding how the SEA would be integrated into decision-making around Mekong mainstream dams and in particular into the BDP. An opinion was provided that the recommendation of the SEA to defer dam development for at least the next 10 years should be considered as there are too many uncertainties and more studies are necessary. The MRCS responded by indicating that the decision to trigger the PNCPA would be made by the riparian countries and not by the MRCS. The recommendations from the SEA team are non-project specific and should be integrated into the considerations of the PNCPA process. The notion of trade offs and synergies are important components of this discussion, which need to be further explored.

The SEA report recommended four strategic options:

1	Not to proceed with the mainstream projects
2	Defer a decision on whether or not to proceed and in what form and circumstances
3	Proceed with mainstream development on a gradual phased basis
4	Proceed with rapid development of all 12 projects

A clarification was made that Options 3 and 4 (see above) are not the same as they reflect different timing and rates of development. Option 3 provides opportunities to learn in a more structured manner from one dam to the next. Option 4 results from pressure from developers to go ahead depending on the electricity price they can achieve. Participants agreed that decisions need to be made carefully. A more practical reality is that the mainstream dams are being developed for export only with only a portion of the energy provided for domestic use. According to Thailand's Power Development Plan the first power from mainstream Mekong dams would not be available until 2019. In Viet Nam, the tariff to the consumer is 5.5 cents US dollar per kilowatt house per year. The tariff of the proposed first dam along the Mekong mainstream, the Xayaboury dam, is expected to be 6.7 cents US dollar per kilowatt house per year. Until the Viet Nam government subsidizes the power from the mainstream, there would be no exported electricity to Viet Nam.

According to the results of the SEA, if all tributaries and mainstream dams go ahead they will contribute 6% of the energy use in the region. There is 840,000 GWh/year demand projected by 2030. The mainstream power will represent 6% of that power. What is important to note is that about two-thirds of that power would be from the mainstream and the rest from the tributaries. The tributaries also have social and economic costs.

If the planned hydropower projects move forward, fisheries are expected to be severely impacted. A participant expressed concern about the fisheries assessment within the BDP and in particular the work in Cambodia. The participant asked whether or not it was more feasible to focus hydropower development on the tributaries instead of the mainstream. In terms of biodiversity fish are designated as black or white. Most of the white fish stay in certain areas. There is a need to study the black species more and not to focus only on migratory species. There will be significant losses to fish catch and there is a need to understand whether these can be compensated and whether support can be provided to local people in the areas to be impacted. In response, the MRC indicated that the focus of their work is on migratory species as some of these species will be lost due to hydropower development. However, some migratory species, such as the common carp in China, are highly migratory and the building of dams has not stopped their spread. Similarly with regard to trout, these fish can be found in reservoirs. However, the issues are not just a question of migration and other factors to consider include water quality and pollution.

Participants had several questions on the operationalisation of the PNPCA process and in particular the role of stakeholders within the process. The formal process of the PNPCA will be dealt with through the normal Joint Committee meetings. There is currently no provision in the procedures for stakeholder engagement. How stakeholders can participate and how proper knowledge and information exchange can occur among people within the Basin was not further elaborated. MRCS indicated a willingness to

further explore options such as a request to place the PNCPA roadmap and other materials on their website. The MRC reiterated that the aim of prior consultation is to achieve consensus, ascertain the impacts on the other countries and prevent negative impacts. The debate on stakeholder engagement in the PNCPA process still left many questions open of which require further follow-up by the MRC.

#### **4.6 Development and management options for the Mekong Delta in the context of upstream developments and sea level rise**

Three presentations set the stage for the discussion on development and management options for the Mekong Delta.

##### ***Combined impacts of upstream developments and sea level rise in the Delta in Viet Nam: modelling of extreme cases, Mr. Nguyen Xuan Hien, Southern Institute for Water Resources Planning***

IWRM challenges in the Viet Nam Delta are a combination of impacts of upstream developments, conflict between different water uses in the Delta and impacts of sea level rise. Viet Nam under the Climate Change (CC) Adaptation programme has analysed sea level rise scenario to assess impacts, identified measures and recommendations to cope with combined upstream development and sea level rise.

Modelled CC scenarios of sea level rise in Viet Nam (30 cm by 2060, 100cm by 2100 and 75cm by 2030 based on elevation of mean sea level and assuming that no dykes and sluices are built at the sea shore) show severe impacts, illustrated by two parameters: flooding and salinity intrusion. Combined impacts include: deeper salinity intrusion threatening fresh water and failure of salinity control projects; dry season water shortage that will get more serious; and existing dyke systems, which will become ineffective and cause flooding in cities.

Adaptation measures identified include: structural ones (using existing structures, sustainable development solutions promoting Mekong ecosystems and coastal dykes in two phases, resettlement areas with roads, etc; and non-structural ones including coastal mangrove forests, especially already existing forests, cropping calendar and diversification; and strategic adaptation master plan for the Delta.

Recommendations were made for further studies, regulation of water consumption, re-regulation from wet to dry season, integration of Mekong Delta provinces water uses and cooperation among countries and technical support.

The challenges for Viet Nam are the careful consideration of the need for coastal dykes, given environment impacts and the slow nature of sea level rise, and conflict between protection of agriculture land and aquaculture.

These issues for Viet Nam need to be incorporated in future BDP planning, including recognition of the different baselines used, different assumptions of sea level rise and trade-offs between a single sector and the many other sectors in the BDP. The Viet Nam scenario used the BDP scenario

assessment data. However, the increase in dry season flow will depend a great deal on the operations of the proposed dams. Dams normally store water as much as possible at the beginning of the rainy season and normally do not have flood control effects. Also, if dams do not release water during critical periods, flows downstream will be reduced rather than increased at these times. Floods are considered as having both positive and negative impacts on the Delta.

In summary, further studies are required in the context of climate change, sea level rise and socio-economic development of the whole Mekong Basin to clarify the overall picture of changes in currents, salinity, flooding and the environment in the Mekong Delta. Water demand should be based on principles of sustainable development and comprehensive management of water resources is needed in the Delta to ensure reasonable water consumption. The search for measures to create and exploit additional sources of water in the dry season needs to be intensified. The Mekong Delta provinces need to integrate the impacts into development goals to find practical and suitable development plans to cope with changes due to upstream development and sea level rise. Close cooperation among nations of the Mekong River Basin together with international assistance is needed to help find optimal solutions for these issues.

***Cambodia Delta development plans and areas for regional cooperation, Mr. Long Saravuth, Deputy Director General of Technical, MOWRAM***

Cambodia sees changes in the flow regime of the Mekong as an opportunity for development. However, planning for irrigation and flood control is still at a conceptual stage due to lack of data. The approach to planning for the Cambodia floodplain development follows IWRM and also living with flood concepts. Initial work is being done with the Flood Management and Mitigation Programme C2 demonstration projects. The conceptual plan for the Cambodian Delta includes three different levels of flood protection and potential sites for irrigation under study. The challenges for Cambodia include questions such as ‘what does sea level rise mean for Cambodia and the Viet Nam Delta’? The presenter recommended the following: a joint scenario to be developed between Viet Nam and Cambodia to see what would happen if Cambodia implemented protection from floods at different levels and a master plan for the Mekong Delta to assess how sea level rises in Viet Nam will impact on Cambodia. Furthermore, under the BDP scenarios, operations of dams would affect the Delta together with impacts from, for example, the inter-basin diversions have not all been considered combined with climate change scenarios.



***Knowledge management for proactive collaboration on climate change, Mr. Paul McShane, Chief Research Officer, Monash Sustainability Institute***

The speaker discussed the importance of knowledge management as the systematic management of information to develop strategies and guide practice. In managing climate change in the Mekong Basin,

a coordinated approach is required among responsive agencies. In particular, human security and climate change adaptation are recognised among LMB countries in national action plans on climate (e.g. Viet Nam's National Target Programme on Climate Change). A framework for knowledge management was presented in the context of climate change adaptation for the LMB. The framework provides a structural (e.g. government to government communication) and functional (e.g. integrated water resources management) issues responsive to a collaborative approach to climate change adaptation. This can help resolve some of the problems encountered among agencies with overlapping responsibilities.

### ***Discussion***

The first discussion was around what options exist for the Mekong Delta for future food security. There is an ongoing flood management (early flood control in Viet Nam). What will happen if sea level rises and increased infrastructure is carried out, which are both transboundary issues? What are some of the most important issues in this regard? Which framework for these issues can be discussed? What kind of plan will maximize benefits and minimize negative impacts?

Although flood issues are prominent, they should be considered and follow-up studies should be understood in the context of IWRM.

The Integrated Knowledge Management Programme (IKMP) will be able to set up a knowledge hub by the end of 2010 to be utilized and shared. IKMP would like to participate/facilitate the sharing of unified information for planning in both Viet Nam and Cambodia to be used for the Basin planning and knowledge base.

Dams will reduce the sediment and impact coastal and marine fish productivity. Coastal protection is a key challenge under climate change. Coastal dykes may not work as the experience of the Netherlands demonstrates. Viet Nam has rich marine fisheries based on rich sediment coming from the Mekong River. Although no data is available yet, experience from other basins shows modelling will have to do a better job to assess these areas.

Knowledge is normally in the head of the people. However, with information systems and knowledge hubs, MRC is ready to take on the challenge of knowledge management within the Basin.

Critical issues identified in the session were: i) flood protection; ii) sustainable irrigated agriculture for food security that is also fish friendly (ASEAN should be the centre for rice export of all four LMB countries in the future); and iii) fisheries (Viet Nam can support Cambodia in developing aquaculture to mitigate the loss of capture fisheries). However, other considerations need to be made, for example the potential conflict between agriculture and aquaculture, should be considered since aquaculture cannot compensate for capture fisheries and species' loss; sedimentation and nutrients that will be lost partly due to the Chinese dams, LMB mainstream dams and other tributary dams (e.g. in the 3S basin); and the impact from irrigated agriculture and fisheries (including coastal fisheries). The group suggested that a socio-economic development committee for Mekong Delta should be established between Cambodia and Viet Nam.

#### **4.7 Session 2: IWRM-based Basin Development Strategy for the Lower Mekong Basin – influencing national plans and decision-making or another statement of will?**

*“Development Spaces” for water resources development in the Lower Mekong Basin and the complete draft of the Basin Development Strategy, Dr. Mei Kariyan, presented on behalf of the Advisory Group for the Basin Development Strategy*

The first day of the Forum focused on the BDP assessment and scenario development. For the second day, Dr. Mei began with an overview of the purpose of the Basin Development Strategy. Water resources development is now high in national agenda for economic growth and poverty reduction. Increasing demand for an integrated basin perspective against which national plans and large projects can be assessed is important. There is also a need for a stronger commitment to a basin-wide IWRM approach to guide well-balanced development.

The objectives and scope of the strategy are:

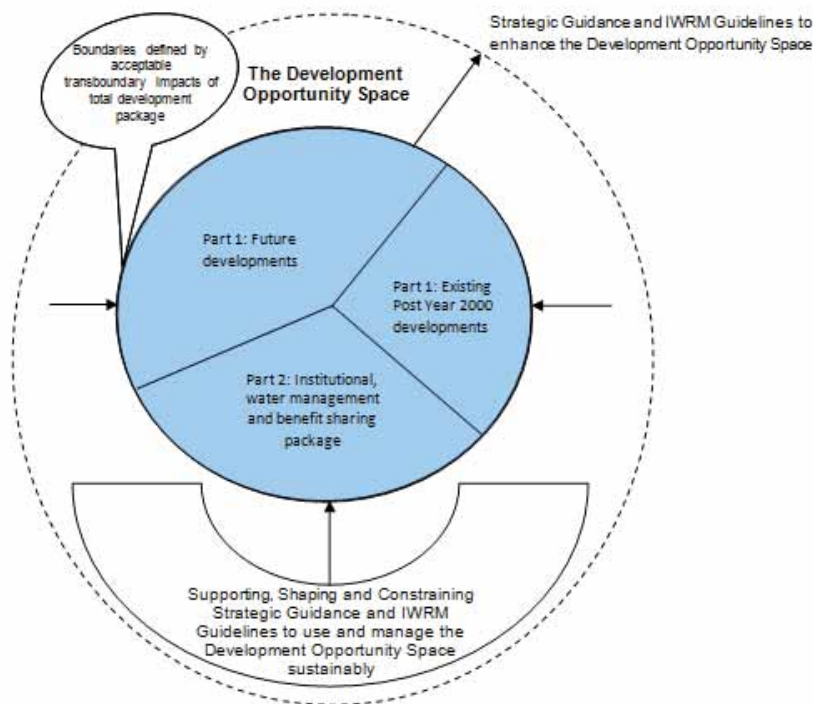
- Reconfirm the long-term goals and specific objectives;
- Define the development opportunity space for the basin’s water resources development;
- Provide strategic guidance and IWRM Guidelines to assist national planning and management of water and related resources; and
- Provide an IWRM planning framework for the basin, national and sub-basin levels.

The scope of the Strategy is basin-wide (both mainstream and tributaries) and the term is a 20-year outlook with a review and update every five years.

Dr. Mei explained that the Development Opportunity Space is not just a volume of water that can be used but a space with opportunities for water related development and management. It comprises of two parts:

- 1) Opportunities for developing water and related resources above the Baseline of year 2000 that are represented in a scenario, or part of a scenario.
  - a. Some opportunities have already been taken e.g. existing projects since the year 2000;
  - b. The opportunities for future development will be reduced as projects are formulated approved and become existing projects;
  - c. The space can be enhanced to enable further new opportunities to be taken up.
- 2) A package of water related activities and opportunities that will provide a strengthened institutional, human resource and water management framework within which future development can proceed in a sustainable way.

In looking further into the Development Opportunity Space (DOS), the question is asked what level of “developments (and related benefits and impacts) best represents national goals and mutually beneficial use of the Basin’s resources?”



**Figure 8: The “development opportunity space”**

There is an ongoing discussion to appropriately identify the DOS. By agreeing to the DOS, countries would not commit to a particular project, or set of projects that make up the agreed scenario. Rather countries will have determined a space within which to work and cooperation. For example:

- Within the DFS, there are no planning choices available; the strategy must include a range of complementary studies and measures that seek to optimize the opportunities and reduce the negative impacts or convert impacts into benefits;
- Within the 20-year Scenario without Mainstream Dams, incremental transboundary impacts beyond those occurring in the DFS could be acceptable. These could be considered to be included in the development opportunity space with a condition that strategic guidance and IWRM guidelines are developed for:
  - Sustainable hydropower development on the tributaries and;
  - Efficient irrigation management that enhances fisheries and reduces movements of nutrients and agro-chemicals towards the mainstream and the Tonle Sap.
- The LMB 20-year Scenario without Lower Mainstream Dams might be considered to be included in the DOS provided that,
  - Guidelines to address local impacts of dams are taken into dam project feasibility and assessment procedures; and

- Strategic studies on fish passage technology for Mekong conditions and the future of the Giant Catfish.
- The 20-year Scenario (with all mainstream dams) will create severe cumulative impacts and the uncertainties surrounding these impacts are wide and cannot meet the balanced aspirations of the countries. Therefore, consideration of including it in the DOS should be deferred for five years or until the agreed list of further strategic studies have provided more definite information (impact size, distribution, mitigation and management).

Strategic guidance and IWRM Guidelines are fundamental parts of the strategy. Every five years the State of the Basin Report, based on the countries' and MRC monitoring systems, will provide a regularly updated status of the Basin's resources. By adopting a five-year review period for the Strategy, there are expected to be sufficient checks and balances to adjust the 'DOS' and the associated strategic guidance, and manage the identified uncertainties.

***Critical review of the draft Strategy, Dr. Philip Hirsch, Professor and Director of Australian Mekong Resource Centre, Sydney University***

Dr. Hirsch was invited by the MRC to provide a critical review of the then current draft of the IWRM-based Strategy. He discussed the purpose of the Strategy as being to give strategic guidance on development options for the Mekong based on the use of the river and tributaries within an integrated framework. He raised the question of what do we mean by development? Development for whom? Is it about food security, poverty or increasing GDP? In terms of use of the river, are we talking about use in dollar or other values? The Strategy appears to imply that dollar values prevail, but the risks are the lowest common denominator. Who defines the options? How the final adoption of these scenarios is to be made is ambiguous and remains ambiguous even after the preceding presentation by Dr. Mei. The danger is in using terms such as IWRM without consideration of what it means. Dr. Hirsch asserted that the strategy seems to be based on: a) nominal balancing of social/economic/environmental issues; b) treating the basin as an interconnected whole; and c) balancing country benefits. However, to the speaker, it is less clear as to whose voices are integrated into the planning; what kind of development is envisaged; and what planning is there for those affected by dams.

Dr. Hirsch questioned whether or not the strategy is truly IWRM based. He remarked that the net-present-value takes priority in the strategy and is a GDP driven approach whereby the trickle down benefits are somehow compensatory or mitigatory. He explained that this is an important assumption that has been made. He also considered that food security is considered secondary in the strategy even though impacts to fisheries are already shown. Research has shown that there is annual loss of 0.6 – 1.6 million tons of fish in the Mekong Basin, plus the loss of flagship species and key habitats/hotspots. Dr Hirsch did not consider this equitable and that it compromises the sustainability of the vital ecosystems in the Basin. Forty-one species of fish are expected to be lost if the six upper mainstream dams are built, and these are not only flagship species. There are significant areas in which the BDP appears at odds with the SEA findings, but this may be simply a question of timing, as the draft is not yet completed. The M-IWRM Project presented on the first day of the Forum called for a start to the PNPCA process for the first Mekong mainstream dam, while the BDP has not yet reached consensus and the SEA proposes a possible 10-year deferment as an option.



Dr. Hirsch was of the view that the development space is too hydrologically driven. The main emphasis in the BDP Strategy is on maintaining hydraulic pressure in the Delta to prevent high saline levels. This is an important task but there are so many other impacts that come from development being proposed. The differences between the DFS and the 20-year scenarios were downplayed in the presentation by Dr. Thanapon as, although the hydrological differences appear slight, other impacts are significant.

In the presentation by Dr. Green, the development space being defined despite hydrological analysis being far ahead of other areas. The starting point is important for the development space concept and it appears that the starting point is being taken as the DFS and not the baseline. If the 2000 baseline is taken as the starting point, the DFS might already be considered a substantial amount of development and not considered an option in the Strategy. If the DFS is taken as a starting point, the political pressure for further development will be greater. Thus, it matters as to how the strategy presents the tradeoff/balance between options.

Finally, Dr. Hirsch provided a number of suggested courses of action. The development space needs to be reconsidered in terms of enhancing food and livelihood security for the poor. The Millennium Development Goals, food security, and IWRM principles of not compromising the sustainability of vital ecosystems should be used. There is a need to recognise the limitations of large stakeholder forums as a basis for scenario adoptions. There are opportunities to learn from existing dams, ensure definite scenario dams are properly mitigated, and tradeoffs equitably managed before committing to any more.

## **4.8 Plenary discussion**

The discussion first focused next steps in BDP. As this is the approach being put forward by the MRC to the countries, re-packaging the Plan in a more strategic way is needed to ensure that it is the best way forward. There were suggestions for slowing down the process and taking on board issues being generated from the MRC programmes. In particular, the SEA should be cautious in putting up summary recommendations and the PNPCA should not be triggered when there is still a process of collecting and synthesizing information on particulars at specific sites.

Further discussions centred on the role of stakeholders and gaining input into the discussions about the Strategy. If the conclusions are to be put forward as having stakeholder input, more facilitation is needed for more stakeholders to be involved and input into the process. There needs to be increased understanding by all in order to have a much better discussion on all the elements of the strategy as it is very complex. Many believed that the gathering of stakeholders at the Forum is an important step. However, for example, in Cambodia, there has been active engagement by NGOs together with government institutions to work closely on various issues. Nonetheless, the degree to which those findings can be brought to the top-level decision-makers is questioned.

A participant raised a question with regard to how consensus can be reached with the approach developed for the IWRM-based Strategy. The CEO explained that the purpose of this Forum was not

to endorse or obtain consensus. However, the feedback will inform the MRC on how best to revise and update the strategy document, which is subject to future processes within the MRC to reach agreement on the final strategy.

The MRC explained that the Strategy should not be over-simplified and should ensure that it does comply with the principles of IWRM and the mandate of the organisation as set out in the 1995 Agreement. The discussions on power and energy are already moving forward quickly, especially for the negotiations for the export of electricity in the region. In order to influence that process the MRC needs to employ a multitude of mechanisms. For example, the SEA is one mechanism and the PNPCA is another. There can be many views emanating from the PNPCA process. However, the BDP is the only process that interlinks the regional, national and private sector approaches. The MRCS considers that it is not too early to get this process and strategy approved. Otherwise it may be too late.

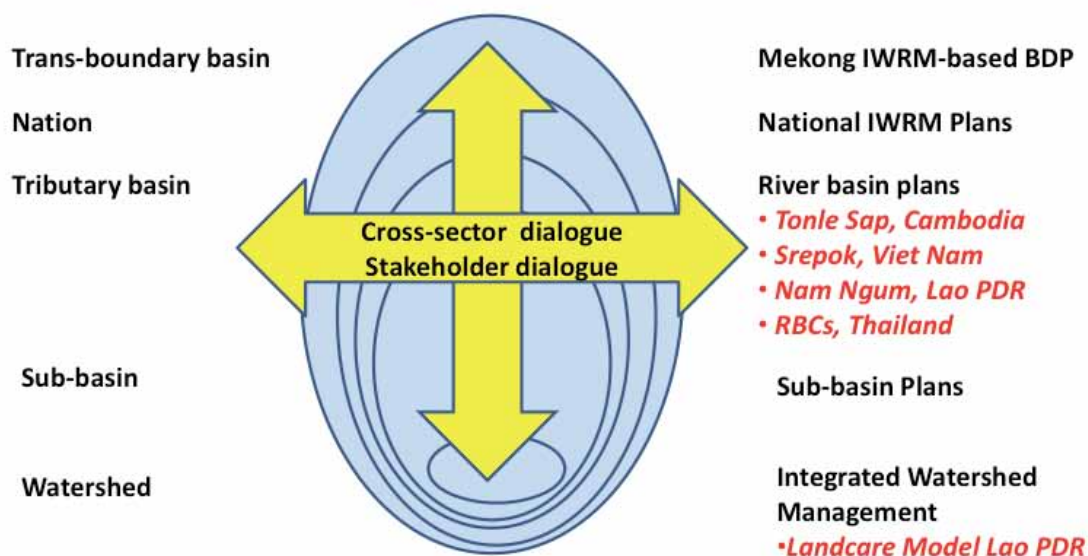
China indicated that they have gone through this process and have built dams. China sees a lot of effort has been put into the BDP strategy. It is meticulous and addresses the key issues well. However, it is difficult to reach conclusions on such big issues. China has a lot of experience and would like to share these experiences with the MRC in the future with a view to promoting mutual learning.

#### **4.9 Session 3: River Basin Organisations (RBO) in IWRM implementation and sustainable basin development in the Mekong: experiences and future**

The objective of this session was to facilitate critical dialogue on experiences, strengths and weaknesses of RBO in the Mekong Region and how the IWRM-based Basin Development Strategy could support the establishment and strengthening of RBO, including the linkages between water resources managers at the basin, national and sub-basin levels.

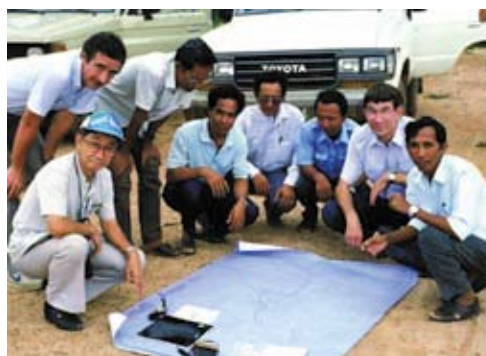
The session was opened with presentation of a slide on river basin management – the IWRM process at the basin level (see Figure 9). In the four Lower Mekong countries, there are various efforts to establish some form of a committee or organisation to manage river basins. In Thailand, River Basin Committees (RBC) have been formed; in Lao PDR a new decree has been passed to set up RBO with the first one focused in the Nam Ngum River Basin (NNRB); in Viet Nam the Ministry of Natural Resources and Environment (MONRE) has passed a decree to set up RBO and the Srepok River Basin Organisation has been formed; and in Cambodia the Tonle Sap Authority has also been newly developed. Both vertical and horizontal cross-sector dialogue is important. This session aimed to address three critical questions: 1) what is the future of RBC/RBO in the Mekong Basin?; 2) how can they contribute to the implementation of the BDP; and 3) how can the MRC assist?

## River basin management - the IWRM process at basin level -



**Figure 9: River basin management – the IWRM process at basin level**

**Presentation 1: Outcomes of the Symposium on RBO in the Mekong Basin, 25-26 March 2009, Muang Thong Thani, Thailand, Poonsup Srichu, Network Coordinator for Rehabilitation and Development of the Songkhla Lake Basin**



The first presentation discussed the outcomes of a symposium held in 2009 on RBO in the Mekong Basin. RBO/RBC are providing new platforms for dialogue and sharing. The establishment a regional RBC network was identified as a key mechanism. The Songkhla Lake Basin was provided as an example. The Council of the Songkhla Lake Basin was established in 2009 under Article 66 and 67 of Thailand's 2007 Constitution. The Council has the authority to set up policy measures and basin development plans; build capacity and strengthen participation within the network; provide a coordinating role with relevant agencies; share knowledge and develop an information centre, monitor development within the Basin and raise finances for future projects. Stakeholders are involved via many different mechanisms such as formal and informal meetings, through integrated planning with relevant agencies, etc. The Songkhla Lake Basin is a well-known example of good basin management and the symposium was an opportunity to showcase this.

***River Basin Management in Cambodia – Lessons learned and demands through case studies of the Tonle Sap Basin Authority, Mr. Meng Mony Rak, Director of Natural Resources of the Tonle Sap River Basin Authority***

The second presentation focused on the Tonle Sap Authority (TSA), which was formed in July 2009. The goal of the TSA is to be in charge, manage, conserve and develop the Tonle Sap Region. The current focus of the TSA is on the territory of the eight provinces, which are located between two major national roads (No 5 and 6). The TSA is important given the numerous threats to the Tonle Sap area, which is already recognised as a biosphere reserve through UNESCO. Some of the threats to the area include changes in water quality and the hydrological regime throughout the Lake; the high use of the Lake for fishing and other developments; the loss of flooded forests and other habitats; decreases in fisheries resources and diversity of fish; and declines in other wildlife resources, especially birds, reptiles and mammals. In the immediate future the TSA is developing a Tonle Sap Master Plan/Route Map; developing a State of the Tonle Sap report; establishing an information system in cooperation with national institutions and development partners; and further researching and assessing issues associated with fish harvesting, fish processing, agriculture, and irrigation.

Several questions were raised to the presenter on the TSA case. Firstly whether or not there is any connection between the TSA and the Cambodia National Mekong Committee (CNMC)? According to the declaration based on the Royal Decree, the CNMC is a committee member of the TSA. Another questioned the mandate of the TSA and whether the Authority could be included in the discussions with the MRC or in other negotiations of developments from outside the basin that affects the amount of water that comes into the Tonle Sap. The representative from the TSA indicated that the government agrees to negotiate any decisions through the CNMC.

***RBO for effective river basin management in Viet Nam: The case of the Srepok River, Mr. Pham Tan Ha, Water Resources Specialist, Office of Srepok River Basin Organisation***

The third presentation presented the case of the Srepok River Basin Council, which was established by the Ministry of Agriculture and Rural Development in May 2006. The RBO includes 29 members from four provinces and representatives from national-level ministries. The main activities of the RBO are framed in four areas: institutions, water resources development, water sharing and environmental protection. The RBO is also engaged in various support activities such as community awareness and participation, capacity-building and information and database management.

Despite the effort expended in setting up the RBO, there are a number of challenges that the organisation still faces. Given that the RBO was set-up before Decree 120/ND-CP on river basin management was passed (1/12/08), the Srepok RBO has not yet had its structure changed to reflect the new Decree. This is a major challenge for the RBO. In addition, the RBO does not have an independent RBO office, no budget for activities, and does not have a role in decision-making for the Srepok River Basin.

A question for clarification was asked concerning Decree 120, noting that some changes within this Decree have been made but others have not been. How and when will the changes be made, and what

momentum is needed to make them happen? The Srepok RBO is still waiting for guidelines to be issued in order to make the appropriate changes.

***Integrated Watershed Management in Lao PDR: the Case of the Nam Ngum River Basin, Mr. Chanthaneth Boulapha, Deputy Director General, DWR/Water Resources and Environment Agency (WREA)***

The fourth presentation focused on the case of the Nam Ngum River Basin Organisation (the first RBO in Lao PDR). The presenter outlined the challenges to IWRM in Lao PDR given the changing roles and responsibilities of different agencies. The Ministry of Agriculture and Forestry (MAF) has the capacity to undertake sub-watershed planning and different development sectors have been responsible for independently carrying out sector water resources planning. However, with the formation of WREA, they have a new mandate for river basin planning including water resources allocation and regulation, environmental management, land resources planning and sectoral coordination.

Recent advances in IWRM in Lao PDR have included the formation of WREA in 2007; a Decree to form RBC; and a new draft Water Resources Policy and Water Resources Strategy and Action Plan (2011-2015).

In the Nam Ngum River Basin, there are currently four hydropower schemes and another six are planned. There are also other water uses such as irrigation, mining, urban development and industrial development. From 2004-2010, the Government of Lao carried out the Nam Ngum River Basin Development Project supported by AFD and ADB to foster and institutionalise IWRM in the mainstream planning process and support investment interventions to provide sustainable livelihood opportunities for poor ethnic communities in the Nam Ngum River Basin. The Nam Ngum River Basin Committee was established to coordinate/advise the government on development policies, strategies, and plans; to coordinate development projects in order to reduce negative impacts to water resources; advise the government on resolving disputes; and coordinate and promote water resources and awareness and participation. The RBC is now supported under the National IWRM project supported by the World Bank, ADB, AusAID and other donors.

A discussion developed around whether or not any formula for obtaining contribution from hydropower projects has been set to contribute toward funding the RBC? This is still developing in Lao PDR and discussions are taking place with the Ministry of Energy and Mines and developers. In the first instance, the RBC has been facilitating a Hydropower and Mining Forum, which brings together all the actors operating in the Nam Ngum Basin to discuss relevant issues. This is just one step into that process of setting guidelines for payments.

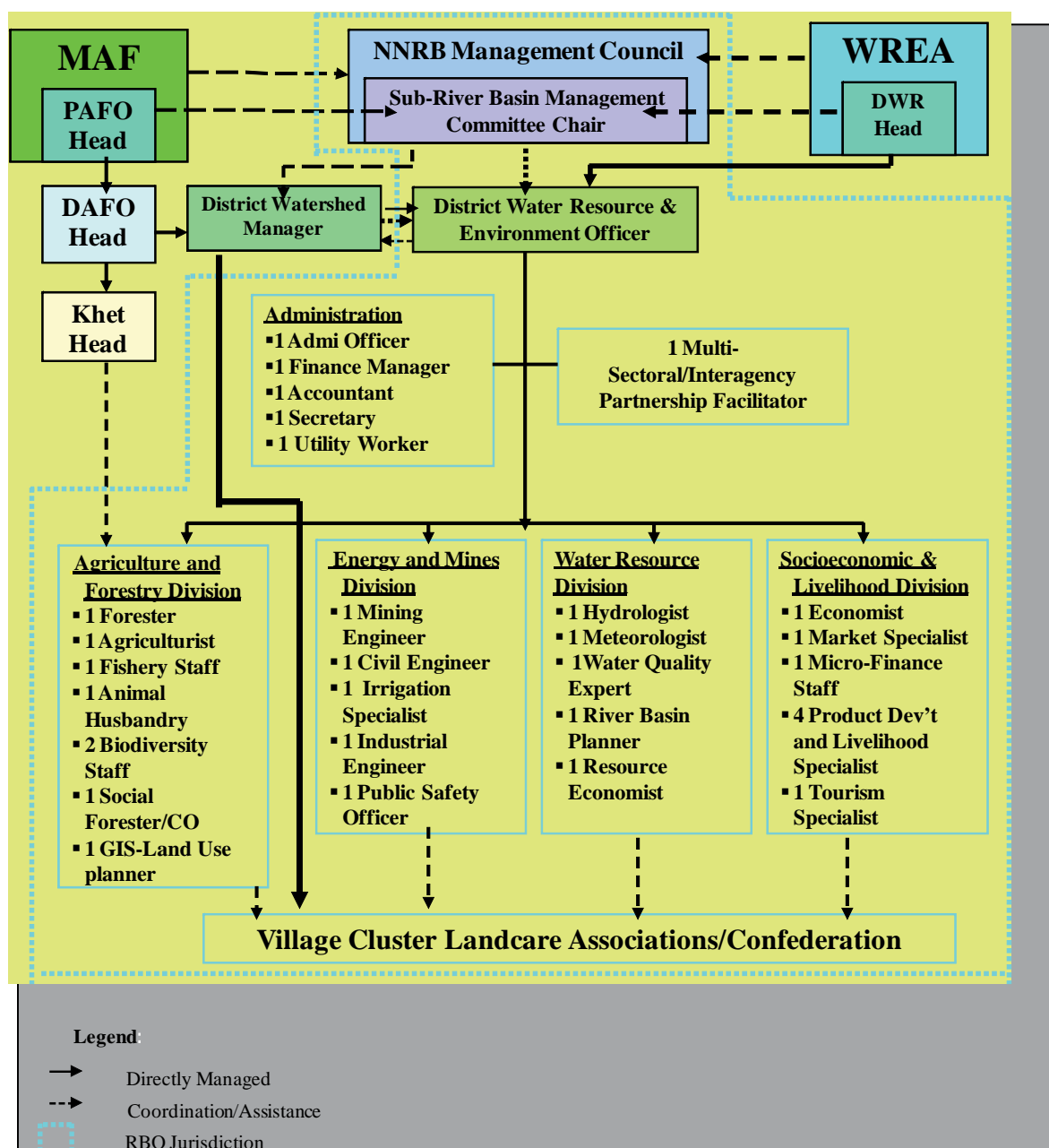
***Interagency Approach to River Basin Organisation Formation: Exploratory Model of the Nam Ngum River Basin Development Sector Project, Lao PDR, Dr. Thetheva Saphangthong, Coordinator of the Integrated Watershed Management Unit of NNRBDSP-Department of Planning, MAF and Dr. Paulo Pasicolan, Watershed Management Expert***

The fifth presentation focused more in-depth on the Nam Ngum River Basin Development Sector Project (NNRBDSP), which sought to bring together central, provincial and district agencies to implement integrated water resources management. The aim of the project was to ensure effective and efficient water resources management in a river basin and support the formation of the RBO's institutional mechanism as one task of the pilot project (the RBO was presented in the preceding presentation). The presenters also shared the distinction between the different line agencies in Lao PDR. For example, the Ministry of Agriculture and Forestry (MAF) is mandated to formulate an integrated watershed management planning model for the entire country while the Water Resources and Environment Administration (WREA) is mandated to organise River Basin Committees and Organisations. The NNRBDSP explores an interagency integrated water resources management model (see Figure 10).

The presenters shared two basin conditions in creating a functional river basin organisation.

- 1) There should be a demand-driven and community-based approach to river basin management involving two parallel components. Firstly, one where the demand is determined by national priorities and concerns and secondly, one in which the direct stakeholders can articulate their needs and actively participate in the planning, conservation, management and sustainable utilization of their local watershed resources for multiple purposes; and
- 2) Any management body aimed at operationalising IWRM at the river basin level that is not directly linked to the real land managers (farmers) or resource users at the village level is bound to fail in its mission and goals. Thus, to set up a functional River Basin Organisation, it must be anchored on strongly established and diverse resource users' or land managers' groups at the local level.

Finally, the presenters advocated that while there are on-going initiatives by WREA in creating River Basin Committees in selected areas in the country, a parallel effort should be carried out at the local level by MAF. This could include the formation of grassroots or village cluster associations such as using the Landcare Model in the Philippines to comprise of the RBO basic social unit. The Landcare Model seeks to organise, train, and mobilise villagers and shifting cultivators to take an active role in restoring the protective and productive functions of the watershed through the adoption of soil-water conservation measures.



*Figure 10: Proposed Nam Ngum River Basin IWRM project organizational set-up at the district level: prospective forerunner to RBO*

*Discussion: Why RBO? Scrutinizing the RBO concept: Strengths and weaknesses and learning from the four Lower Mekong Countries, Dr. Apichart Anukulampai, IWRM specialist in Thailand*

Dr. Apichart was invited to provide remarks on the critical topic of why we need River Basin Organisations (RBO). Two key points emerged. Dr Apichart established that empowerment of stakeholder participation in decision-making processes and management of water resources within the basin is critical. The end result is not a basin plan, but rather awareness raising and a change of

thinking from water resources development to water resources management. The key elements of success is a sound legal framework, the mandate and function to carryout activities; the organisational set-up; and finances to support the implementation.

Several strengths from the examples provided in the five presentations were identified. The recognition of the importance and the necessity to establish RBC has been a first step. In the four Mekong countries this has been backed by the required legal support such as the Royal Decree (Cambodia), the Prime Minister's Decree (Lao PDR and Thailand) and the Ministry Directive (Viet Nam). All aim to promote stakeholder participation and implement an IWRM process.

Several challenges have also been identified. Most of the RBO/RBC are relatively new organisations (mostly from 2-5 years except for in Thailand – over 10 years) and are still determining the best way to operate. In all cases, there has been an inadequate budget to support the operationalisation of the RBO. Many have no clear role or responsibility in the decree and in practice. The composition of members is still geared towards government representation and do not include other stakeholders in most of the examples provided (except Thailand).

The presenter indicated that the existing variations in organisational set-up and responsibilities of RBO/RBC in the four LMB countries are appropriated by taking into consideration the different political, socio-economic and cultural conditions of each country. However, it is an evolving process and more work and effort is needed to strengthen the RBO/RBC. In order to achieve this, Dr Apichart suggested that the following is necessary:

- Provision of firm legal support;
- Provision of adequate budgets;
- Clearly defined roles and responsibilities of RBO/RBC;
- Strengthened role of stakeholders through capacity-building; and
- Broadening the involvement of civil society.

A network of RBO/RBC in the LMB would be highly desirable to promote close cooperation in water resources management and exchange of experiences.

Participants were interested in how a transboundary RBO could be established for both Viet Nam and Cambodia. The facilitator returned to Figure 9 and shared the importance of making linkages vertically and horizontally across all levels and all peoples for effective implementation of RBO.



## 5. The way forward

On behalf of the MRC BDP team, Ms. Pham Thanh Hang, MRC BDP Coordinator presented a recap of key issues and the way forward for the BDP. This includes:

**BDP will ensure a continued participatory and transparent process that engages stakeholders at all levels.** Through the development of the MRC Stakeholder Participation and Communication Plan, BDP2 will continue to engage with diverse stakeholders to ensure the BDP is realised and useful at all levels.

**Take into account the views and recommendation of the Forum.** The Regional Technical Group and the National Advisors will discuss and work hard to address all the inputs made over the two-day forum. The target of getting the Strategy approved by the end of 2010 may not be met but MRC will continue to post developments on the MRC website and all stakeholders are invited to provide input.

**Continue to strengthen cooperation with China.** The MRC has appreciated the involvement of China in the 2<sup>nd</sup> and 3<sup>rd</sup> Forums. Now there are many opportunities on the table for collaboration including joint research, joint exchanges and dialogues through MRC's formal mechanisms. MRC is committed to advancing these opportunities.

**Proceed with the next phase of the BDP.** The BDP2 finishes at the end of 2010. At the same time, the MRC is completing its Strategic Plan 2011-2015. The IWRM-based Basin Development Strategy and the Strategic Plan 2011-2015 are two key directional documents, which will guide the MRC over the next five years. The MRC will take the BDP process forward in terms of actions: it will implement a learning-by-doing process; it will aim to fill the gaps in knowledge; and it will take the planning process to the implementation level.

## **6. Closing remarks**

On behalf of the MRC, H.E. Pich Dun, Secretary General, Cambodia National Mekong Committee, Acting Member of MRC Joint Committee for Cambodia and Chair of the MRC Joint Committee for 2010-2011 thanked the participants of the 3<sup>rd</sup> BDP Forum for their active participation.

He remarked that the outcome of this Forum shows that the MRC has made another step in Basin Development Planning. Decisions today will lead to very different futures for the Mekong Basin and therefore our progress is significant. He confirmed that the MRC Member Countries wish to finalize and adopt the Basin Development Strategy to serve as the framework for further negotiation and cooperation in water resources development and management. The BDP scenario assessment shows how developments will affect each of the LMB countries. Thus there is an appreciation within the MRC of stakeholders concerns on the reliability of the results of scenario assessment as well as the valuable recommendations made for their improvement. Comments and recommendations will be taken forward into the next discussions among the countries and in the finalization of the Strategy. However, H.E. Pich Dun emphasized that the approval of the Strategy is not the end. It is in fact the start of a new journey – when commitments will be translated into actions.

H.E. Mr. Pich Dun thanked all the participants, the MRC Dialogue Partners, China and Myanmar, all the presenters and facilitators for joining Forum.

On behalf of the MRCS, the CEO expressed his appreciation for the frank and constructive comments and useful recommendations for the BDP scenario assessment. He reiterated the need for balancing the opportunities for development with the recognition of the risks and constraints and to ensure that these are factored into the Development Opportunity Space. He confirmed that the Basin Development Plan is not a blueprint, but a part of the process of development in the Mekong Basin.

The CEO noted that there is a lot of work ahead for the MRC Member Countries to finalize the BDP. Comments will be taken seriously and although there is still some way to go to demonstrate the ‘integrated’ nature of the Strategy and fully reflect other work such as the SEA. He expected that this can be achieved with full commitment by the MRC Member States and the rich inputs made by participants at the meeting.

The CEO thanked all the participants and organizations for their involvement in the Forum. He also thanked the MRC Dialogue Partners, China and Myanmar, for sending delegations to engage constructively in this important work. He also thanked the Development Partners and H.E. Madame Khempeng Pholsena, who on behalf of the MRC Council, set the meeting on the right track in her opening speech and H.E. Mr. Pich Dun for his encouragement and direction.

## ANNEX 1: PROGRAMME OF THE FORUM

*“Decoding the Development Scenarios and Strategy for Basin Development:  
What does the future hold?”*

**29-30 July, 2010, Don Chan Palace, Vientiane, Lao PDR**

DAY 1 -29 JULY, 2010	
08:00-08:30	Registration
<b>Opening Session</b>	
08:30-09:10	<b>Opening Remarks</b> <i>H.E. Mme. Khempheng Pholsena, Minister to the Prime Minister's Office, Head of Water Resources and Environment Administration (WREA), Member of the MRC Council for the Lao PDR on behalf of MRC Member Countries</i> <i>The Head of Delegation from China</i> <i>The representative from Myanmar</i> <i>Mr. Jeremy Bird, Chief Executive Officer, MRCS</i>
09:10-09:30	<b>“Warming up”</b> The session encourages participants to voice their concerns on development challenges in the Mekong River Basin and their comments and expectations from the MRC BDP process and the Forum itself <i>Facilitator: Mr. Suon Seng, Executive Director</i> <i>(CENTDOR: Centre for Development Oriented Research in Agriculture and Livelihood Systems, Cambodia)</i>
09:30-09:40	<b>“What does the future hold?”</b> Reflections through the Basin Development Planning process to date Objectives of the 3 <sup>rd</sup> Regional Stakeholder Forum <i>Mrs. Pham Thanh Hang, MRC BDP Coordinator</i>
09:40-09:50	<b>Forum Structure</b> <i>Facilitator: Mr. Suon Seng</i>
9:50-10:10	Coffee break
<b>Session 1: Basin-wide development scenario assessment –Toward consensus on acceptable level of water resources development in LMB</b> <b>Objective:</b> <ul style="list-style-type: none"> <li>- To present the results of the basin-wide development scenario assessment and seek critical feedback from stakeholders</li> <li>- To compare the pros and cons of the considered scenarios</li> <li>- To discuss the options for the sharing of benefits, risks and impacts</li> <li>- To debate the acceptable level of water resources development in the LMB</li> </ul> <b>Facilitator: Dr. Robert Mather, Head of Country Group 1, IUCN The World Conservation Union, Asia Regional Office</b>	
<b>Plenary 1: Development Scenarios Assessment – What do the results tell us?</b>	
10:10-10:50 (5' Q&A)	<b>Basin-wide development scenarios: recap of scope and assessment approach and overview of the findings</b> <i>Dr. Thanapon Piman, MRC BDP programme</i>
10:50-11:15 (5' Q&A)	<b>Critical review: How certain are the results of Hydrological Assessment?</b> <i>Dr. Anthony Green, Modelling Advisor, MRC IKMP</i>
11:15-11:40 (5' Q&A)	<b>'Ensuring ecosystem integrity and maintaining ecosystem services, a review of BDP environmental assessment</b>

	Mr. Marc Goichot, Sustainable Infrastructure Senior Advisor, WWF Greater Mekong Programme		
11:40-12:20	<b>PLENARY DISCUSSION: Scenario assessment findings –what do the results tell us?</b> Facilitator: Dr. Robert Mather The presenters and MRC staff will answer to questions from the audience and/or discuss comments		
12:20-12:40 (5’ Q&A)	<b>Strengthen Exchanges with Mekong River Countries and Promote Joint Sustainable Development</b> Senior representative from the government of the People’s Republic of China		
12:40-12:45	Introduction to Parallel sessions in the afternoon Mr. Suparerk Janprasart, Sociologist/Socio-economist, MRC BDP programme		
12:45-14:00	Lunch		
<b>Parallel 1: Critical dialogues on key aspects of scenario assessment that influence the decision on basin development options</b>			
14:00-14:10	<b>Parallel 1.1:</b> Expansion of irrigation in LMB – not only invest more but invest better and other options for sustainable agriculture development?  Session introduction Facilitator: <b>Dr. Chu Thai Hoanh, Senior officer, IWMI Southeast Asia</b>	<b>Parallel 1.2:</b> Opportunities and risks of mainstream hydropower dams – How would mitigation measures and sharing of benefits and costs work to support decisions on basin development options? And the role of Procedures for Notification Prior Consultation and Agreement (PNPCA) Session introduction Facilitator: <b>Dr. MEI Kariyan, CNMC National Advisor</b>	<b>Parallel 1.3:</b> Development and management options for the Mekong Delta in the context of upstream developments and sea level rise  Session introduction Facilitator: <b>Mr. Nicolaas Backer, Chief Technical Advisor, FMMP -MRCS</b>
14:10-14:35 (5-10’ Q&A)	<b>Irrigation expansion or other opportunities for sustainable agriculture development - lessons learned from MRB</b> Dr. Andrew Noble with support of Dr. Chu Thai Hoanh, IWMI-SE Asia	<b>Opportunities and risks of proposed hydropower schemes on the LMB mainstream: Consideration of avoidance, mitigation and enhancement measures and links to the MRC PNPCA</b> Mr. Larry Haas, Project Advisor, MRC Initiative for Sustainable Hydropower	<b>Combined impacts of upstream developments and sea level rise on Viet Nam Delta – modeling of extreme cases</b> Mr. Nguyen Xuan Hien, Deputy Director, Southern Institute for Water Resources Planning (SIWRP), Viet Nam
14:35-15:00 (5-10’ Q&A)	<b>More water to the NE – what communities want to see its use and management?</b> Dr. Jongdee To-im, Faculty of Environment and Resource Studies, Mahidol University and Mr. Somkhit Singsong,	<b>The BDP fisheries assessment and the future for LMB fisheries</b>  Mr. Kent Hortle, Chief Technical Advisor, MRC Fisheries Programme	<b>Cambodia Delta development plans and areas for regional cooperation</b> Mr. Long Saravuth, Deputy Director General of Technical, MOWRAM, Cambodia

<b>15:00-15:25</b> (5-10' Q&A)	<i>Huai Sam Mo Basin, Thailand</i>  <b>Key factor affecting the expanding irrigation in Cambodia</b>  <i>Mr. Dararath Yem</i> Environment and Water Resources Management Advisor, Cambodia	<b>The role and implementation of the MRC PNPCA</b> <i>Ms. Birgit Vogel, Chief Technical Advisor, MRC Mekong IWRM Project</i>	<b>Knowledge management for proactive collaboration on climate change</b> <i>Dr. Paul McShane, Chief Research officer of Monash Sustainability Institute, Australia</i>
<b>15:25-16:15</b>	Discussion	Discussion	Discussion
<b>16:15-16:25</b>	Summary of key messages <i>Facilitator, Dr. Chu Thai Hoanh</i>	Summary of key messages <i>Facilitator, Dr. MEI Kariyan,</i>	Summary of key messages <i>Facilitator, Mr. Nicolas Backer</i>
<b>16:25-16:45</b>	COFFEE BREAK		
<b>16:45-17:30</b>	<b>PLENARY DISCUSSION</b> <ul style="list-style-type: none"> <li>- Key messages from the parallel sessions (Facilitators for the sessions)</li> <li>- Further discussion on the results of basin-wide development scenario assessment</li> <li>- Summary of Session 1, Dr. Robert Mather</li> </ul>		
<b>17:30-17:40</b>	Closing of Day 1		
<b>19:00-21:00</b>	DINNER RECEPTION		

DAY 2 – 30 JULY, 2010	
<b>08:30-08:45</b>	<b>Recap from day 1 and comments from stakeholders</b> <i>Mme. Pham Thanh Hang, MRC BDP Coordinator</i>
<b>Session 2: IWRM-based Basin Development Strategy for LMB – Influencing national plans and decision making or another statement of will?</b> <b>Objective:</b> To present the draft IWRM-based Basin Development Strategy for the Lower Mekong Basin and seek critical review and feedback from stakeholders <b>Format:</b> Participants will sit as groups (Communities, Civil society organizations, NGO/research organizations, Government officials) <b>Facilitator:</b> <b>Dr. Andrew Noble, Regional Director, International Water Management Institute, IWMI Southeast Asia and Central Asia</b>	
<b>08:45-09:15</b> (5' Q&A)	<b>“Development space” for water resources development in LMB and the complete draft of the Basin Development Strategy for LMB</b> <i>Dr. MEI Kariyan, on behalf of the Advisory Group for the Basin Development Strategy</i>
<b>09:15-09:35</b>	<b>Critical review of the draft Strategy</b> <i>Professor Philip Hirsch, Professor and Director of Australian Mekong Resource Center, Sydney University, Australia</i>
<b>09:35-10:05</b>	<b>Initial feedbacks</b>
<b>10:05-10:30</b>	COFFEE BREAK
<b>10:30-12:00</b>	<b>PLENARY AND PANEL DISCUSSION: Perspectives on the draft Strategy and how it can be finalized, approved and implemented</b> <i>Facilitator: Dr. Andrew Noble</i>  The facilitator will invite representatives from groups and all participants to express their views on the draft Strategy. The Panel, comprising of 4 Lower Mekong Countries, CSO, and Development Partner

	representatives, will be invited to respond to comments as well as share their views Summary of Session 2: Dr. Andrew Noble
<b>12:00-13:30</b>	<b>LUNCH</b>
<b>Session 3: River Basin Organization (RBO) in IWRM implementation and sustainable basin development in the Mekong - Experience and Future</b> <b>Objective:</b> To facilitate a critical dialogue on experience, strengths and weaknesses of RBO in the Mekong Region and how the IWRM-based Basin Development Strategy could support the establishment and strengthening of RBO, including the linkages between the “water resources managers” at the basin, national and sub-basin levels. <b>Facilitator:</b> Professor Torkil Jøneh Clausen, Water Policy Advisor Group (DHI), Senior Advisor to the Global Partner Partnership and Adjunct Professor at the Professor at Technical University of Denmark	
<b>13:30-13:35</b>	<b>Session introduction</b> <i>Facilitator: Prof. Torkil Jøneh Clausen</i>
<b>13:35-13:55</b> (5' Q&A)	<b>Outcomes of the Symposium on RBO in the Mekong Basin, 25-26 March 2009, Muang Thong Thani, Thailand</b> <i>Ms. Poonsup Srichu, Network Coordinator for Rehabilitation and Development of Songkhla Lake Basin, Thailand</i>
<b>13:55-14:15</b> (5' Q&A)	<b>River Basin Management in Cambodia – lessons learned and demands through case studies of Tonle Sap Basin Authority</b> <i>Mr. Meng Mony Rak, Director of Natural Resources of Tonle Sap River Basin Authority</i>
<b>14:15-14:35</b> (5' Q&A)	<b>RBO for effective river basin management in Viet Nam – the case study of Srepok River</b> <i>Mr. Pham Tan Ha, Water Resource Specialist, Office of Sreprok River Basin Organization, Viet Nam</i>
<b>14:35-15:15</b> (5' Q&A)	<b>Integrated Watershed Management in Lao PDR: the case of Nam Ngum River Basin</b> <i>Mr. Chanthaneth Boulapha, Deputy DG: DWR/Water Resources and Environment Agencies (WREA), Lao PDR</i>  <i>and</i> <b>Interagency Approach to River Basin Organization Formation: Exploratory Model of the Nam Ngum River Basin Development Sector Project, Lao PDR.</b> <i>Dr. Thetheva Saphangthong Coordinator of the Integrated Watershed Management Unit of NNRBDSP- Dept of Planning, MAF and Dr. Paulo Pasicolan, Watershed Management Expert</i>
<b>15:15-15:30</b>	<b>COFFEE BREAK</b>
<b>15:30-15:45</b>	<b>Discussion: Why RBO? Scrutinizing the RBO concept: strengths and weaknesses and learning from the four Lower Mekong Countries</b> <i>Dr. Apichart Anukulampai, the pioneer supporter of IWRM in Thailand</i>
<b>15:45-16:30</b>	<b>PLENARY DISCUSSION</b> Future of River Basin Management and RBO in Mekong River Basin Contribution to the implementation of the Basin Development Strategy What MRC can help?
<b>Closing Session</b>	
<b>16:30-16:45</b>	<b>Summary of the Forum and next steps</b> <i>Mrs. Pham Thanh Hang, MRC BDP Coordinator</i>
<b>16:45-17:00</b>	<b>Closing Remarks</b> <i>HE. Pich Dun, Secretary General, Cambodia national Mekong Committee, Acting Member of MRC Joint Committee for Cambodia, Chair of the MRC Joint Committee for 2010-2011</i> <i>Mr. Jeremy Bird, CEO, MRCS</i>

## **ANNEX 2: LIST OF PARTICIPANTS**

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### ANNEX 3: FORUM PAPERS

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3. Key factors affecting the expansion of irrigation in Cambodia  
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*Philip Hirsch*
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*Simplicia A Pasicolan*
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*Sok Serey, Thau Sok Kalyan and Samath Sela*
11. An analysis of the necessity for GMS cooperation on hydropower dams  
*Sun Haiyan*
12. The role of IWRM-based development on the utilization and protection of the Lancang-Mekong River: A case study from Yunnan Province, China  
*Wang Yan*

# **Ensuring ecosystem integrity and ecosystem services: A critical review of the BDP environmental assessment**

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## **Introduction**

This review challenges the pertinence of the method used to address the key functions of the ecosystems and how to measure and consider its integrity in the development of the Mekong River Commission's (MRC) Basin Development Programme (BDP) scenarios. The role of connectivity between the different units of a river system is not adequately addressed, and this will undermine efforts to protect them as well as maintain the benefits to people dependent upon them.

Some dimensions of ecosystem are not sufficiently or appropriately addressed in the BDP scenarios. Alluvial channels are the result of a combination of ecosystems differing from one another by age, structure, composition, and they all evolve with different time scales. River flows maintain this dynamic assemblage of ecosystems. With limited data, and understanding, one can question the simplification process necessary to feed a scenario approach. A proper ecological management requires an integrated and basin wide dynamic approach.

Furthermore, this review notes key gaps in the assessments, and important bias in the interpretations. This includes a gross underestimation of the cumulative impact of Lower Mekong mainstream dams on the stability of the Mekong Delta, on the inevitable evolution from straight to sinuous and/or meandering channel forms on bank erosion, as well as the ecological impacts of winnowing of the sand layers on bedrock sections directly downstream main stem dams, and the potential impact of the incision of the river bed on the water table.

In the spirit of the precautionary principle, the review invites the BDP to better highlight the risks and uncertainties associated with the accuracy of the forecasts in the scenario summary tables, and the strategic guidance; and furthermore to state the potential range of consequences of a forecast error on scenarios. The review also invites BDP to better integrate key lessons from other river basins, and to make space for innovative technologies in hydropower development that can be much more sustainable than current practice in the Mekong basin.

The current state of development vs. ecosystem integrity of the Lower Mekong does not necessarily call for a fatalistic and reactive approach to environmental impacts. This could and should be seen as an opportunity that will create significant win wins for people and the environment.

WWF supports the Mekong River Commissions mission framed under the 1995 Agreement. WWF also supports the general objective of the BDP as stated in the Mekong River Commission Secretariat strategic plan and the BDP assessment scenarios.

Let us start with some general statement and principles that we will apply as general guidance of this review:

- If models and scenarios are useful to guide and support decision-making, one needs to acknowledge their limits. Stating those limits more clearly would make the scenarios more useful and would ensure a higher integrity of the outcomes;
- An ecosystem is a combination of different components. Those component fit into three categories as, (a) the bedrock (also know as **substratum**, or geological base) on which the river system is sitting, (b), the flows, which include **water flows, sediment flows**, that are moved either on the bottom (bed load), in suspension, or in solution. Attached to the suspended matters, and/or in solution the flows also include **nutrients** (c) the biological component that include animals and vegetal. The ecosystem also needs the **energy** created by the inertia form the slope, and the heat from the sun; and **connectivity**, which allows all those to interact;
- The integrative concepts of fluvial continuum and hydrosystems are of prime importance along such a large river. The Mekong is a large fluvial system which changes from upstream to downstream due to changes in water discharge and sediment transport, and due to changes in the nature of its bed. Hydrosystems incorporate 1) longitudinal exchanges of water, sediment, nutrients and species from sources to delta, 2) lateral exchanges between the channel and its floodplain, 3) and vertical exchanges between the channel and the substrate of the bed when it is composed of alluvium (this process includes exchanges of water, nutrients and fauna between the river itself and the groundwater below the channel). A fourth dimension is time, because time integrates long-term changes such as climate-induced and human-induced changes at the watershed (erosion) and river scale; those changes (discharge, sediment and other fluxes) affect landforms and associated ecosystems. If they are reversible, the integrity of the system is preserved. Dams are human structures, which are a key factor of disturbance and irreversibility, and deserve particular attention. Time is also the period of adjustment when ecosystems are perturbed. In this case, time scales differ according to the different components of the physical and biological components of the Mekong hydrosystem;
- These exchanges are key functioning features which are necessary to maintain the river and its floodplain in an healthy state. Any perturbation of fluxes affects the exchanges, then the general functioning of the hydrosystem, and its ability to produce the ecosystem

services that humans benefit from the river. It is the whole of this river ecosystem that should be the frame of an “environmental assessment”;

- “Connectivity” is a critical part of the assessment, and very much under represented throughout the BDP scenario document. Much more emphasis is needed on “connectivity”, because if connectivity is significantly reduced, the ecosystem might collapse even if the other components have been preserved.

## **1. Mapping the functional units of the ecosystems and eco-master plans**

The structure of the BDP scenario assessment gives the impression that the commonly recognized functioning of an ecosystem is not fully understood. Thus environmental impacts (“impact on wetland and biodiversity”; and “impact on the Tonle Sap”) are located in one Technical Note on environment, and “impact on flows”, and “impacts on river morphology” are located in a different technical note on River Systems. Are the two latter not environment issues? It is widely accepted that flows and river morphology are overarching principles of the environment, and they should therefore be treated as such. The structure of the report as it is, minimizes the role of flows and river morphology, and in the end, give them less emphasis in the conclusions. As a consequence, flows and river morphology have not been selected amongst the nine most important criteria that guide the main conclusions. The key criteria selected are just sub-components of the ecosystem like “river banks” or “rapids”. How is this justified? This methodological choice is odd, and it seriously biases the conclusion of the report towards a minimization of the environmental impacts. In the end, the assessment is just a list of habitats, species and hot spots, with little emphasis on how they are all connected together by the river system.

A more appropriate methodological way of addressing the challenge of the Basin Development Plan, might be to produce maps of the different functional units of the ecosystems, with their different structures, composition and time frames. Those maps are commonly used by managers of rivers in Europe and North America, and they prove to be a good tool to understand and manage the ecosystems.

Without a solid baseline, it is difficult to plan for future changes to an ecosystem. A baseline is not a list of sub-elements of the ecosystem, it is a demonstration of the understanding of how they operate together as “functional units”; and this includes what are the roles of flows (water, sediment and nutrient) and connectivity.

It is difficult to monitor changes and devise meaningful mitigation measures without a solid baseline. Furthermore, you can only simplify something you thoughtfully understand. Models and scenarios are simplification exercises. They do not bring new understanding; they just allow to organize data and trends you have already understood. Maps of ecosystem functions will allow us to significantly improve modeling the ecosystem.

Ecosystem management calls for in-depth qualitative approaches, as you cannot easily quantify ecosystem processes. You then need a much more refined scenario analysis to integrate qualitative information.

Rather than listing ecosystem problems and developing individual mitigation management plans (i.e. as proposed managing wetlands and flooded areas under increasing pressures from development; managing the impacts on flagship species and environmental hotspots, ...)

BDP might prefer a **more integrating approach. The model of Eco-Masterplan for river protection, as recently developed for example in Austria,** might be a good reference.

Once such an eco-master plan is produced, it is then easy to integrate it to scenarios. **Creating such maps of the different functional units of the ecosystems and an eco-master plan for the Mekong and integrating it to the BDP assessment would be a very positive proactive measure. It will allow BDP to identify many win wins solutions for people and the environment grasping the unique opportunities the current situation of the Mekong offers. It would put MRC in a position to promote more sustainable development options. And this will bring MRC away from the “fatalistic reactive approach” of the current scenario analysis.**

## **2. The four dimensions of a river system**

Researchers have described 4 dimensions of a river system: longitudinal, lateral, vertical and time.

Most attention in the current scenario is given to the longitudinal dimension, which is an important dimension. But one should not underestimate the two spatial dimensions, as well as time.

It is also likely that hydropower dams will trigger impacts on the lateral dimension.

### *Longitudinal/lateral*

If one can consider, as stated in the BDP report that downstream impacts on the longitudinal profile will trigger localized riverbank erosion, no mention is made to the indirect effects of a higher level process that will influence the lateral dimension of river geomorphology. A classical downstream impact often occurs when the section of the river downstream of a dam loses its bed load and part of its suspended load, is the dissipation of the energy by eroding the river bed to reconstitute bedload, then reducing the slope of the river bed. This leads to increasing the length of the channel by increasing the sinuosity. The river then meanders and thus erodes its banks. This process takes place faster than the adjustment of the longitudinal profile when the size of bed particles requires high discharges and thus delays the adjustment of the long profile. Furthermore, if the incision of the riverbed is stopped or reduced because the riverbed has a rock base, the longitudinal auto-adjustment proceeds through lateral erosion, which leads to increased



rate of sinuosity and may lead to meandering. In this case, the effect is amplified. This means that the concavity of the bends are going to suffer rapid erosion, and the bend will migrate rapidly, especially when erosion occurs in the deeper part of the river if happening from the longitudinal profile process. There will be, as noted by the BDP scenario, a partial readjustment due to reduced flows velocity within the reservoirs, but this will be comparatively very limited. Consequences for the populations living on the riverbanks (in the area around Vientiane and immediately downstream, and to a greater extent on the stretch downstream from Kratie), until the Viet Nameese border will be much more important than anticipated in the current BDP scenario assessment.

#### *Vertical*

Incision of the riverbed in alluvial stretches, such as between Vientiane and Paske in Lao PDR, and downstream from Kratie, Cambodia from a sediment hungry river are also possible impacts. This was well studied in European Rivers, and comes with a list of consequences for the water table and riparian vegetation.

#### *Winnowing of particles*

The reaches of the river between Sanakham and Vientiane, and from Pakse to Kratie feature a special morphology. The bedrock, or substratum, is very near the surface, and the riverbed features many channels separated by rock-based islands. The entire area is covered with a fine layer of sediment (silt, sand or gravel).

This creates a very complex mosaic of habitats that support an incredible rich biodiversity. Those stretches of river provide an important support to the wild fisheries.

Dams directly upstream of those areas will cut bed load and very rapidly lead to the winnowing of all sediment, leaving only bear bed rock bottom channels or particles too coarse to be transported; this effect will promote siltation between the particles and will severely affect vertical exchanges with underground water.

This will cause a very important simplification of the river morphology, thus significant loss of habitats diversity, which will translate into loss of biodiversity and fisheries productions.

This is a significant ecological process that has not been captured in the BPD scenario assessment.

#### *Time*

Time scales used need to be revisited. The choice of the word “long term” to qualify a 20-50 yr time frame in a large river system such as the Mekong is misleading. Twenty to fifty years is a short period for a large river. Long term, in the case of the Nile, a river of comparable size to the Mekong, has been identified by recent research in the last 500 yrs.

The Technical Note on the impact on morphology leads the non-expert reader to a gross misunderstanding. By stating that the river will seek to re-establish its sediment balance by scouring, it indicates that it will only be a question of time before the river returns to its original balance. The scenarios need to be much clear on the fact that all of the 20-50 yrs mainstream scenarios will bring the river to a new dimension. The sediment input in the ecosystem is going to be significantly reduced, so the system cannot return to its original balance. The result is going to be a metamorphosed river, which will seek equilibrium/balance, not the pre-dam one, but a new one, for a long term, with new river landforms. The river landforms and associated ecosystems will be changed for a very long time (in river time, this is considered as several hundred years).

We disagree with the understanding that sediment loss by trapping in the reservoirs will be compensated by remobilization in existing deposits in the system further downstream. There will be a reduction of the disequilibrium of the water-sediment balance from erosion of the riverbed and banks downstream from the reservoirs, but this will be temporary. Once the bottom deposits (the easiest to remobilize) will be gone, more serious bank erosion will probably begin, with potential serious consequences for riparian population. The report is correct when it states that the readjustment will be aggressive after 20 years.

It cannot be assumed that the most important changes will happen in the very short term (5 yrs), and then later to state that the expected changes between 2030 and 2060 will be small, thus not important. We are facing cumulative processes that are going to take place in the long term. Farmers in the Nile valley, for example, are still facing severe erosion caused by dams built 50 years ago, and erosion will continue for many more years. (Ayman A. Ahmed & Ahmed Fawzi, 2009).

Decision can be made to make those changes, but probable consequences can be evaluated, and decision makers have to face them. The role of the BDP scenarios is to assess and highlight those impacts, not to minimise them. Decision makers have to understand what is likely to happen, and what are the possible mitigation measures, if mitigation is possible.

### **3. Delta impacts (Viet Nam)**

**The impacts to the delta are seriously underestimated. This cannot be ignored, as this is a classical process that has been observed on many other dammed rivers in the world.** What is considered in the BDP scenario assessment as the 20 years scenario is already happening today. For example, a) no more progradation in the western part of the delta front in Ca Mau, and erosion in the east of the delta; b) serious erosion of the delta front is currently happening on the entire coast of Tra Vinh Province; c) serious bank erosion is happening on the banks of the Mekong in Dong Thap province.

It is very clear that the Chinese dams and in-channel sand mining will have or are already having an impact on the sediment input to the delta. It is also very certain that the Lower mainstream dams will amplify the impact of the Chinese dams on sediment, and also significantly accelerate

the time frame for the impact from the Chinese dams and in channel sand and gravel mining as they will reduce the buffer effect from middle reaches and tributaries.

Thus impacts on the delta will happen much faster, as the impacts will be cumulative. There is no way around this, one can only reduce the gravity with sediment flushing provisions, but this cannot be stopped nor reversed.

## 4. Biodiversity

**1067 new species** have been discovered in the Mekong region over the past 10 years. The Mekong basin is in the center **where most new species are being discovered**, with an average **rate of discovery superior to 2 per week**. This is because the Mekong features **amazingly rich ecosystems**, and also because so **few surveys** have been conducted; so potentially **many more species** have **not yet been described**.

The BDP scenario assessment reports this well in its Technical Note on wetland and biodiversity, (“Impacts on biodiversity are expected to be considerable”), but one would question the weight that biodiversity impacts receive in the main report. We do not think BDP has dealt sufficiently with endemism, i.e. species that only occur in one area of the world, and thus will be lost to the world if they disappear in that area.

Charismatic species mentioned in the DBP report are also umbrella species e.g. many other species depend on similar habitats and will also be lost if those charismatic species disappear. We would expect more substance in the scenario assessment on how to balance the consideration of lost species with the economic benefits? How does the BDP team move from recognizing that the impacts on biodiversity are going to be very high, to a relatively low consideration in the final scoring tables? What should be the process to decide that one species will be lost for the world? Who decides how many points you attribute to biodiversity loss in the BDP tables?

### General and over-arching comments on the format of the BDP report

- The report systematically uses a format and the concept of river equilibrium to come up with short-cut solutions each time there is a challenge to the Upper Lower Mekong mainstem scenario. The river will be impacted, but everything will be balanced, and either it will become stable again, or the downside will be compensated by a newly created benefit;
- The report recognizes that the natural hydrology will be impacted, but this will have positive implications on salinity intrusion, thus benefiting agriculture (no mention of negative implication of reduced salinity on aquaculture). And anyway, the impact of climate change on rainfall patterns and sea level rise will compensate for this impact;
- Another example: the reversing of the flow of the Tonle Sap will be reduced by 7-8%, but the report states that this change is much smaller than the 300% inter-annual variation; the impact is therefore considered as minor. What ensures the ecosystem integrity of the Tonle Sap is precisely this important inter-annual variation with different areas being

more or less flooded according to the different years. The BDP scenario assessment report swaps an important natural fluctuation for an irreversible change. Those are two very different issues that do not work at the same level. One cannot compensate for the other;

- In the “geomorphological assessment” Technical Note, one can read that the river will try to reestablish its sediment balance by scouring and readjusting the slope and forms. This will happen, but it is difficult to come up with a precise timing. This leads to a conclusion that all will be fine, however it is just a question of time. The reader is lead to an understanding that we just need to be patient, and eventually the balance will be back. Yes, but it would be fair to underline the fact that the change in the river system is going to be major. One should use terminology such as “complete metamorphose” of the ecosystem, and thus writing about returning to the balance does not mean much, because the system will radically change in the long term. The way in which this is presented is very misleading;
- The BDP scenario assessment stated that reduced upstream input of nutrients in the Tonle Sap will be compensated for by agriculture and waste discharge. Banking on increased pollution, is BDP suggesting to pollute more downstream? One needs also to note that this would also come with a simplification of the nutrient quality range. Probably only the most tolerant species will adapt to changes in nutrient quality. This will cause further loss of biodiversity, and would also possibly affect the quality of the wild fisheries.

Through the report the environmental impacts are systematically presented as “potential”. Why? We are in front of a physical determinist principle; those impacts will definitively happen. Exact time frames are not always easy to predict, but the trends and impact are very clear.

Modifications of the flows of water, sediment and nutrients are going to trigger a chain of cascading changes of the functional units in river ecosystems, this is going to happen at different time scales, but it is certain it will happen. One has to face it and be open and clear about it. The environment is going to change in a very big way. One cannot say they are “potential impacts”.

Is the BDP critically assessing the projects to support decision-making, or defending, justifying the Lower Mekong mainstream scenario?

## **5. New technologies for more sustainable hydropower**

There are important lessons to be learned from other large rivers. The Lower Mekong remains relatively pristine, with a great deal to be protected: biodiversity, fisheries; and ecological integrity of the basin.

The hydropower industry has made significant progress towards sustainability over the past years. New technologies have been developed to produce electricity differently. And tools exist to measure the sustainability performance of hydropower projects.

For example, Thakho, a diversion project on the left bank of the Mekong mainstem in Southern Lao PDR has no dam and no reservoir, and thus negligible impact on flows, connectivity, fisheries and biodiversity. It also has negligible negative social impacts, and retains the benefits of a hydropower project for local communities. Furthermore, it produces electricity all year long; even more in the dry season, allowing to balance the national grid dependant on reservoir hydropower.

There is no mention of the Thakho project in the BDP work, when the project is highlighted as a good project in the MRC Strategic Environment Assessment.

With an installed capacity of 80 to 180 MW - depending on the option to be selected by the government of Lao PDR-, one needs to acknowledge that Thakho is a relatively small project in comparison to the 30 Gigawatt potential capacity of Lao PDR. But it remains a good reference to promote good practice, and is financially attractive.

But innovative solutions do not necessarily mean small size. Grand Inga project for example, is a planned project that would have an installed capacity of over 40,000 MW (more than twice the size of Three Gorges, or more than the entire capacity of Lao PDR in one dam).

This project is located on the Congo (also known as Zaire River), a river of comparable size with the Mekong, and it hosts about the same number of fish species.

The specificity of this project is that the main dam and the reservoir are not on the river. Water from the main stem is diverted to a reservoir in a big bend of the river. The reservoir is sitting right on the bank of the river, thus impact on flows and connectivity is minimized. Only a small dam is built across the river to divert part of the flow. Different technologies exist for intake, including some with no dams like on Thakho. If such no dam diversion is possible, then the impacts on flows and connectivity could be negligible, and benefits from electricity generation would not be outweighed by negative impacts on the ecosystems. We are not saying that Grand Inga is a viable project, and that the social impacts are bearable. Our research did not cover a detailed impact assessment of the project. If the issue of connectivity and flows are solved, it is not enough to make it a sustainable project. Other impacts like resettlement or relocations of communities also need to be mitigated. But this is a very important step towards a sustainable project. The point we want to make is that if such new technologies can be at advance planning stages in other developing countries, why can't we evaluate them also in the Mekong. Are there such sites on the Lower Mekong? Would they be suitable alternative to the existing main stem sites and designs? Why aren't they included into scenarios in the BDP, exploring those options?

## **6. Lessons from other large rivers**

The managers of rivers in the western world are spending significant resources on ecosystem restoration. In Northwestern USA (Columbia River Basin), the cumulated economic value of the salmon species which were not born, did not grow up and did not reproduce has been computed.

It is more important than the value of energy since the completion of dams in the 1940's. When Colonel Dornstauder, Executive Director of Civil Works of the United States Army Corps of Engineers, was invited to advise the China Three Gorges Hydropower Company in a conference in November 2009, his presentation was all about biodiversity and geomorphology. Basically saying, if the Government of USA had a wild Mississippi to develop today, they would focus on the maintenance of the integrity of the ecosystem, because the main work for the past 20 years has been about fixing the damage that has been done to them. And without them, the eastern USA is reaching a bottleneck in development. We have to be cautious on simplistic comparisons between the Mississippi and the Mekong but what we can say is that if the decision-makers in the Mississippi knew at the time of the planning of their river, what they know today, they would have certainly planned differently.

What is best practice in Water Resources Management in 2010? What planning model is MRC following?

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# **More water to the Northeast: Views from communities for improved use and management**

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## **Introduction**

Water is an important natural resource. When the environment changes overtime, often water quality and water quantity will change. Seasons affect not only water quality and quantity but also all living things including plants, animals, and humans.

A river basin is the portion of land drained by a river and its tributaries. It encompasses the entire land surface dissected and drained by many streams and creeks that flow downhill into one another, and eventually into one river. The final destination is an estuary or an ocean. As a bathtub catches all the water that falls within its sides, a river basin sends all the water falling on the surrounding land into a central river and out to the sea.

All people live in a river basin. Even if we do not live near the water, we live on land that drains to a river or estuary or lake, and our actions on that land affect water quality and quantity far downstream. River basin management is needed to understand the environment and natural resources in a holistic manner. Moreover, humans have to adapt according to the environment and nature, by not altering nature to only serve human needs. Nowadays, the climate and seasons are changing which is a challenge for people to adapt to.

## **1. River basin and river basin management**

River basins have various sizes and scales. The Mekong Sub-basin is one of ten large-scale river basins in the world. Based on geographical characteristics, Thailand can be divided into 25 river basins. The average annual rainfall for the country is about 1,700 mm. The total annual rainfall of all river basins is about 800,000 million m<sup>3</sup> of which 75 percent of the amount is lost through evaporation, evatranspiration and the remaining 25 percent (200,000 million m<sup>3</sup>) is in streams, rivers, and reservoirs (see Table 1). Thus, the available water quantity is about 3,300 m<sup>3</sup>/capita/year (Office of National Water Resources Committee, 2000).

River basins in Thailand are divided into two groups a) water flows into the Gulf of Thailand (sea) and b) water flows into the Mae Kong River (Mekong).

**Table 1: Watershed Areas and Annual Runoff of the Major River Basin in Thailand**

Basin No	River Basin Name	No Watershed area [sq.km.]	Annual run-off [million m <sup>3</sup> .]
1	Part of Salawin	17,920.19	8,156
2	Part of Mekong	57,422.07	15,800
3	Kok	7,895.38	5,119
4	Chi	49,476.58	8,035
5	Mun	69,700.44	21,767
6	Ping	33,891.71	6,686
7	Wang	10,790.74	1,429
8	Yom	23,615.59	1,430
9	Nan	34,330.16	9,518
10	Lower Chao Phraya	20,125.25	4,925
11	Sakae Krang	5,191.43	519
12	Pasak	16,292.24	2,708
13	Tha Chin	13,681.24	2,815
14	Mae Klong	30,863.76	12,943
15	Prachinburi	10,481.32	4,502
16	Bang Pakong	7,978.15	4,900
17	Part of Tonle Sap	4,149.97	1,193
18	East Coast Gulf	13,829.72	25,960
19	Phetchaburi	5,602.91	1,140
20	West Coast-Gulf	6,745.33	1,013
21	Peninsular-East Coast	26,352.78	35,624
22	Tapi	12,224.53	17,380
23	Thale Sap Songkhla	8,494.97	7,301
24	Pattani	3,857.82	3,024
25	Peninsular-West Coast	21,172.25	9,918
Total		512,065.81	214,128

*Sources: Office of the National Water Resources Committee (2000)*

## 2. Water management obstacles

Thailand has various problems in water management both in planning and implementing of policies. The obstacles to water management in Thailand are summarized below.

The first issue of water management in Thailand is likely to be the structure of the Thai government which does not support the management as a whole system. Many organisations are carrying out similar activities and have similar responsibilities, sometimes with the same organization. This means the Integrated Water Resources Management (IWRM) in Thailand is not well understood, managed or implemented. IWRM needs the participations and coordination



among various stakeholders such as people in local communities, government officials, and NGOs.

The second issue is related to laws and regulations. The regulations of Water Resources Management in 2007 defines the responsibilities of River Basin Organization (RBO) quite clear. However, as Thailand does not have a water law, there are difficulties for RBO to manage and operate.

The third issue addresses the weaknesses of RBO because of abandonment of the government. Moreover, the budget for promoting the strengthening of RBO has not been provided from the government. In addition, public policy is still needed for micro water resources management.

The fourth issue is one of people's understandings of water resources management which does not match the demand of natural resources and efforts on environmental conservation and rehabilitation.

### **3. River basin management must start from the micro level**

The Huai Sam Mo (HSM) Sub-River Basin is one of twenty sub-basins in the Chi River Basin of the 5T area of Lower Mekong Basin. It extends into two provinces that cover Kok Po Chai district of Khon Kaen province, and Consawan district, Kang Kro district, and Phu Khiew district of Chaiyaphum province. HSM is located in the Korat Plateau. HSM covers 729 square kilometers or 180,150 acres (455,652 rai) that covers 1.47% of the Chi River Basin area. Agricultural area covers 318,718 rai which is 70 percent of the total area. Major crops include rice, sugarcane, cassava, maize, and legumes. Livestock include cattle and chickens. Irrigated areas cover 5,000 rai (3,000 rai using water released from a hydropower plant upstream and 2,000 rai in the downstream area using water from natural reservoirs). The residential area comprises 9 percent of the area with local residents including 12,139 households and 53,972 people. Annual rainfall and water demand are as follows (Integrated Water Resource Management Center, Khon Kaen University).

- Annual rainfall of 1,210 mm. (Highly spatial different in rainfall distribution);
- Total run-off 149 million m<sup>3</sup>;
- Long period rain spell;
- Supplementary water supply from hydropower 30 million m<sup>3</sup>;
- Total storage capacity 32.91 million m<sup>3</sup>;
- Water demand for all sectors 51.70 million m<sup>3</sup> insufficient water 18.79 million m<sup>3</sup>;
- Flat and high elevated topography – Table Mountain;
- Limited Gravity irrigation System – mostly pumping irrigation;
- Annual flood and drought disaster;
- Low fertile soil / with high percolation;
- Short period land utility - one crop a year.

### *HSM as pilot project of the Chi River Basin*

HSM was selected as a pilot site for the Upper Chi River Basin under the policy of the Ministry of Natural Resources and Environment for integrated natural resources management with local participation of people and good governance in solving water-related problems. The site was selected because it covers more than one province. Moreover, the characteristics of the HSM represent other sub-basins. Between 2002-2009, several agencies support HSM to identify its needs and strategies such as MRC-GTZ, World Bank, WWF, Khon Kaen University and the Department of Water Resources. A Sub-basin Working Group was established in 2006 as a coordinating body. The vision of the HSM sub-basin group is “HSM sub-basin has a strong organization to manage water sustainably and rehabilitate the natural resources by using local wisdom and government resources”. Local administration organisations are active participants of the development process.

HSM has identified five development strategies as follows:

- 1) Community water resource development;
- 2) Promotion of organic agriculture and income generation activities;
- 3) Institutional development and environment rehabilitation;
- 4) Development of local curriculum, local knowledge study and community rules ;
- 5) Promotion of the role of women and youth.

### *HSM as the research site on integrated water resource management*

The Integrated Water Resource Management Center from Khon Kaen University conducted the multidisciplinary research in HSM between January to December 2009. The research team members comprised of university lecturers in the field of agriculture, engineering and social sciences. Reports published by the center include:

- Efficiency of Irrigation Water User and Relationship with a Forest Ecosystem in HSM, Chaiyaphum province;
- Research on Format System of Agricultural Farm by Effective Using Water and Economize in Huai Sam Mo Catchment;
- Water Storage in Huai Sam Mo;
- The Potential evaluation and management of Ground Water in Huai Sam Mo;
- The Potential Development of village Ground water supply in Huai Sam Mo.

Under the IWRM approach, 12 workshops were organized in 2006 by HSM working group. Aims of the workshops were to study the past, to understand the present, and to draw the future.

## **4. Findings from stakeholders, researchers, and scientists**

### *Findings on engineering aspects*

There is only 3,000 rai of irrigated area along the main canal irrigated by water of 30 MCM after hydropower is generated from another basin. Comparing the amount of water irrigated with the water required in irrigation of paddy fields, generally in rainy season, that water after hydropower generation is not utilized effectively. Therefore, the proposed plan to construct a diversion canal to store unused water in the power generation plant can be effective to increase the irrigation area in the rainy season. On the other hand, equity to access to irrigation water is not secured due to the difficulty of the lateral canal. Only the farmers who have farmland beside the main canal can access water. Therefore, construction of a lateral and tertiary canal is necessary to secure equity to access water.

Due to insufficiency of irrigation water, an underground dam is proposed in the basin. However, the existing topo-geographical conditions are considered almost the same as that after construction of underground dam. Therefore, it is necessary to study this issue further.

#### *Findings on the agricultural aspects*

In project promotion and implementation, the close collaboration among the two provinces concerned and other institutions such as the Basin Committee, sub-basin working group and international aid agencies was important to secure a success story. Similarly, the views and opinions of local people was very important in project promotion, implementation monitoring activities. However, it was not clear whether water diversion for power generation had been done before project planning, however the water may cause benefits in the agricultural production in the HSM area.

Through the use of stored water in the dry season, which had been retained for the purpose of flood mitigation in rainy season, collaboration between the up- and down-stream basins could be realized. This will lead to overall higher agricultural production in the basin as a whole.

The pilot project is aimed to enable application of the project experience to other areas with similar conditions. There is surplus water in the donor basin and the surplus water may cause higher head if diverted to neighboring basins. This pilot project is the case of effective water utilization which derived from water diversion for power generation purposes. It is considered that there are very few areas with similar conditions. Therefore, it is difficult to apply good practice experiences from this basin to other areas, though it may be possible with right social and institutional aspects.

#### *Findings on environmental aspects*

Findings and lesson learned are derived from project paper titled "Three years experience in the Pioneer stage in Huai Sam Mo sub-basin (HSMSB) Management planning December 2008" and "Utilizing local knowledge in the watershed management plan: The case of Huai Sam Mo Watershed." With the clear vision of the HSMSB to manage water resources in a sustainable manner and rehabilitate the natural environment, four development strategies have been established and partially implemented.

- a) Surface water quality protection and the application of organic fertilizers and pesticides in rice farming enables protection of chemical contamination of watercourses. This is evident at Nong Saiwan tai village at Kaeng Khro district Chaiyaphum province;
- b) Aquatic ecology protection and the application of organic fertilizers and pesticides is not only protecting water quality but also benefits the aquatic ecology in watercourses such as plankton and fish. Developing fishery conservation zones and controlling usage of fishing gears enhance fish production and protection of fish species. This is evident at Non Kyrum village and Kud Lop in the HSMSB;
- c) Soil conservation of vegetation in slope area helps protect soil loss from erosion. This is evident at Saiwan tai village;
- d) Forest conservation in connection with religious practices (forest temple) helps control deforestation. This is evident at Ponetong temple, Nong Kae village.

Additional information about Huai Sam Mo Pilot Project from the Environment Group

Results from our interviews confirmed the following:

The pilot project in Huai Sam Mo (HSM) has had many donors and supporters since its inception. These include:

- a) The Mekong River Commission: funding for planning meetings and action plans (also supported by WB);
- b) KKU and DWR: support for technical aspects;
- c) WWF: study tour from a WWF project in Manchakiri which is supported by Coca Cola Ltd.

Currently there are river basin committees in the Kong, Mun, and Chi Rivers, however there is no sub-basin committee under the river basin committees. In the case of Huai Sam Mo, the members are part of a “working group” and follow the regulations/rules of the Chi River basin committee.

Huai Sam Mo covers some parts of 2 provinces and 16 Tambons, however, it has an independent budget and no relationship with the provinces and Tambons. Tambon Administrative offices do not play a role in the pilot project in term of financial support.

The MRC supports replication of the pilot project into 19 sub-basins. At present, half of them try to implement the same activities shown as below:

- a) Participation in watershed management;
- b) Integrated water resource management;
- c) Planning of community sub-basin (watershed management at community level).

Each area has different characteristics of topology, ecology, and environment resulting in a need for different planning and management approaches. Therefore, water resources management should be started at the micro level. By starting to plan at the household or farm or village level enables a closer view into various problems being faced by drought and floods. On the other

hand, one village may have drought problems while another village may face flood problems at the same time. A good database system of the problems and solutions is also needed for micro level water resource management.

Farms with flood problems need good water drainage systems, while farms which lack water needs a good irrigation system. But all require good storage systems at the farm level for saving water to use in the dry season.

From the HSM experiences, we found that the amount of water which drained among river basins was more than 180 million cubic meters per year, while water demand for all activities did not exceed 50-60 million cubic meters per year. Why do we still need water for our farms? Because water resources management has not started at the micro level.

## **5. Lesson learned**

As the project is ongoing and certain environmental resources are protected, it cannot be concluded at this stage that the natural environment at the sub-basin level can be rehabilitated. However with sound development strategies and implementation, there is a high potential of success. The heart of river basin management is to produce tangible results, therefore the central government and head of government agencies as well as local politicians should give full support. Technologies such as GIS and MIS were established under MRC-GTZ support. The working group should be trained on how to use these systems. People involve in the development process should be committed since the work requires coordination with government and non-government agencies.

Experiences through focus group discussions and dialogues of working groups have shown that **the real problem is not the water quantity but lack of a good management based on system thinking processes and clearly understanding the real environmental situation.**

## **6. Conclusion**

The Mekong River is an international transboundary basin which spans across six countries. All of these development issues have international implications and can only be resolved through an effective framework of regional coordination and cooperation. In the past decade, the MRC has demonstrated a series of stakeholder engagement activities for the region such as forum, special meeting and web based forums. Nevertheless, it should not be through symbolic activities to fulfill the engagement and participation process. From the experiences through focus groups and discussions and dialogues of the working groups (e.g. Huai Sam Mo Sub-basin Working Group), we found that the real problem is not the water quantity but lack of good management. However, we still need to be concerned about the equity of different groups of stakeholders and partnership agreements between the government and communities, which defines and guarantees the roles of communities.

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# **Key Factors Affecting Expansion of Irrigation in Cambodia**

Dararath Yem

Environment and Water Resources Management Advisor

## **Introduction**

Since the 1980s, the Royal Government of Cambodia has worked hard to construct new irrigation schemes and rehabilitate existing irrigation schemes, which were constructed during the Khmer Rouge regime to provide sufficient water for agricultural purposes to increase agricultural productivity and alleviate poverty of rural people. These efforts have been supported by international development agencies such as Japan International Cooperation Agency (JICA), Agence Francaise de Développement (AFD), World Bank (WB), and Asian Development Bank (ADB). The unsustainability of the irrigation schemes has been at the centre of debate among the RGC and involved international development agencies as it has been shown that most irrigation schemes are not functional after the cessation of the financial support from the international development agencies.

According to Perera (2006), irrigation development in Cambodia goes back in distant history to the Angkorian period between the tenth and thirteenth centuries. The Baray reservoir development during those centuries was intended to supply an area of around 7,000 hectares of rice fields.

Apart from the irrigation development in Angkorian time, current irrigation development has been classified into four periods as follows: i) the French Period (1930-1950); ii) Prince Sihanouk Period (1950-1970); iii) the Polpot Period (1975-1979); and iv) the Current Period (1980-now). Of the four periods, the irrigation systems in the Polpot period were constructed without proper planning and design, which were not only ineffective, but have also negatively affected the current hydrological systems. The systems were built without consideration of water availability and hydrological processes.

## **1. National strategies and policies**

Poverty reduction is a primary development goal of the Royal Government of Cambodia. Enhancement of agriculture productivity and water resources and irrigation system management are significant factors contributing to the achievement of the poverty reduction, which are also emphasised in the Rectangular Strategy for Growth, Employment, Equity and Efficiency (Phase II, 2008). One of the four major visions spelt out under the National Water Resources Policy 2004 was the provision of sufficient water to enhance agricultural productivity. The Ministry of Water Resources and Meteorology (MOWRAM) has set a goal for the period 2009-2013 to increase irrigated agricultural area by 50,000 ha/year additional to the existing irrigated agricultural area.

The Technical Working Group on Agriculture and Water (TWGAW), consisting of the ministries of Agriculture, Forestry and Fisheries, and Water Resources and Meteorology formulated Strategy for Agriculture and Water 2006-2010 (SAW) with the aims of meeting one of the specific targets of the National Strategic Development Plan 2006-2010. The SAW's goal is to contribute to poverty reduction, food security and economic growth through: i) enhancing agricultural productivity and diversification; and ii) improving water resources development and management.

## **2. Agriculture and irrigation system management**

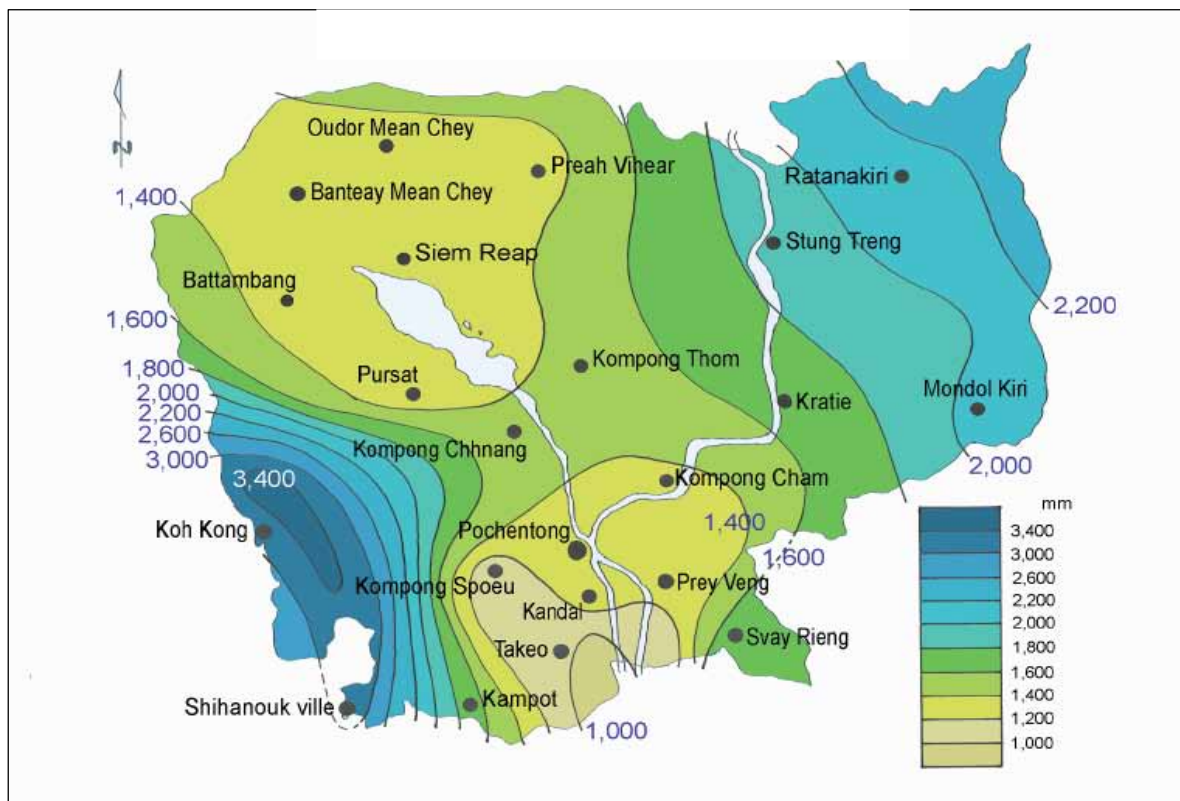
About 85 percent of Cambodians mainly rely upon agriculture and natural resources for their daily livelihoods. According to the NIS (2008), GDP's share of paddy and crops is however much higher than other agricultural products. Paddy rice production has fluctuated from year to year. The share of agriculture, fisheries, and forestry in the national economy declined from 46% of GDP in 1993 to 30% in 2006. The share of the crop sector increased from about 40% of GDP to about 50% (ADB, 2009).

According to the MOWRAM, Cambodia consists of 2,403 irrigation systems throughout the country. Yet, most systems are not very functional due to improper maintenance and operation. It was indicated that of around 570 schemes in the Tonle Sap Basin, only some 195 are fully operational. Most systems - whether functional or defunct - are used for supplementary wet season irrigation only, and the over-all crop intensity is less than 1 (ADB & CNMC, 2004).

Of the total land area, 21% (3.78 million hectares) is allocated for agricultural cultivated area, of which 91.2 percent of the total cultivated area is occupied by paddy cultivation (ADB & IFAD, 2009). According to NIS (2008), the total irrigated agricultural land is approximately 1,064,263 ha, of which 333,032 ha is located in the Tonle Sap area.

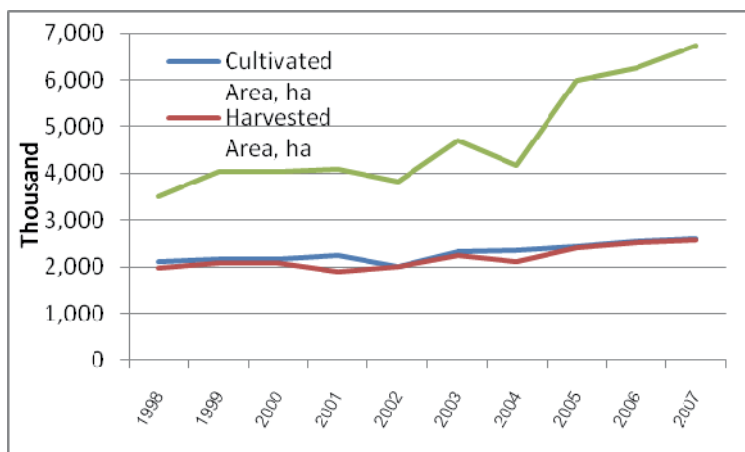
Management of the irrigation schemes has been transferred to the so-called "Farmer Water User Communities (FWUCs)" sometime before the finalization of support by international development agencies and non-governmental organizations (NGOs). While FWUCs were to be empowered to manage, operate, and maintain the schemes, it has been found that some irrigation systems are dysfunctional and others have completely ceased operation. This is despite the introduction of participatory irrigation management development (PIMD) in Cambodia since 2000 with a legal framework and policy support. The management of the systems by the communities is very weak. There are many problems encountered in association with the collapse of irrigation schemes. These problems include FWUCs' lack of financial management, lack of participatory management, lack of technical skills, lack of local leadership, and so on. As a result, a number of conflicts have taken place among the farmers within the systems and catchment, where the systems are located. It has been demonstrated that management support, conflict resolution, and performance monitoring are required to be undertaken by the MOWRAM in collaboration with provincial and local authorities.



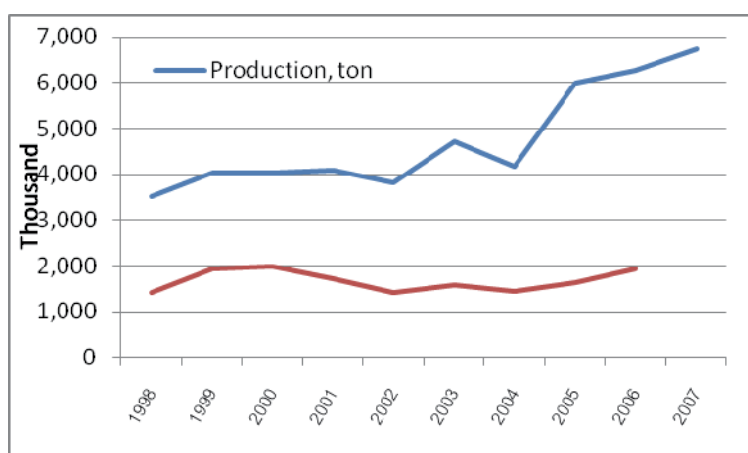


**Figure 1: Distribution of annual rainfall (1981-2004)**

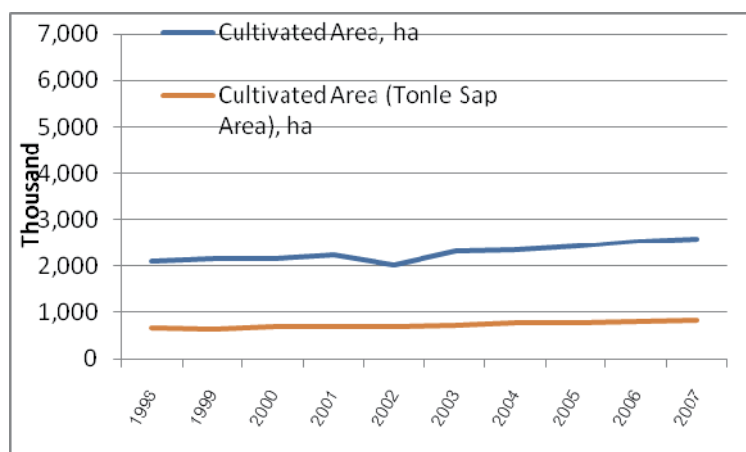
Source: NIS, 2008



**Figure 2: Cultivated area, harvested area, paddy production in Cambodia (1998-2007)**



**Figure 3: Production vs rainfall in Cambodia (1998-2007)**



**Figure 4: Total cultivated area throughout the country and cultivated area in the Tonle Sap Area (1998-2007)**

### 3. Challenges for expanding irrigation systems

It is believed that growth in agricultural sector will significantly contribute to economic growth, which alleviates the poverty rate throughout the country. Growth in the agricultural sector can be achieved through sufficient provision of water to the farmers, which enable them to obtain a high yield of agricultural productivity. Agricultural productivity cannot be increased unless the irrigated water is sufficiently and effectively supplied by expanding irrigation. However, expanding irrigation will not greatly lead to food security, poverty reduction, and economic growth unless the following key factors are carefully considered: i) Institutional and legal framework; ii) Sufficient water availability; iii) Farmers' willingness in terms of participation,

operation and maintenance, and crop diversity adoption; iv) Land tenure; v) Agricultural technology and access to markets; and vi) Climate change.

### *Institutional and Legal Framework*

As mentioned earlier, the FWUCs are formed with the support of MOWRAM's policy and legal framework. The so-called "Prakas" 306 (directive or declaration) on implementation of foundation related-documents to develop FWUCs was issued by MOWRAM in July 2000. The foundation related-documents are as follows:

- Circular No. 1 on the implementation policy for sustainable irrigation systems;
- Policy for sustainability of operations and maintenance of irrigation systems;
- The statute of the farmer water user communities;
- Steps in the formation of a farmer water users' community.

It has sometimes been found that the legal framework needs to be modified and flexible in accordance with the size of irrigation systems. Most FWUCs have reported that they are facing many challenges with the implementation of the legal framework. The challenges can be interpreted in different ways.

### *Sufficient Water Availability*

Many irrigation systems were built in the Pol Pot regime without proper design and planning, which have led to new irrigation system development. Water availability needs to be accurately assessed and studied prior to the new development of irrigation systems to avoid insufficient water supply to the system after its completion. In some cases, farmers and system operators reported that they found insufficient water during operation. Consequently, paddy rice is damaged due to insufficient water supply after the initial transplanting, particularly during the first two months.

### *Farmers' Willingness in terms of Participation, Operation and Maintenance, and Crop Diversity Adoption*

Participation of farmers in irrigation system development has been seen as a great contribution to the sustainability of the irrigation systems. It is always expected that farmers will participate in the development process, operation, and maintenance of the irrigation systems. As a result, main parts of the systems (construction of reservoirs, and main and secondary canals) are the responsibility of the MOWRAM and development partners in terms of grants, while the other parts of the systems (tertiary and other small canals) rest with the farmers. It has been demonstrated however that the farmers do not fully participate unless fair, equitable, and sufficient supplies of water are obtained by them. Lack of participation by farmers tends to contribute to the un-sustainability of irrigation systems due to unwillingness to contribute to the irrigation service fee (ISF).

### *Land Tenure*

Land tenure is very complicated in Cambodia. Many farmers have reported that they don't have lands for cultivation. They cultivate paddy or crops on lands rented from middle class and better off families. Based on interviews with many farmers, it was indicated that income generated from the rented-land cultivation was not enough for them to feed their children; as a result, they needed to look for other sources of income, for instance, selling their children's labour to work for other activities outside their villages, collecting non-forest timber products, doing other small business, etc.

#### *Agricultural Technology and Access to Markets*

Cambodian farmers are 'preservative' in terms of paddy cultivation. This means that they cultivate a traditional paddy variety with a seven- or eight-month rotation, which is tolerant to climate conditions and diseases. Moreover, they usually use different seed varieties, which can lead to low production. Fertilizers and pesticides are used by the farmers in an inappropriate manner in accordance with their neighbours' experience and practices.

#### *Climate Change*

According to the case study conducted by Ministry of Environment (2006), the frequency and intensity of floods may increase with changing climate conditions, leading to severe damage to paddy cultivation and harvests. Droughts and floods have resulted in a significant number of fatalities and considerable economic losses. Losses arising from floods have been further exacerbated by deforestation. Floods have accounted for 70% of rice production losses between 1998 and 2002, while drought accounted for 20% of losses.

It is believed that all irrigation systems constructed in Cambodia have not taken into account climate change. The irrigation system structures are not strong enough to withstand with heavy floods resulting from the change of climate. Experience was shown that most irrigation dams and water weirs and gates were washed away by the heavy floods. Expanding irrigation systems in new irrigation system development therefore has to be carefully undertaken, with consideration of climate change conditions.

## **4. Conclusion**

The agricultural sector, especially paddy and other crops, makes a significant contribution to economic growth. Enhancing agricultural productivity will assist in reducing poverty in rural and remote areas. This can be done through a number of factors, including improving soil quality, enhancing agricultural technology, improving access to markets, supplying sufficient water to the fields through improving irrigation systems and expanding irrigation systems, and improving and revising legal framework.

The agricultural productivity cannot be increased unless the irrigated water is sufficiently and effectively supplied by the expanding irrigation. The expanding irrigation will not automatically

lead to food security, poverty reduction, and economic growth unless the following key factors are carefully considered:

- Institutional and legal framework;
- Sufficient water availability;
- Farmers' willingness in terms of participation, operation and maintenance, and crop diversity adoption;
- Land tenure;
- Agricultural technology and access to markets;
- Climate change.

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# Critique of the Draft Basin Development Strategy<sup>1</sup>

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The IWRM-Based Basin Development Strategy for the LMB identifies a “development opportunity space” that is supposed to achieve a balance between acceptable economic, social and environmental outcomes in the Mekong River Basin, with net benefits shared equitably. It draws on scenarios developed from hydrological modeling and other studies carried out by MRC, including baseline situation, “definite” future situation based on committed projects, foreseeable future situation based on 20 year options, and longer term future situation based on high-level development.

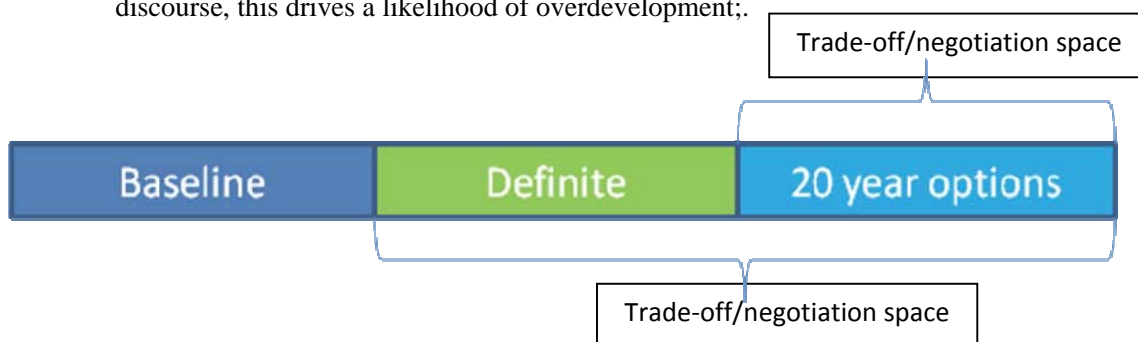
While the strategy does an important job in bringing together highly complex data and projections as a basis for collective planning among riparian countries and diverse stakeholders, it suffers some critical flaws. The critique is based on the following key points:

- IWRM is referred to no less than 125 times in the draft strategy, but it is not defined or discussed. This creates a sense of window-dressing old-style plans with fancy language. There are three main senses in which IWRM seems to be applied: in considering economic, social and environmental objectives through a “triple bottom line” approach, with an attempt to structure scenarios in terms of tradeoffs; by treating the Basin system as an integrated whole so that the maintenance of dry season flows at the head of the Delta can be maintained through storage-based releases compensating for irrigation and other offtakes; and in assessing the net benefits and losses under different scenarios for each country in order to distribute costs and benefits between countries. Less clear are the questions of whose voices are integrated into the planning, what kind of development outcomes are envisaged, with benefits and costs for whom, and what kind of planning is envisaged for those affected by occupation of the “development opportunity space”;

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<sup>1</sup> This critique was presented on invitation from the MRCS BDP team. The oral and written version of the critique presented at the Forum was based on the October 2009 version of the IWRM-based Basin Development Strategy supplied to me a few weeks ahead of the Forum, and a Chapter 5 and Chapter 6 supplied 10 days ahead of the Forum. However, the updated document that the Forum was asked to discuss was not shown to me until the first day of the Forum, when it appeared in the participants’ packages. The current version has been updated to take account of the version of the Strategy document received at the Forum.

- The integrated approach plays lip service to participatory decision-making, but ultimately delivers a macro-oriented set of scenarios in which there is little room for local input or discussion of multiple interests within each of the national spaces. It is simply untrue to say that the Strategy has been produced through a “highly participatory process”. Further, even if the BDP now aspires to a more stakeholder-based approach than hitherto, the key procedures that underlie relevant decisions such as PNPCA have no mechanism for participatory input;
- The Strategy is fundamentally hydrologically driven. The concept of “development opportunity space” that underlies the approach is based on setting the parameters within which water can be stored and extracted such that each country shares in benefits and so that the hydrostatic pressure at the head of the Delta is sufficient to prevent further saline intrusion. Development opportunity space driven by ecological and livelihood limits would produce quite different scenarios for diverse Basin stakeholders to consider. The presentation by Dr. Thanaporn Piman showed little difference in the hydrograph between definite future and 20 year scenarios, yet the impact of the additional 11 mainstream dams and 30 tributary dams on fisheries and wetlands is very significant. Dr Tony Green’s presentation states that hydrological modeling is well ahead of other critical aspects of analysis. It is therefore premature to come up with recommendations based on the existing level of analysis;
- It is not made explicit what the “definite” scenario is based on. In addition to the eight Lancang Jiang dams, 26 tributary dams are taken as given. This implies that MRC / BDP accepts no role in providing strategic advice or participatory input on these projects. After more than a decade of (ostensibly participatory) Basin Development Planning, this is odd.;
- Following the previous point, the “balance” between hydropower and other water resource infrastructure development, on the one hand, and on maintaining ecological integrity and the livelihoods that depend on it, on the other, takes the definite scenario as the starting point and another 26 tributary plus 11 mainstream dams as the negotiable development opportunity space within which to consider or negotiate tradeoffs. Nowhere in the strategy is there a consideration that the tradeoff starting point might be the baseline. At a political level in a region with a heavy development vs environment discourse, this drives a likelihood of overdevelopment.;



- Some of the key assumptions need to be spelled out. Notably, the value of fisheries assumed in the NPV calculations will have a crucial bearing on the tradeoff outcomes. Other MRC assessments have put the annual value of fisheries at between \$1.4 and \$6 billion dollars. With projected losses of up to 40 percent, the difference between these figures is likely to have a major bearing on NPV, even before the distributional implications are considered. Yet it appears that an extremely low value of fisheries is being used for, and hidden in, the analysis. Any robust discussion on the scenarios need to make such assumptions transparent. Also, irrigation benefits have historically been greatly overestimated. It does not seem that this taken into account in assessing net benefits;
- The distributional implications of the tradeoffs are considered mainly at a country to country level. MRC's own work, for example in the fisheries program, acknowledges that most water related developments – and dams in particular – concentrate primary benefits in the more advantaged sectors, while the losses tend to affect the most vulnerable. There is no consideration of how the social distribution of benefits will support national poverty reduction targets or international standards such as Millennium Development Goals. Instead, “poverty reduction” is implicitly assumed to follow the old trickle down assumptions from the economic surplus generated by business activity and fiscal receipts;
- The experience of compensatory and mitigatory measures at project and national level has been very poor in the Basin. Implications that the uneven social impacts of development might be compensated or mitigated at the transboundary level are quite unrealistic;
- There is no reference to the findings of the Strategic Environmental Assessment. If MRC is to work as an IWRM-based organization, it needs to integrate its major programs and decision support oriented scientific assessments. This includes presenting options to put mainstream dams on hold until their implications are better understood. This may be a question of timing, since the SEA draft report has only recently been completed, but the Strategy and this workshop need to take on board its findings and recommendations if there is to be informed stakeholder engagement;
- The tone of the strategy document is complacent. The first mention of dams is on page 10, whereas dams are at the centre of the picture. It describes as “remarkable” the fact that there is substantial room for expanding irrigation off-takes, despite the fact that this in turn require major increase in storage capacity, which in turn again lead to the hydrological regime changes of Tonle Sap and other key parts of the Mekong system that produce the fisheries decline projected in this document and the SEA. This tone does not lend itself to cool and balanced assessment of real strategic choices. It rather promotes a complacent path of incremental development within the “development opportunity space” identified;



- The recommendation on page 46 to accept all 30 tributary dams identified in the 20 year scenario, plus all five mainstream dams above Vientiane, plus the 26 “definite scenario” tributary dams (and of course the eight Lancang Jiang Dams) and to present this as an agreed decision by all the countries within a highly participatory process is absolutely misleading, premature, and contrary to any semblance of input based on meaningful consultation that this stakeholder meeting is supposed to represent. There is no such consensus;
- In recommending the “LMB 20 year plan scenario without Lower Mainstream Dams” (i.e. without dams below Vientiane but including the six dams above Vientiane), the strategy proposes on page 44 that “strategic studies commence relating to fish passage technology for Mekong conditions and to the future of the giant catfish...”. MRC’s fisheries program has presented publicly and conclusively at many forums that there is no fish passage technology that can deal with the passage of fish past mainstream dams. WWF has warned that mainstream dams along this section of the Mekong will drive the giant catfish to extinction. To suggest that there is development opportunity space for these six mainstream dams is entirely inconsistent with the best scientific evidence if concern over fish migration and the giant catfish are taken into consideration;
- By MRC’s presentations, notably the presentation at the Forum by Larry Haas, if all the mainstream dams were to be built by 2030 (i.e. within the 20 year foreseeable future scenario), they would contribute 6 per cent of the power needs of Thailand and Viet Nam. The power demand growth projections in the LMB are of the order of 5 to 10 per cent per annum. This means that the entire cascade of Lower Mekong Dams will at best serve the function of catering for 12 months’ increase in power demand, after which the need to find alternative sources or savings will be back to where it was a year earlier. The SEA indicates that the incremental loss of fisheries from the construction of mainstream dams will at least 600,000 tons per annum and up to be up to more than twice that, or about 40 per cent of the total catch. This raises a fundamental strategic question for BDP, MRC and the lower Mekong countries: is the loss of freshwater fisheries equivalent to at least 1.5 times that of the entire Amazon Basin, or the whole of West Africa, worth sacrificing for one year’s increment in power supply growth?;
- While the draft Strategy document does not explicitly define IWRM, MRC’s IWRM program elsewhere subscribes to the common definition of IWRM as, “a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.” MRC’s own work indicates that the main protein food security of the region’s poor will be undermined by the recommended scenario, including a decline in fisheries of up to 40%; that the distribution of costs and benefits is highly unequal between countries (notably Cambodia and Lao PDR); that several flagship species and dozens of other fish

species are likely to become endangered or extinct; that several biodiversity hotspots will be destroyed or severely impacted. Nowhere in the strategy is it explained how this is equitable or consistent with sustaining vital ecosystems. It is thus highly misleading to represent this document or process as an IWRM-based strategy.

## **Recommended course of action**

The Draft Strategy and related documents have done a valuable job of bringing together highly complex information to present scenarios to stakeholders for deliberation on an informed basis. It has gone astray in suggesting that there is a basis for consensus and in driving that consensus in a particular direction prior to proper deliberation. It might be possible to achieve consensus on the quality of the data and scenario implications produced by MRCS/BDP, if this is well explained to basin stakeholders and if the assumptions behind the calculations are made more transparent. It is a big jump, however, to suggest that such a consensus extends to a mutually agreed adoption of a single scenario at this point. Current stakeholder positions on the desirable level of hydropower development, particularly regarding the mainstream dams, remain quite diverse and far apart.

A fundamental re-think is necessary if the BDP is to be a BDP geared to the needs of the Basin's poor, and not a basin (hydro)-business plan geared to extracting and concentrating benefits from the Mekong for an already advantaged group at the expense of dispersed benefits provided by the river to the disadvantaged.

- Development opportunity space needs to be reconsidered in terms of enhancing food and livelihood security for the poor;
- Use Millenium Development Goals, food security and IWRM principles of social equity and not compromising the sustainability of vital ecosystems, rather than NPV, as primary criterion for analysis of development outcomes of different scenarios;
- Recognize limits of large stakeholder forums as the basis for scenario adoption, and seek more genuine input from scientists and basin stakeholders who have continued to express concern over the development opportunity space notion as currently applied;
- Move away from big stakeholder forums toward a reference group model broader than the current Panel of Experts for ongoing strategy development;
- Learn more from existing dams; ensure that the definite scenario dams are properly mitigated, and tradeoffs equitably managed before committing any more in the 20 year scenario;
- Develop a broader advisory group/panel of experts drawn from a wider range of interests and areas of expertise than at present, on an ongoing basis, mandated to:
  - Provide advice on key issues;
  - Engage with other sections of MRC;
  - Engage with researchers, affected communities, CSOs, universities, etc within the basin to bring in diversity of views in ongoing way.

# Integrated River Basin Management in Lao PDR: Case of the Nam Ngum River Basin

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## Introduction

Although Lao PDR remains one of the poorest countries in the region, it is well-endowed with rivers and water resources that have high potential for hydropower and irrigation development. More than 90 percent of the total area of the country is located in the Mekong Basin, accounting for approximately 25 percent of the total area of Basin.

The country has extensive forests of valuable tree species, valuable mineral and metal deposits including gold, copper, and bauxite; and with a relatively small population, extensive lands that are attracting rapidly expanding foreign direct investment for forest and agricultural concessions. On the other hand the rugged terrain, limited capacity of human resources due to poor education; opaque governance and rapid expansion of poorly regulated private-sector-led development places Lao PDR at risk of not making optimal use of the countries resources for the long-term benefit of its population. The current rapid increase in concessions being granted and the numbers of dams, power plants and transmission lines currently under planning or construction has contributed to major water resource issues being faced in Lao PDR.

The Lao PDR is the source of approximately 38 percent of the annual flow of the Mekong River. The water resources and topography of Lao PDR give it great potential for hydropower development, an important part of the national socio-economic development strategy. Water resources are also valuable for other economic sectors such as irrigation, rural and urban water



**Figure 1: Major river basins in Lao PDR**

supply, fisheries, tourism, mining, industry, transportation and others. With water availability of more than 55,000 cum/cap/year Lao PDR has the highest water availability per capita in Asia, and only a tiny fraction of this is being developed and used. However, due to the highly seasonal availability and use of water in a monsoon climate, shortages and competition for water do arise locally in the dry season, and as continued development takes place, increasing scarcity and competition for water can be expected. Increasing impacts of development on water quality and on human health and the natural environment, not least from increasing mining activities, will also take place.

## **1. Progress with water reforms**

The government is working very constructively to improve the water resources planning and management system in Lao PDR. The Prime Minister's Decree setting up the Water Resources and Environment Administration (WREA) was issued in May 2007. WREA was established within the Office of the Prime Minister and includes the following departments: i) the WREA Cabinet Office, ii) the Department of Environment (DE), iii) Department of Water Resources (DWR) iv) the Water Resources and Environment Institute (WERI) and v) the Department of Meteorology and Hydrology (DMH) with the Waterways Unit formerly of the Ministry of Public Works and Transport, and, vi) Environment and Social Impact Assessment Department (ESIA), vii) Greater Mekong Sub-region Department, Provincial-level water resources and environment departments are being set up to take over the water and environmental functions of the science, technology, and environment agency.

The previous Water Resources Coordinating Committee served as the Water Apex Body for the country, while the Lao National Mekong Committee (LNMC) served as the liaison to the Mekong River Commission, and hence the linkage between national and regional/basin water resources development and management. The two bodies have recently been merged with LNMC becoming the national Water Apex Body. LNMC has become part of WREA thereby placing WREA in a central role both in coordinating the national water sector, and within the wider setting of regional water resource management.

WREA is taking an active approach in defining its priorities and coordinating donor support around these. The WREA strategic plan, along with the plans and priorities of other water sector agencies, provides the framework for donor support within a true program approach. WREA is starting to lead this process rather than allowing international partners to dictate priorities or select only high profile “attractive” projects in an uncoordinated manner. This program approach will be based on national priorities and a practical and pragmatic approach. It will also incorporate adequate governance provisions (safeguards, monitoring, reporting, etc) which originate in the Ministry of Finance and Ministry of Planning and Investment.

A number of critical elements are now coming into line to make a program approach possible. As indicated above, WREA is actively organizing and strengthening itself from the central to the local level. It is proceeding to update its National Water Resource Policy and develop its Strategy

with ADB/AusAID assistance. A review and updating of the Water Law and related legislation are underway. Other aspects of the IWRM Support Program are being refined and developed and WREA is taking initial action to set up a program management unit within its Cabinet Office.

The ADB has worked with development partners in Lao PDR to mobilize the necessary resources to implement these activities as a multi-donor supported program. The national IWRM support program (NIWRMSP) has been designed to provide a common framework for development partners to coordinate support to WREA to provide capacity building to enable the administration provide the necessary leadership in water sector decision- making and regulation. The NIWRMSP, estimated to require about some US\$ 18 million over a five-year period, covers 10 components: national IWRM capacity building; implementation of the National Water Resources Policy and Strategy; support to the Department for Meteorology and Hydrology; review and revision of the Lao PDR Water Law; hydrology and modeling; water quality and ecosystem health; water resources inventory and assessment; river basin and sub-basin management; IWRM Bachelor's Degree course at National University of Lao PDR; and strengthening groundwater management.

## 2. The Nam Ngum River Basin (NNRB)

The Nam Ngum River Basin (NNRB) is one of the most significant and important river basins in Lao PDR. It is the 2nd largest river basin both in terms of annual flow and population (9 percent of the country population), and the 5th largest in terms of area (7 percent of Lao PDR). The Nam Ngum's annual flow is 21 billion m<sup>3</sup> which is 14% of the flow of the Mekong River. This plentiful water resource underpins an unusually large number of industries and communities which are dependant in some way on having a reliable and predictable water resource. Important industries in the basin include hydropower, irrigation, aquaculture, mining, navigation, manufacturing, tourism and recreation. In addition, a reliable and high quality water supply is essential to the health and well-being of the many urban and rural communities as well as for maintaining the biodiversity in the

<i>Physical Features</i>	
Area	16,841 square kilometres ( 7.1 % of national area)
Length	354 km
Elevation	Minimum: 155 m (Nam Ngum junction with Mekong river) Maximum : 2,820 m (Phou Bia)
Annual Rainfall	Maximum : 3,500 mm (Vang Viang) Minimum : 1,450 mm (Phonsavan)
<i>Water Resources</i>	
Average Flow to Mekong River	22 billion metres <sup>3</sup> / year (14.39% of Mekong River Flow)
Flow through Nam Ngum 1 Reservoir	9.1 billion metres <sup>3</sup> / year (44.5% of flow into Mekong River)
Annual Water Use	0.9 billion metres <sup>3</sup> / year Agriculture 99% Urban 0.48% Industrial 0.08%
<i>Land Cover and Use</i> (compiled from 2003 GIS data obtained from NGS)	
Natural Forest Cover	47.35 %
Shrub land / Regrowth	33.66 %
Agriculture	8.04 %
Grassland	7.10 %
Water Surface	3.82 %
Urban	0.02 %
<i>Administration</i>	
Provinces Included in the Basin	Xieng Khouang Province, Luang Prabang Province, Vientiane Province, Vientiane Municipality, Bolikhamxay Province
Number of Districts	19
<i>Socio-Economic Features</i>	
Population	502,150 persons (8.9% of Lao PDR)

**Figure 2: The Nam Ngum River Basin**

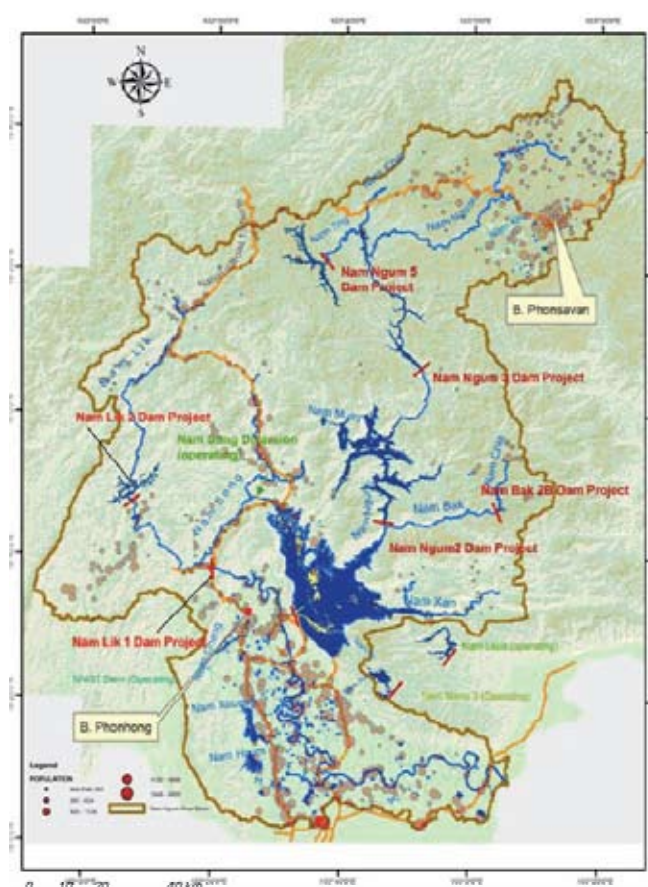
river basin. Overall, the current water and related resources in the NNRB river basin are plentiful and still in good condition, although dry season water shortages and land degradation are challenges locally. There are both future opportunities for development as well as future risks which could degrade water environment conditions or threaten the established rights of existing water users and uses including the environment.

There are currently four hydroelectricity related schemes in or diverting to the Nam Ngum River Basin with a total storage capacity of almost 7,300 million cubic meters (mcm) and an electricity generation capacity of 255 MW. The largest of these dams, Nam Ngum 1, has a storage capacity of around 7,000 mcm. An additional six dams are at various stages of planning and construction and a possible barrage across the lower Nam Ngum River is being investigated. From the 255 MW operational in 2007, projected development in Nam Ngum is estimated at between 1,500 and 1,800 MW of installed hydroelectric generating capacity by 2020, and bringing the total storage volume to more than 17,000 mcm.

### 3. Improving water security in the NNRB

Relative to the challenges in the basin, the Lao PDR has lacked the capacity required to implement Integrated Water Resource Management (IWRM) approaches in an adequate manner. This has significantly limited its ability to manage its own water resources strategically, to ensure that the rapid development of water-related projects occurs in a balanced (economic, social and environmental) and acceptable way. This highlighted the need for the country to have appropriate policies and capacities for water resource management.

The Nam Ngum River Basin Development Sector Project (NNRBDP) has been implemented with the assistance of the Asian Development Bank (ADB) and Agence Française de Développement (AFD). It has been an important step in the progressive implementation of IWRM in Lao PDR. The Project's long term goal was optimal use of water resources, especially in the NNRB. Two immediate project objectives were to: i) foster and institutionalize IWRM in the mainstream



**Figure 3: Location of existing and planned hydroelectricity schemes in NNRB**

planning process of the Government at the central and provincial levels, and ii) support investment interventions in relatively degraded parts of the NNRB to provide sustainable livelihood opportunities for poor and ethnic communities. To meet its objectives the Project includes the following components: i) Integrated Water Resources Management (IWRM); ii) Reservoir Management and River Basin Modeling (RMRBM); iii) Watershed Management (WM); and iv) Office of the National Project Manager.

The development of a Nam Ngum River Basin Committee (NNRBC) was pursued throughout the NNRBDP. In the early stages of the Project it was not clear at what level or under what legislation the formation of a NNRBC could take place. After the formation of WREA it was indicated that the formation of a river basin committee might be delayed until provincial and district WREA offices had been formed and strengthened. In 2008 discussion took place regarding the formation of a possible “hydropower forum” in the NNRB and the NNRBDP provided draft legislation for that purpose. At that time the DOE questioned the need for a hydropower forum and indicated that issues such as water resource royalties could be addressed in other, simpler ways.

In 2009, with the formation of the reorganized LNM, a legal basis was given for the Minister of WREA to establish river basin committees which would report to the LNM, and a draft Decree was prepared and revised. This Decree is still awaiting final approval by the Government. Discussions have been held with the basin provinces and a broad support built up for the formation of the RBC, with the role to assist the Government to ensure that water resources are developed and protected in sustainable manner and in accordance with national policy and objectives. The membership of NNRBC would include provincial representatives, major water-related agency representatives (such as electricity, mines, irrigation, water supply and water resources management), and representatives of social agencies, mass organizations and private sector. However, one issue constraining establishment of the Committee is the rather weak legal basis for such bodies in Lao PDR. The Law on Water and Water Resources (1996) does not mention river basin organizations; a revised law is envisaged as part of the NIWRMSP which is expected to include provisions for RBC for the basins and sub-basins.

#### **4. Main water resources issues of the NNRB**

**Watershed management** – Under the NNRBDP the Ministry of Agriculture and Forestry (MAF) has established capacity to undertake sub-watershed planning, largely from a land use and for planning agricultural support services. However WREA has the mandate for water resources allocation and regulation, so coordination between the two ministries is called for in order to coordinate local watershed management with the planning and management at basin level. In 2009, internal coordination arrangements were discussed and agreed upon between NNRBDP’s related units (IWRM and IWMU) of WREA and MAF, through minutes of the meeting. However, the said document will need to be developed to a more expanded binding institutional arrangement between the MAF and WREA as regard to inter-agency coordination for future projects.



**Royalties for water resources development** - A linked concern is the lack of formal mechanisms to determine the royalties to be levied from resource users and the Government has requested assistance on this topic. The analysis of options for determining royalties should identify sustainable financing environmental services through royalties or through a separate environment management levy. An important issue is how these mechanisms would then apply to existing concession agreements such as Nam Ngum 2 Hydro Power Project.

**Coordinated reservoir operations** – Concessions for hydropower development are approved individually in response to proponents’ applications, and the operation and dispatch of power is controlled by individual power operators and their clients. Where a cascade of hydropower installations is created, such as the currently planned four installations on Nam Ngum (NN1, NN2, NN3 and NN5) it is likely that the benefit to Lao PDR may be increased if the operations of these assets could be better coordinated. Component 2 of NNRBDP studied the opportunities for such coordination using the PARSIFAL model, and estimated that power production from NN1 could be enhanced by up to \$7.3 million/year after NN2 comes into operation.

**Water quality issues related to mining** - By 2007 over 6,000 km<sup>2</sup> of mine concession areas have been approved in the basin and mining activities are expected to intensify in the future. A majority of those mining projects that presently are listed as in prospecting and/or exploration stages are expected to move into operation. With more operational mines the probability of accidents with potential to cause water-quality impacts increases.

**Balancing economic development and environment protection** - Approximately 35-40% of the Nam Ngum River mainstream will be submerged once the currently planned mainstream reservoirs are completed. If related laws and regulations are not enforced to support sustainable management of the river basin, this development may bring about negative impact on ecosystems and environment. The immediate challenge is to develop the basin's water resources to secure the appropriate quantity and quality of the resource, including environmental flows to downstream ecosystems, and share the benefits fairly between the different users and the biodiversity of the ecosystems.

**Inter-basin transfers** - A number of inter-basin transfers are already taking place within the NNRB, including additional water from sub-basins into the Nam Ngum Lake for additional hydropower generation. However, plans are also being discussed to transfer water from the lower Nam Ngum Basin to Northeast Thailand (in a tunnel across the Mekong River). Such transfers have implications for both “donor” and the “recipient” basin/sub-basins, in terms of benefits sharing, as well as in terms of environmental and other social impacts, which need to be carefully considered.

**Adaptation to climate change** - Projections of the impact of climate change in the NNRB vary, between 3% increase to 5% decrease in flows. In addition the occurrence of extremes in the form of intense rains, floods and droughts are likely to increase. These changes need to be addressed,



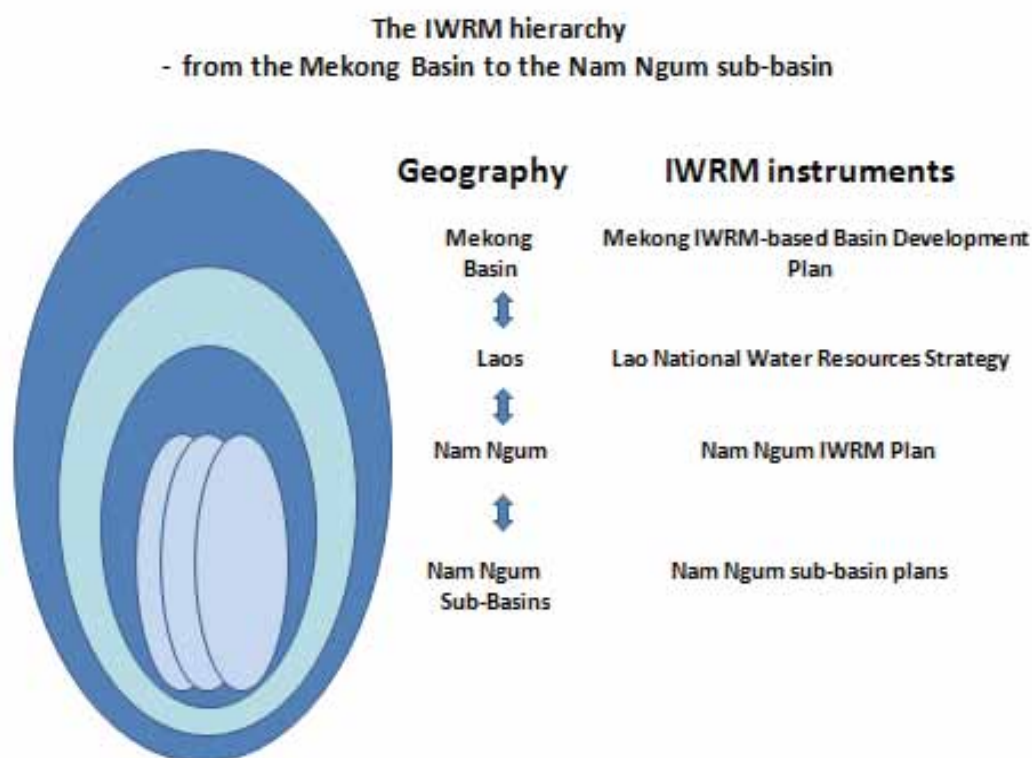
by improved and more accurate impact assessments while simultaneously planning and implementing adaptation measures<sup>2</sup>. A special challenge in this context is to ensure that adaptation is “mainstreamed” in IWRM development, and not carried out as a separate activity.

**Technical capacity and funding** – Technical capacity and financial resources for river basin planning are very limited given the relatively recent creation of WREA. Technical studies and training activities have been carried out by international and local consultants. Future planning studies need to adequately budget for this kind of input. Without adequate funding, limited counterpart staff will be “spread thinly” across future river basin planning activities with the prospect of limited outputs and benefits. Provincial and district water resource management capacity is being strengthened, which will help improve the delegation of more water resource management functions to the local level and thus greater participation by stakeholders in these functions. Greater awareness of water resource management issues and the need for careful management and conservation of the resource is needed. Some of these gaps are being addressed in the NIWRMSP now being developed.

**Data management** – Better information and tools to support management and analytical and planning capacity needs to be improved. This includes better natural resources information as well as better information sharing of development plans, concessions and their possible water resource impacts. It should also include studies, such as impacts of climate change and reforestation on water yields and quality. Although there has been reasonably successful collaboration between WREA and MAF on data sharing under NNRBDP, there is a need to sustain this collaboration beyond project completion. Plans are underway under the NIWRMSP for WREA to play a stronger role in these areas. A more sustainable financial basis is also needed as part of the improvement of water resource data and information management.

## **5. The Nam Ngum – Mekong linkage**

As described above the Nam Ngum River Basin is part and parcel of the larger Mekong River Basin, and hence any development in the NNRB, addressed by Lao national, provincial and basin institutions, are at the same time developments in the Mekong River Basin addressed through the Mekong River Commission (MRC) channels. While many smaller national projects in the NNRB may have little impact in the larger Mekong context, their cumulative effects may be significant. Other developments, such as the major hydropower schemes now being planned, are likely to have transboundary and basin-wide implications which need to be considered.



**Figure 4: The Mekong – National - Nam Ngum linkage**

The developments in the Nam Ngum call for close coordination between the Mekong “IWRM-based Basin Development Plans” now being prepared with the Lao National Water Resources Strategy and Action Plan and the IWRM Plan for the NNRB, as illustrated in Figure 4.

## **6. The IWRM plan for sustainable development of NNRB**

Related to NNRB, the “Draft Nam Ngum River Basin IWRM Plan” (March 2010) has been prepared, concluding in a series of Key Result Areas (KRA) which flow from and are directly linked to the Vision and Goal for the basin and, the studies and consultations undertaken to develop the plan. The work plan is organized into strategically related KRAs where specific actions for implementation are identified. The KRAs are the important areas which need to be addressed most urgently in order to achieve the Plan’s vision and goal. They are largely self contained areas of work which are focused on the responsible agencies and aim to minimize duplication between sectors and prospective donors. Each KRA identifies important strategies and activities for the next 5-10 years which will depend upon ownership at all levels, as well as technical and financial support.

The responsibility for implementing those actions remains with the responsible government agencies and appropriate level of government. The Actions identified in the Plan are to be included in the 5 year and annual work plans of the different levels of government and their agencies. Coordination and oversight of implementation of the Plan will be done by WREA in cooperation with a RBC involving line agencies and Provincial governments. MAF has played an important role in the development of Plan. As this is the first river basin plan in Lao PDR, this Plan and the supporting approach provides an initial template for river basin management activities elsewhere, and MAF will continue to play an important role in capitalizing the lessons learned and providing technical supports to the process.

Criteria for identification of Key Result Areas, Strategies and Activities of the Plan are:

- a) Importance of the action to achieving the Vision and Goal of the NNRB Plan;
- b) The action is directed at and specific to the NNRB;
- c) The action has been shown to be important from technical studies and / or consultations with the river basin stakeholders;
- d) The action requires the support of basin governments at different levels, sectors and/or the River Basin community;
- e) The actions are within the executive power and responsibilities of Basin governments;
- f) The action is feasible and practicable.

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# **An interagency approach to river basin organization formulation: An exploratory model from the Nam Ngum River Basin Development Sector Project, Lao PDR**

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## **National setting**

Lao PDR is envisioned as the battery of Southeast Asia. The country is endowed with rich water resources, which abundantly flow year-round along several networks of streams and river systems. Such potential to become the main supplier of electricity in the Mekong is a matter of time. Today, hydropower and irrigation are high priorities for investment by the Government of Lao PDR (GoL). But water is also regarded as a critical link to other sectoral developments, the pursuit of food sufficiency in particular.

The multiple usages of water resources for irrigation, power generation, fisheries, navigation, recreation, industrial, and for domestic consumption, makes water allocation a tough management challenge. Correspondingly to these competing uses are different agencies mandated to manage wisely this common resource, either with conflicting or complementary objectives. To arrive at the best combination of uses, there will always be some trade-offs, those who lose and those who gain. Thus, the formation of a River Basin Organization (RBO) as an institutional mechanism to help address conflicts and competition in the use of the common resource is deemed necessary.

## **1. Project background**

The Nam Ngum River Basin (NNRB) is one of the most important major catchments in Lao PDR. It is the second largest in the country, with 21 billion cubic meters of annual water yield, 14.4 percent of the flow of the Mekong River. NNRB was selected as pilot site of Nam Ngum River Basin Development Sector Project (NNRBDSP). It started in 2002 through an ADB loan and a grant from the Agence Française de Développement (AFD). The project is implemented by the Ministry of Agriculture and Forestry (MAF), Water Resource and Environment Agency

(WREA) and Ministry of Energy and Mines (MEM). The overall aim is to show case how integrated and multiple-use natural resource management can be pursued through interagency partnership. The project provides the first opportunity for central, provincial, and district units of the country to implement Integrated Water Resource Management (IWRM) through hands-on and closely interlinked activities. The IWRM concept seeks to ensure effective and efficient water resource management in a river basin. While intended to reinforce links and synergies between water, land use, environment, and development, in practice, it is complex. It involves various agencies and stakeholders with competing or conflicting resource concerns, oftentimes cuts across several administrative boundaries and cultural divides.

## **2. Objective of this paper**

This paper presupposes that any management body at the river basin level that is not directly linked to real land managers (farmers) or resource users at the Kumban level is bound to fail in its mission and goals. Thus, to set up a functioning RBO, it must be built on strongly established and diverse users' groups or land managers at the ground level.

The paper highlights the importance of forming the Landcare units at the village and district levels as the nuclear organization to comprise the RBO. It is guided by the underlying principle:

“There shall be a demand-driven and community-based approach to river basin management involving two parallel components. Firstly, one where the demand is determined by national priorities and concerns. Secondly, one in which the direct stakeholders can articulate their needs and actively participate in the planning, conservation, management and sustainable utilization of their local watershed resources for multiple purposes.”

This paper aims to present a proposed RBO with a broad base institutional membership from the village up to the province level. Most the content of this paper were derived from the Nam Ngum River Basin Midstream Landscape Continuum Western Segment Management Plan produced by the Integrated Watershed Management Unit (IWMU), Department of Planning, Ministry of Agriculture and Forestry.

## **3. Proposed river basin management set-up**

In the course of the long search for a appropriate physical framework that could match the specific need of each administrative unit involve in land use planning, IWMU-NNRBDSP likewise evolved an organizational management set up that would provide institutional context of a watershed management plan. For instance, at the province level, the watershed landscape continuum transect is more appropriate for PAFO because oftentimes, a river basin straddles one or more provinces. At the District, land use map is what DAFO needs because most of the land delineation and allocation activities are done at this level. Similarly, at the Khet Center, farm planning using the agro-ecosystem zone is what the farmers can identify with their cropping

system at the plot level. With this proper match of planning framework correspondingly to the needs of each specific actor's category, it also defined clearly the line of responsibility and accountability among the different levels of administrative units as far as managing the natural landscape is concern. The effect of this planning innovation may result in the following:

- 1) Ensure wider planning participation with specific output for each administrative unit, while at same time defining clearly individual roles and responsibilities;
- 2) Systematize land use planning nationwide, linking the lowest social unit (farming household) to the highest field level (province); and
- 3) Provide a model for interagency and multi-sectoral partnership arrangement in river basin resource management.

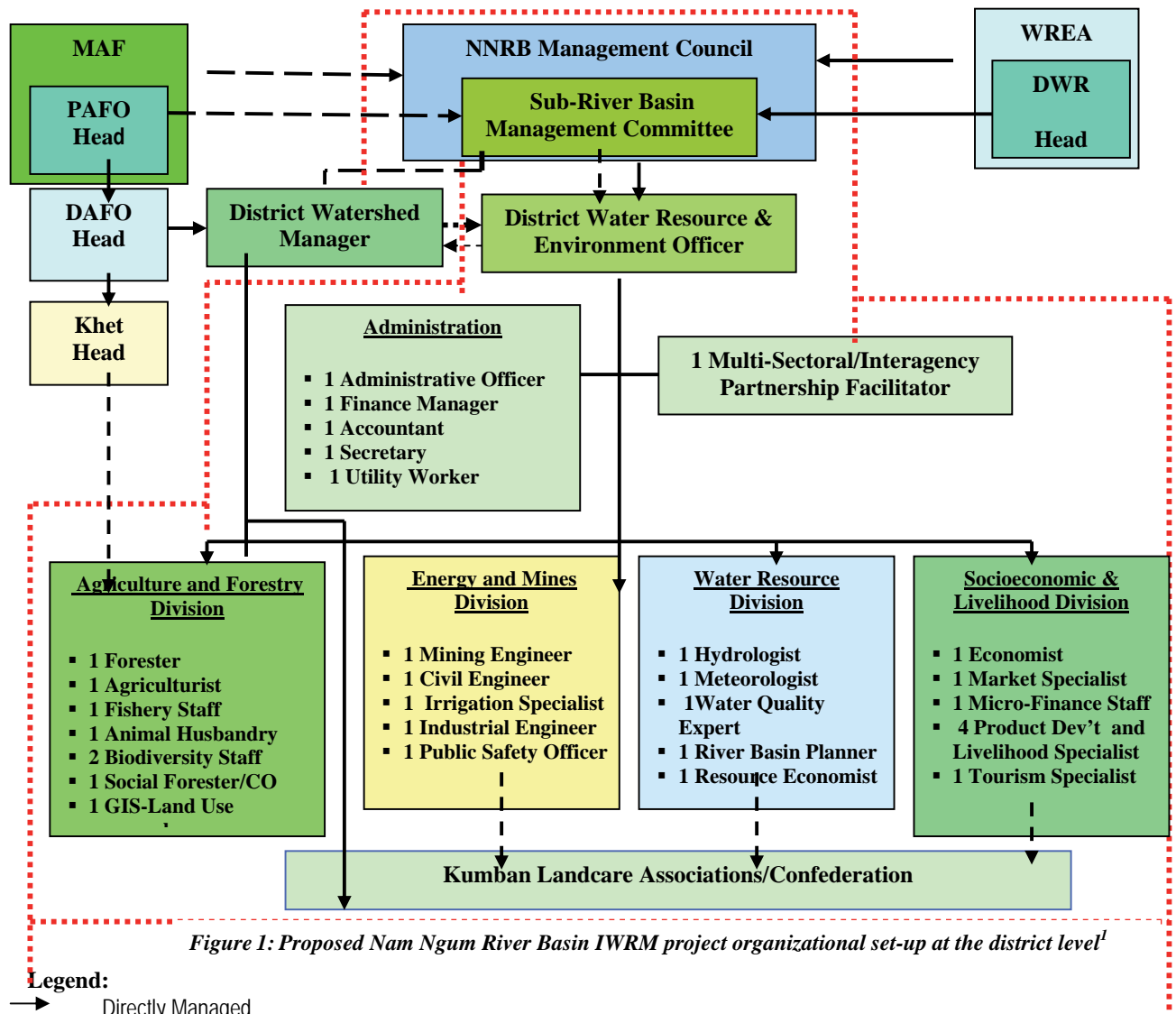


Figure 1: Proposed Nam Ngum River Basin IWRM project organizational set-up at the district level<sup>1</sup>

Note: Landcare as the River Basin Organization's basic social unit

<sup>1</sup> Prospective forerunner for River Basin Organization

Translating this concept into a river basin resource management system, Figure 1 above presents a proposed Nam Ngum River Basin IWRM Project Organizational Set-Up. This model hopefully will evolve into an RBO with a broad base of institutional partnerships.

Since the villagers, the farmers in particular, are directly involved in changing the landscape through their cropping systems, they should be organized into a social unit comprised of one stakeholder in the RBO. The Landcare Organizational Model for improved natural resource management seeks to organize, train and mobilize villagers and shifting cultivators to take an active role in restoring the protective and productive functions of the watershed through the adoption of soil-water conservation measures.

This model was first originated by the World Agroforestry Centre (formerly ICRAF) and successfully tested at the Southern part of the Philippines in the 1990s at that time when mainstreaming local governance in natural resource management started. It has a remarkable impact in restoring the landscape through the introduction of agroforestry and other sustainable land use practices in the uplands. The unique feature of Landcare approach is its organizational viability to bring into partnership the grassroots and villagers with the Local Government Units and the Technology Transfer Facilitators and Regulatory Bodies (represented by Forest and Environment Bureau, Academe, NGOs, Development Agencies, etc) for the rehabilitation of degraded areas in the river basin.

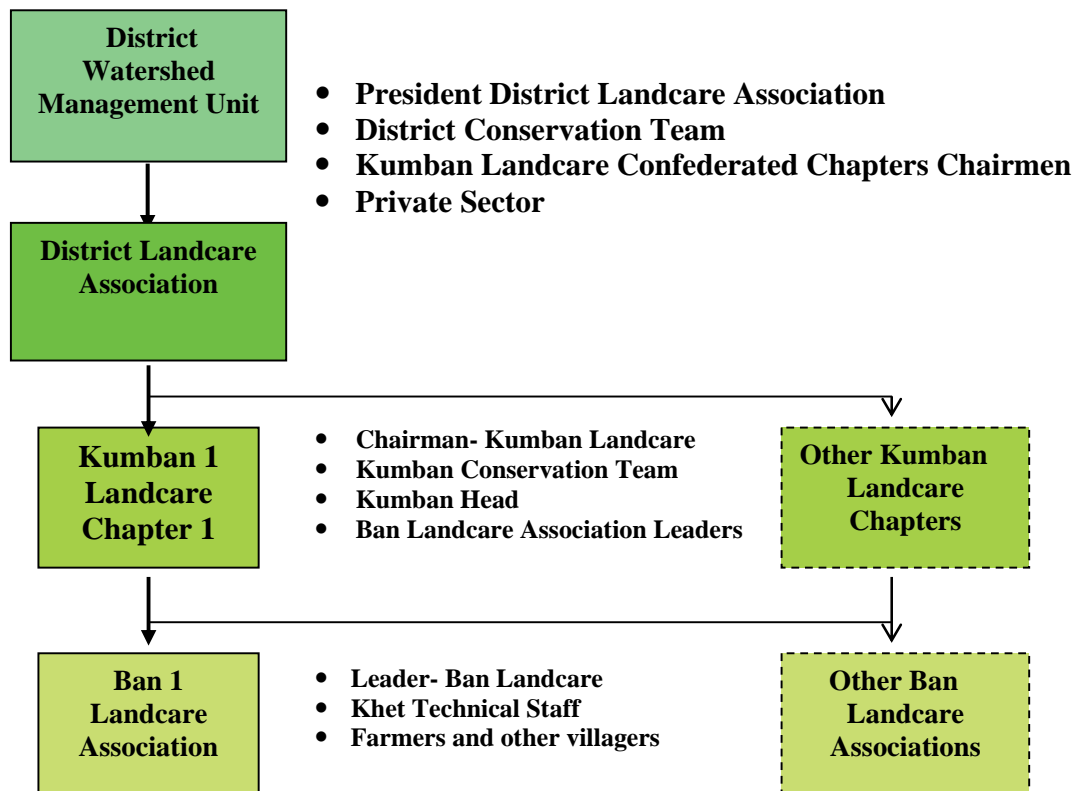
Landcare also refers to a group of people, particularly farmers who are concerned about land degradation problems and are interested in working together to do something positive for the long-term health of the land. It evolved as a participatory community-based approach and grounded model designed to effect change in complex and diverse ecological conditions.

It features the evolution of new land use systems and improved relationships between people and the land, building upon human resources (social capital) instead of disconnecting them or seeing them as part of the continuous land degradation problem.

This strategy could be one alternative solution for the long standing shifting cultivation problem in Lao PDR. Farmers and peasants in the northern provinces can be organized into Landcare units not only for ecological reason but also for increased productivity. Same group may be tapped later to reforest denuded areas and to manage remaining protection and conservation forest. Figure 2 shows the organizational structure of a proposed Kumban Landcare Association.

The Landcare Model could also be used as a pattern to follow for the other resource users' group, such as irrigator's association, ecotourism clubs, fisherfolk's group, etc. All these groupings are considered basic social unit that should constitute the RBO in order to have a broad-base institutional anchoring. Otherwise, if RBO is top heavy in staffing but lacks the institutional base that links the real actors and managers of the land, forest and water system, such resource management set-up only becomes a non functioning government institution.

## Key Actors



**Figure 2: Proposed organizational structure of Landcare Association**

Functions of the key actors in the River Basin Resource Management System is to implement any resource management plan inside the river basin, the following are key coordinating units and their corresponding roles:

**NNRB Management Council (NNRBMC).** This is the highest coordinating body of the NNRB. The membership will be composed of heads or deputy heads of the different departments attached in each participating agency (MAF, WREA, MEM, LMA, Ministry of Finance and Investment, Ministry of Industry, etc.). The Chairmen of the four (4) sub-basin segments: Xieng Khouang upper watershed, Mid-stream Eastern Landscape Segment, Mid-stream Western Landscape Segment, and the Vientiane Capital Downstream Segment will seat as regular members of the council (Figure 3 for the spatial zoning of NNRB). The main functions of this body will be: oversight, steering, policy making, and strategic direction setting. There will be at least eleven (11) members, and the chairman may assume a key position of the Office of the Prime Minister. The council will at least meet quarterly to review, evaluate and monitor the progress of plan implementation for the entire basin. The country's Master Plan serves as reference point for every river basin plan





**Figure 3: Nam Ngum River Basin planning segments**

Sub-River Basin Management Committee (SRBMC). This unit will function more as a regulatory and monitoring body executing the policy guidelines set by the NNRBMC for each watershed landscape segment. It will be composed of at least nine (9) members representing each sector of the province: agriculture and forestry, mines, water resource, energy and irrigation, tourism, the private sector, and Provincial Governor. The designation of the members must at least be provincial officer of certain sector. This body may meet regularly monthly for strict implementation and monitoring of all agreements and plans set by SRBMC. The watershed landscape continuum profiling and zoning scheme by PAFO may serve as indicative guide for land use cover development and management.

District Watershed Management Unit (DWMU). This unit will operate as surveillance and monitoring team that will be created under DAFO at the District level. The main function would be to regularly safeguard the natural resource base against poaching, smuggling, forest fires, and

other forms of illegal activities. It will also spearhead the shifting cultivation mitigation team and ensure that the land use development plans of DAFO and the agro-ecological zonings of the Kumban are strictly followed on the ground. This team directly supervises, monitors and manages the implementation of the Landcare technology adoption and transfer activities in close partnership with the Khet Center staff. Land use maps being produced by DAFO could serve as guides in providing appropriate vegetation cover for the District.

*District Water Resource and Environment Office.* This could be managed by an administrator from WREA who will be the focal figure assuming the overall responsibility for the successful implementation of the sub-basin development plan at the District level. This technical staff may be equivalent to WRE Officer. He will be directly under the NNRBMC for direction but functions interdependently with DAFO and the other District line agencies' heads in the NNRB coverage area. Besides being the key person for sub-basin development plan implementation, he will work closely with the DWMT of each District within the NNRB. However, his main tasks, to see to it that all the programs and development strategies set in the plan must be properly implemented under broad based interagency and multi-sectoral partnership. Under the District WREO are the five (5) divisions: administration, agriculture & forestry, energy & mines, water resource, and socioeconomic & livelihood.

*Division.* The 5 aforementioned divisions are under a unit head, each representing the agency associated with specific sectoral function. To make the staffing composition a real interagency blend, it is preferable to have the technical personnel coming from the different participating agencies on secondment or special detailed arrangement in the RBO. Each division consists of a composite team of technical people who will directly carry out the project undertaking for the river basin to accomplish certain level of outputs.

*Kumban Landcare Association:* This comprises the farmers and soil conservationists. The farmers' agroecological zones and land use plans by DAFO will be implemented by this group of land cultivators. By identifying and delineating the critical zones and the degraded areas, the vast shifting cultivation areas will be prioritized for rehabilitation in the river basin. Livestock will be integrated while mining areas will be secluded.

#### *Council Head or Focal Person In-Charge*

The River Basin Council Head should always come from WREA as it has the mandate. However, depending on what type of sectoral concern that needs to be highly addressed at a particular time in a given river basin, the representative of the concerned agency may prevail in the choice for Chairmanship. When it comes to the natural landscape rehabilitation and management, this belongs to MAF. On the other hand, all water resources management concerns such as legislation, allocation, taxation, formation of RBO, this falls under WREA's domain of concern. Chairmanship could even be rotated with certain tenure.

## **4. Suggested future action**

This proposed model is in its exploratory stage and much room for modification is expected. Among the suggested follow up activities to further test and validate the appropriateness of proposed organizational set-up are:

- Formalize the interagency partnership among MAF, WREA and MEM for the Nam Ngum River Basin management;
- Pilot test the three (3) Watershed Landscape Continuum Management Plans (i.e., Xieng Khouang Upstream, Midstream Western Segment, and the Midstream Eastern Segment) produced by IWMU-NNRBDSF;
- Pilot test the organizational model in one sub-basin of the Nam Ngum River basin;
- While there are on-going initiatives by WREA in creating River Basin Councils in selected areas in the country as mandated by law, a parallel effort should be done at the ground level in forming Landcare Associations among villagers;
- MAF as the guardian in ensuring the quality and soundness of the natural landscape, and having the Khet Center as its direct link to the farmers, fisherfolks and other rural sectors at the village level is therefore the most appropriate agency to organize the grassroots institutions for IWRM;
- How to link to each other the top level basin institutions (RB Council/Committee) and the grassroots' movements (Landcare as an example) is another interesting subject of policy study on interagency and multi-sectoral collaboration and partnership.

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Prime Minister Decree No: 293. 2010. "*Decree on Establishment and Activities of the River Basin Committee.*" June 15.

# **What are the constraints for farmers to realize the potential of the Stung Chinit Irrigation Scheme?**

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## **Introduction**

Irrigation expansion is an aim of the Cambodian Government to boost economic growth and reduce poverty in rural areas of Cambodia. However a number of irrigation projects which have been developed and rehabilitated in the last two decades barely function. The building of new irrigation schemes, or rehabilitation of old ones, is continuously proposed, especially in the Northwest region of Cambodia.

The Stung Chinit Irrigation and Rural Infrastructure Project (SCIRIP) is one of the largest irrigation schemes in the country which is supposed to be a pilot project for the expansion of other irrigation schemes in Cambodia. SCIRIP was rehabilitated during 2002-2006. The infrastructure was funded by the Asian Development Bank (ADB). 'Agence Francaise de Développement' (AFD) financed the development component, including the formation of a farmer water user committee (FWUC). The project was executed by the Ministry of Water Resources and Management (MOWRAM). The primary target of the project is to provide irrigated water for 2,000 ha of dry season crops and 7,000 ha of wet season crops.

## **1. Lessons learned from SCIRIP for irrigation expansion in Cambodia**

When the infrastructure was finished and the FWUC had been established agricultural extension was phased out. With an investment in the project of about US\$ 23 Million, how has the livelihood of local people improved? Has the project achieved its targets for agricultural expansion?

Our research has found that about 2000 ha out of 7000 ha (<30% of expectation) of the newly rehabilitated area has been adopted for irrigation in the wet season and less than 100 ha (<5% of expectation) has been adopted the irrigation in dry season. This is far smaller than the original project targets.

Surprisingly, there is no academic research to understand “what are the constraints preventing local people from taking benefits from this huge investment in irrigation infrastructure”?

CENTDOR in collaboration with RUA have implemented research to find out the answers to this central question and to contribute to irrigation development in Cambodia. The project aims to answer the following specific questions on four sub-topics:

Farmer Water User Committee: How was the FWUC formed? How were roles and responsibilities of FWUC defined? How does FWUC function? What are the constraints and appropriateness of FWUC in encouraging the participation of its members?

Power relation in the family: Who are bread-winners in household enterprises? What is the nature of decision making in household enterprises? How does the status of household enterprise and decision making create constraints and opportunities in investment in farming activities?

Dynamics in land tenure and land use: What is the status of land tenure and land use in common areas of SCIRIP? What are the dynamics in land tenure and land use systems in the common areas of SCIRIP? How does the status and dynamics in land tenure and land use create constraints and opportunities in the investment of household farming activities?

Socio-economic profile of households: What are the socio-economic profiles of households in the common areas of SCIRIP? How have different socio-economic categories of households in the common areas adopted to new cropping practices? What are the socio-economic factors determining the adoption of new cropping systems?

At this early stage, the research findings are focused on the component 1 (farmer water user committee). The historical setting of the scheme is also described. This part is mainly generated from the document reviews and key informant interviews.

## **2. Historical settings of Steung Chinit irrigation infrastructures**

### *Stung Chinit Irrigation Scheme – Historical Perspectives*

The Stung Chinit Irrigation and Rural Infrastructure Project is located in the district of Santuk and Baray, Kampong Thom Province about 138 km from Phnom Penh. The scheme was built during the Pol Pot Period in 1977. It was said that between 40,000 to 100,000 forced laborers from Kampong Thom and Kampong Cham had been used daily in the construction works (ADB 2000, Gret and CEDAC 2000, Joris 2004). The total area of the irrigation system was 12,000 ha during Pol Pot period. At the initial stage, rice was cultivated in both wet and dry seasons and the system management was under the strict control of the Khmer Rouge. After the fall of the Pol Pot regime in early 1979 the irrigation system for sometime was under the control of Cambodian-Viet Nameuse armies based on the sites. District agricultural office and commune chiefs were in charge of the operation and maintenance activities. The Krom Samaki provided labor for the operation and maintenance (O&M) of the schemes and the land was collectively owned by these groups. Some system repairs of the canals and the dyke were funded by the central government and by some international donors. However the irrigation system gradually became dilapidated due to

lack of maintenance and very limited available resources. The groups too did not last long and become defunct.

From 1981-1982, the practice of Krom Samaki still continued and the Water Resource Province Office took the responsibility of main gate operations (which was done through the Chief of Tbeng village) but this control was limited to flood management. When farmers needed water they operated the gates as directed by the village chiefs. Still, it was mostly the head-end farmers who benefited due to system deficiencies. Irrigation system fast deteriorated not only because of the neglect either by farmers or the authorities but also due to some actions of the villagers such as grenade fishing. The dry season cultivation was not possible due to the dilapidation of the system.

In 1983-84, the practice of solidarity groups was stopped and land was divided amongst individuals, with each person receiving 22 acres. Since then no more land has been reallocated, but there was more forest land available for farmers to clear and request for ownership from the village chief and commune chief. This means that some families could clear additional land, usually in the range of 2-3 ha but occasionally as much as 5 ha. This was done even though irrigated land was still available. From 1985-1990, the Pol Pot canals began to fail. Farmers started to have problems with growing rice because of shortages of water – rain fed systems only. Farmers used both inorganic and organic fertilizers and also began using pesticides. Rice yields were 1.0 – 1.2 t/ha. Farmers received land ownership and were issued land by the District Office of Agriculture.

Farmers could continue the wet season cultivation with irrigation water only from the Stung Tang Krasaing as the main gates were operable only in this section. However, the water level of the Stung Tang Krasaing was low as it was rain-fed. Therefore, wet season cultivation mostly depended on rain water rather than irrigation and during droughts most of the cultivation was damaged (CEDAC/GRET 2000 and Joris 2004). The dry season rice cultivation was hardly feasible except in a few places near the rivers and ponds.

During 1987-1989, additional construction and renovation was carried out; in particular one Makara water gate close to the present spillway was added and additional construction (such as SC2 and DC2) was renovated. During 1991-1992, a canal was dug by local people from the spillway to Tros village in Baray district on the east side of kampong Thmor market – a distance of about 2 km. Villagers found out that the logic behind the activity was to search for the hidden gold kept during the Pol Pot regime. Villagers who were involved with this construction reported that when they found the hidden gold (it was done at night time when people sleeping) the activities stopped and most of the gravel, iron and other material used for construction was taken away as well.

Since 1993, when the country signed the peace agreement and the first national election was held with the facilitation from UNTAC Cambodia had more access to international financial supports (Ojendal 2000). Halcrow and Partners (1994) carried out a major survey of the irrigation

potential. They prepared an inventory of the 841 existing irrigation systems, and screened 97 systems as ‘promising’ for rehabilitation. They recommended eight irrigation schemes for rehabilitation out of a closer study of ten systems and Stung Chinit was one among them.

### **3. Steung Chinit irrigation and rural infrastructure project (SCIRIP)**

The Chinit River is the source of the water for the reservoir. It is one of 12 tributaries of the Tonle Sap River. The length of Stung Chinit upstream from the Stung Chinit weir to spring water sources located near upper Stung Porong is 153 km. The intersection with the Stung Tang Krasang is located 30 km downstream-stung Chinit weir.

SCIRIP is an integrated rural development project with substantial investments in water resource development, rehabilitation of rural roads and markets, training of farmers for the management of the irrigation scheme and development of water user groups to ensure the long-term sustainability of the project. The primary project objectives are to raise agricultural productivity and increase farmers’ incomes by providing irrigation and drainage for 7000ha in wet season and 2,000 ha in dry season, and improving rural roads and markets in and around the project areas.

The total project cost is estimated at \$23.8 million equivalent, comprising \$9.6 million (40 percent) in foreign exchange and approximately \$14.2 million equivalent (60 percent) in total currently costs. The project is funded from ADB with \$16 million, AFD with \$ 2.6 million, Cambodian government with \$4.8 million and local beneficiaries with \$0.4 million (in kind labor).

The Ministry of Water Resources and Meteorology and the Ministry of Rural Development are the main implementing agencies. There is a Project Steering Committee at the national level chaired by the Ministry of Economy and Finance, and comprised of the national project directors from MOWRAM and MRD, and representatives of other ministries involved in the project with the responsibility of overall implementation of the project. At the provincial level there is a Project Coordination Committee to monitor the implementation process.

### **4. Institutional analysis on the management of SCIRIP**

The Policy of Participatory Irrigation Management and Development (PIMD) has been adopted by the Cambodian government since 1999. This is the governing national policy in irrigated agriculture in Cambodia today. The Royal Government of Cambodia (RGC) in accordance with its Circular No. 1 on Sustainable Irrigation Policy (1999) seeks to devolve responsibility for all aspects of scheme operation to Farmer Water User Communities (FWUCs) which is the institutional mechanism for adopting participatory irrigation management. The purpose of the participatory irrigation management and development (PIMD) is to enable farmers to take over the management of their irrigation systems and achieve their socio-economic developments such



as increased productivity and profitability and better living conditions through their involvement in irrigated agriculture.

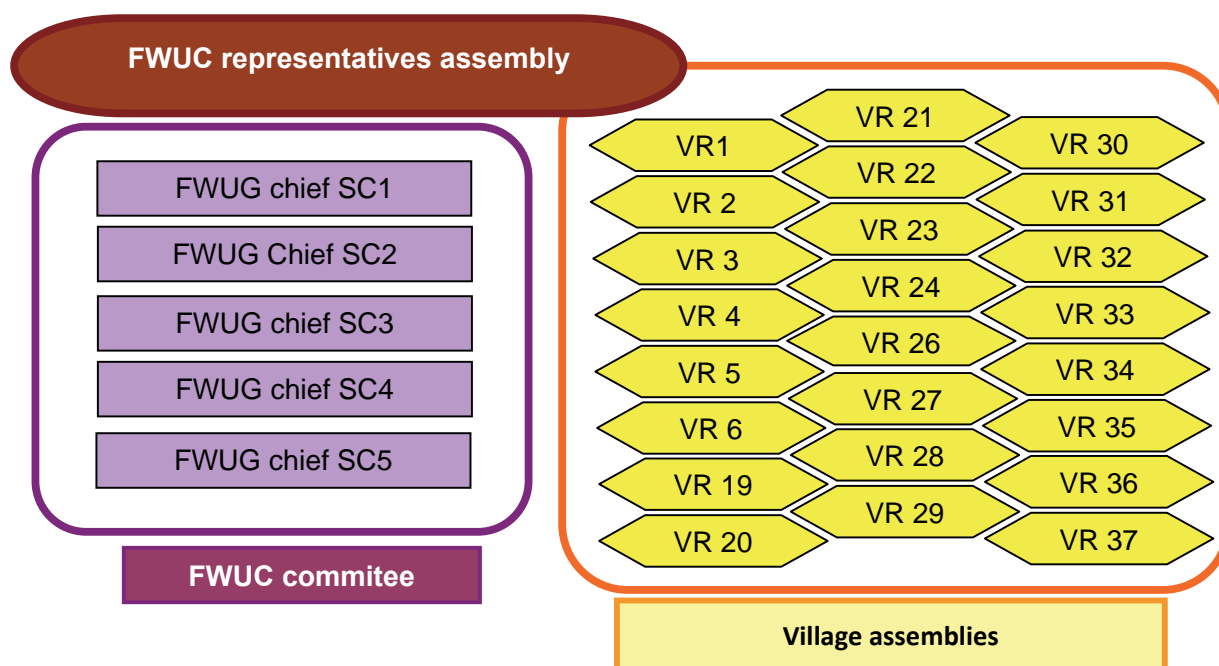
Perera (2006) reported that the implementation of PIMD in Cambodia was a very difficult and challenging task, given the many existing unfavorable conditions including high levels of poverty, low agricultural productivity and poorly designed and deteriorated irrigation systems.

Before the formation of the MOWRAM, water resources management was under the responsibility of several institutions at different levels. In 1999 the MOWRAM was established with a mandate to develop policy-related activities in the sector. The responsibility of implementation of PIMD was with the Department of Irrigation. Now the PIMD program has become a separate wing under the Ministry.

The policy states that the FWUC is the mechanism established by farmers, and it has duties to manage and utilize water in any irrigation system by obtaining due recognition from the Royal Government of Cambodia. As Perera (2006) explained PIMD program was initiated when MOWRAM issued Pracas (declaration) 306 in June 2000. This gave the overall framework for the formation of FWUCs and irrigation management transfer (IMT) to the FWUCs.

The FWUC is the focal management body of the Stung Chinit irrigation system. The structure of the FWUC was a base level of 50 Sub Farmer Water User Groups (SFWUGs) and Farmer Water User Groups (FWUGs) at the next level. Both were to be formed based on hydrological boundaries. The FWUC committee which was the executive body, consisted of the Chief of the FWUC who had the overall responsibility, 1st Deputy Chief responsible for system maintenance, 2nd Deputy Chief responsible for water management, Secretary responsible for public relations, Accountant responsible for financial management and the leaders of the FWUGs. The district chiefs and Commune chiefs were included in the committee on advisory level.

The formation of the FWUC commenced from November 2001 by the GRET/CEDAC with the deployment of village facilitators. As a first step the WUGs were formed after some awareness creation among farmers and next the WUC was formed with the selection of the farmer representatives. The FWUC received the official recognition in 2006. However, this process was interrupted sometimes due to delays in construction work. When the study was carried out both the FWUGs and SFWUGs were not functioning and another model had been applied.



**Figure 1: The New Structure of the FWUC organizational structure**

The structure of FWUC mechanism is the ideal type mentioned in the FWUC statutes with official approval from the MOWRAM. The mechanism shows 24 villager representatives (VR) (even though the numbers show VR 37, VR 7 to 18 do not exist). This means that each secondary canal consists not only of single villages, and therefore we see more VR (these serve as sub-groups as well). In practice, the system and mechanisms as outlined in the FWUC statutes of working procedure recognized by the MOWRAM do exist, but in practice it is somewhat more complex.

Apart from that, a coordinating committee of Stung Chinit Irrigation Committee (SCIC) exists, comprised of the officials of MOWRAM and provincial and district water resources offices (DOWRAM) and the representatives of the FWUC. This body is responsible for the system management above the secondary level. The majority of the members are from the FWUCs rather than those from the agency offices. It is comprised of members of the FWUC (more than 50 percent) and representatives from PDOWRAM and local authorities (less than 50%), representatives from fishing communities and farmer representatives outside the irrigated area from upstream and downstream.

## 5. Roles and responsibilities of FWUC

### *Functionality of the FWUC*

Formation of the FWUC took place after initial awareness creation at village level on the proposed irrigation system and the proposed institutional arrangements. However, the initial model of the FWUC with sub-water user groups at tertiary levels and groups at secondary levels created to fit to the new irrigation design did not function. The present FWUC is based on village level. Instead of sub-group and group representatives the FWUC is represented now by village representatives and block representatives.

Currently, the working mechanism is done differently from those mentioned in the official status approved by MOWRAM. It is implemented by the current five members of FWUC whose function is twofold. First they devise their responsibility based on the FWUC status and then each person takes responsibility for one secondary canal each, in consultation with the village representatives for each secondary canal. The VR is paid 8,000 riel per working day. The members of FWUC and the village representative are voted for by villagers, while the block rangers and accountant are hired by the project with a special allowance.

The committee level of the FWUC is functional, but at the village and block levels organisation is very weak. The farmer participation in irrigated related activities is individual rather than as groups. There is no building of group consensus among farmers. At the field level the function of the FWUC virtually depends on village facilitators appointed at village level, and block rangers appointed at the block level by the CEDAC/GRET. They are employed under the project to fulfill the responsibilities of the village and block representatives and are responsible in implementing their duties to the project implementers not to the FWUC. This may be an approach followed to make the FWUC functional as it is not functional at the field level. Such an approach will facilitate the work of the project implementers but in the long-run it will contribute to further decline of the FWUC. There is a possibility of creating high level dependency on them by the FWUC leaders leading to collapse of the FWUCs after their withdrawal. The main officer holders of the FWUC are being paid a monthly allowance by the projects or the state. It is under discussion to include the village facilitators (they are hired by CEDAC/GRET) as well into the FWUC committee and if they are included they will also be paid resulting in the increase of the total overhead expenditure of the FWUC. It may not be possible for the farmers to bear the cost of maintaining the FWUC committee after the withdrawal of the project resulting in further collapse of the FWUC. Already it is indicated that the existing FWUC committee members would not work if the financial support is withdrawn.

The existing irrigation and cultivation behaviors of farmers in Cambodia do not require or encourage collective group actions (Perera, 2006) and Stung Chinit is not an exception. An extensive farmer mobilization process is required to change the existing behavior of farmers into group actions to fit with the technical interventions of new irrigation designs. The new irrigation designs are a total change of the existing system having some social implications as well with the components such as land re-allocation. These implications should be considered in preparing institution building programs for the formation of the FWUC.

The FWUC is responsible both for system operation and maintenance below the secondary level. At the field level it was expected that the farmers to share water together on a rotational system. This system was tested in the pilot areas. However, it was observed that the irrigation is still an individual responsibility of farmers.

#### *Collection of Irrigation Service Fee*

Firstly, water fee collection took place in secondary canal 1 (SC1) with 162 ha for the wet season 2006. This is the reason why the SC1 became the first to have an irrigation service fee (ISF) applied, with 17,400 riel/ha for wet season 2006. Only 1,393,800 riel equalling 49 percent of total ISF were collected. The amount of money charged for ISF equals 10 percent of the proposed charge of ISF which still remain low.

With present capacity and the level of performance, the FWUC is not capable of taking over the responsibly for the scheme. As per MOWRAM et al. (2006) the most probable scenario of 5 years transition period starting with the post-construction (operational) phase in 2007 is given in the Table 1. It is highly unlikely that the farmers can or will be willing to bear this cost in the years to come.

**Table 1: Transfer of the institutional, O&M costs from MOWRAM/ADB/AFD to FWUC**

Year	FWUC		Project (US\$)	Total (US\$)	FWUC Rounded ISF (US\$/ha)
	US\$	Rounded ISF (US\$/ha)			
2007	52,500	17.5	52,500	105,000	20
2008	65,625	22	39,375	105,000	25
2009	78,750	27	26,250	105,000	30
2010	91,875	31	13,125	105,000	35
2011	105,000	35	0	105,000	40

Sources: MOWRAM, ADB and AFD (2006)

## **6. Farmers' constraints in participation and make use of the Steung Chinit irrigation infrastructure**

#### *Problems related to new designs*

The overall period of project implementation was 6 years, starting from October 2006. The overall cost for the infrastructure work is amount \$16.5M. From an ADB review mission, it recommended limiting the rehabilitation only to Stung Chinit weir and to construct the 5 secondary canals on the north part with the minimum height for the flood embankments. Tang Krasang weir was dropped as a proposal, because of low river flows during the dry season. This new proposal at a cost US\$23.8 million to irrigate only 3,000 ha in wet season and 1,800 in dry season was approved by the ADB in December 2003.

The irrigation system has been designed to modernize totally the existing structures. It is an ideal irrigation design and a replication of what they have constructed in Pakistan. Initial discussions had been held with the villagers to make them aware of the new rehabilitation construction, its design concepts and particularly to get their consent to the expected land re-allocation under the project. One village rejected the land re-allocation and was excluded from the project as the easy solution without taking into consideration the long-term consequences, as the down-stream villages were to be provided with irrigation through this area. Also, the canal system and associated operational practices are new and complicated to farmers, while the maintenance cost for farmers would be high with fast degradation of canal embankments built with sandy soil.

Also, construction of drainage canals as per the new design system is almost a new concept in the Cambodian context where the irrigation canals serve the dual purpose of storage and drainage facilitating the re-use of water. If the drainage canals lack proper maintenance which is a farmer responsibility they would soon disappear, resulting in the failure of the total design concept. In a field visit it was observed that the drainage canals were already neglected by farmers and gradually being damaged and silted up.

Subsequent discussions with farmers after the initial round of consultations had been held in order to get their participation in constructing not only the quaternary canals, but the tertiary canals as well as this was their responsibility. Farmer participation had been obtained in the construction of (tertiary and) quaternary canals mostly under the food for work program of the World Food Program. The motivation of the farmers to be involved in the canal construction was to get the food rations and such an approach hardly creates any ownership feeling among farmers towards the system which should be the main objective of getting farmer participation. Also, in the field visits it was observed that the construction of quaternary canals in some places was not completed and farmers generally neglected the maintenance of them. Also, the farmers were not satisfied with the quality of the earthwork constructions of the secondary, tertiary and quaternary canals and some of them broke down in the very first water issue. Due to the expected high maintenance cost some farmers are beginning to think that the irrigation systems built during the Pol Pot period were better as they were simple and easy to operate and maintain.

The system rehabilitation was continued as a straight forward construction work by the construction company with limited attention to farmer suggestions. The construction company did not pay adequate attention to the suggestions made by farmers such as to keep the oxcart path access to the fields in road constructions. Another frequent complaint made by farmers was the unequal land leveling resulting in irrigation difficulties.

#### *Land reallocation*

Land reallocation remains as a hot issue in the implementation process of the project. The first ever land allocation in the scheme took place after the fall of Pol Pot regime without any plan and people got lands in different places at different sizes. Particularly the village chiefs and local authorities shared the best lands among themselves. As per the SCIRIP project design, each plot of lands is to be re-demarcated to similar size with direct access to water and re-allocation to

farmers. Some farmers do not want to change their land, which has been developed by themselves into fertile lands, while some others do not agree as the lands demarcated for them are located at higher elevation with irrigation difficulties.

Some farmers paid no attention after they realized that their land had been readjusted to higher elevations where they would not be able to harvest any rice yield during the wet season. Other information suggests that land readjustment is a slow process, which will only begin after the construction of quaternary canals and dykes is complete.

#### *Rural Infrastructure Development*

Road improvement benefits are estimated using two conservative methodologies: Vehicle operating cost (VOC) saving and increased agricultural producer surpluses (APS). VOC savings result from improved road surface leading to less wear and tear on vehicles, and indirectly from reduced charges associated with higher vehicle utilization rates (due to reduced travel times) and less expensive modes of transportation. Applicability of such methodologies to measure the impacts in rural areas where the oxcarts are still the main mode of transportation is doubtful.

Anyway, farmers are generally happy with the construction of roads under the project particularly because of the easy access to the fields using bicycles in some blocks. Also, the access facilities to the villages have been improved and on the other hand it facilitates better market access for farmers.

The frequent complaint made by farmers with regard to road construction is the difficulty of taking the ox-carts to the fields as the existing ox-cart paths have been blocked in the road construction. Another main complaint made by farmers is that the bridges built across the secondary canals are too narrow for ox-cart passing. Also, the number of bridges built across the main and secondary canals is not adequate for cattle and human crossing.

In some places along the SC5 and SC4, local farmers have set up a small bridge with one piece of plank, some with a palm tree or coconut tree for human crossing. However since the distance between bridges across each secondary canal is too great, villagers from Kley have put palm trees to form as bridge for their oxcarts, cows, and buffalos instead of using the concrete bridges built by the project.

However, subsequently it has been agreed by the contractors to construct additional structures such as bridges and oxcart roads as requested by the farmers.

#### *Delay in making compensation for the lands inundated*

It has been agreed to pay compensation for the lands inundated under the reservoir but payments had not been made during our visit in November 2006. Some developed lands belonging to 11 villages were inundated in the expansion of the reservoir. Snao, Khley and Trapaing Pring villages are the most affected in the reservoir expansion. Villagers in Snao mentioned in the

interviews that the compensation is to be made based on the productivity of the land ranging from \$700-1500 per ha. It was estimated that the total amount of land to be compensated for by the reservoir construction would cost US\$ 6 million.

Outside the reservoir, the paddy field and residential land impact compensation were studied by the technical team from MOWRAM. The price for a rice field was US\$1,000/ha and US\$ 20,000/ha for residential land.

#### *Ineffective drainage and water logging*

Most villagers got used to the original scheme of Pol Pot in terms of water distribution and regulation to the paddy fields. The scheme did not have drainage canals where water was released and flooded onto the paddy field. The current design includes big and very deep drainage canals and an abundance of water has flown out through this canal. In addition, villagers whose paddy fields are close to the drainage canal complained that most water could not stay within their paddy field and drain to the canal even though their paddy field was situated about 100-150 m away from the drainage canal. This already happens in Tbeng Kaong section of the drainage canal. Villagers suggested building a water gate to block the water where a certain amount of water should be kept and let out from the drainage canals.

Paddy fields at the east side of the main canal are estimated to be about 400 ha and have been flooded and destroyed two times during the last wet season. The reason was that the areas were cut off from target irrigated areas after the main canal was renovated where the areas have been automatically blocked by the dikes surrounded with no drainage system. Villagers complained that the main canal serves as the deadlock where there was no drainage system and water gate to regulate water in these areas. Until now, there is no compensation of rice crops lost from government and villagers have requested a drainage system so that water can be regulated.

## **7. Conclusion**

The SCIRIP project was established to meet the needs of farmers in the common area. However, the project design was complicated. Underestimates of costs and inappropriate irrigation and drainage design have created on-going problems.

Due to the advanced (complicated) design, it is beyond the capacity of the farmers (users) to adopt it. Therefore, farmers are discouraged from participating in the project. Since, farmers have learned that the pilot phase was not working well which has further discouraged them from participating in the SCIRIP. In particular, they assumed that the whole scheme was not useful for them.

However, these are only the initial findings of the first part of the study. There will be other findings generated to explain the constraints of farmers in realizing this scheme. The full findings are expected to be completed in April 2011.

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# **Management of River Basin Organizations in Viet Nam**

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## **Background**

Viet Nam covers an area of 331690 km<sup>2</sup>, and has a population of 86 million people (as of 2007). The climate varies from temperate and subtropical in the north to tropical in the south. Average annual rainfall is 1 600 mm, varying from 700 mm to 4,000 mm in different regions of the country.

In Viet Nam there are as many as 2,360 perennial rivers over 10 km in length, and 14 river basins with an area of more than 2,500 km<sup>2</sup>, 10 of which have an area of more than 10,000 km<sup>2</sup>. The National Water Resources Profile identified the following river basins: Basins over 10,000 km<sup>2</sup>, namely Bang Giang and Ky Cung, Hong (Red) and Thai Binh, Ma, Ca, Vu Gia and Thu Bon, Ba, Sre Pok, Se San, Dong Nai, Cuu Long, and 4 basins with area from 2,500 – 10,000 km<sup>2</sup>, namely Thach Han, Huong, Tra Khuc and Kone. The total available internal water resources of the country is about 335 billion m<sup>3</sup> (the total water available from inside and outside of national boundary is about 830 billion m<sup>3</sup>). The rainy season total water volume takes account of 70-80 percent of yearly water flow. Annual flow is concentrated in 3-4 months of mid rainy season, while in 3 months of mid dry season the surface flow is about 5-8percent. The dry season lasts 6-7 months; and accounts for only 20-30 % of rainfall. Besides surface water sources, underground water resources also have dynamic source potential estimated cumulatively as 1500 m<sup>3</sup>/s. However, water source distribution is very uneven both in space and time. Therefore, droughts and water logging often occur and there are more complicated and serious water management trends in most of areas of the country's territory than the overall numbers would suggest. A map of the major rivers of Viet Nam is presented in Figure 1.

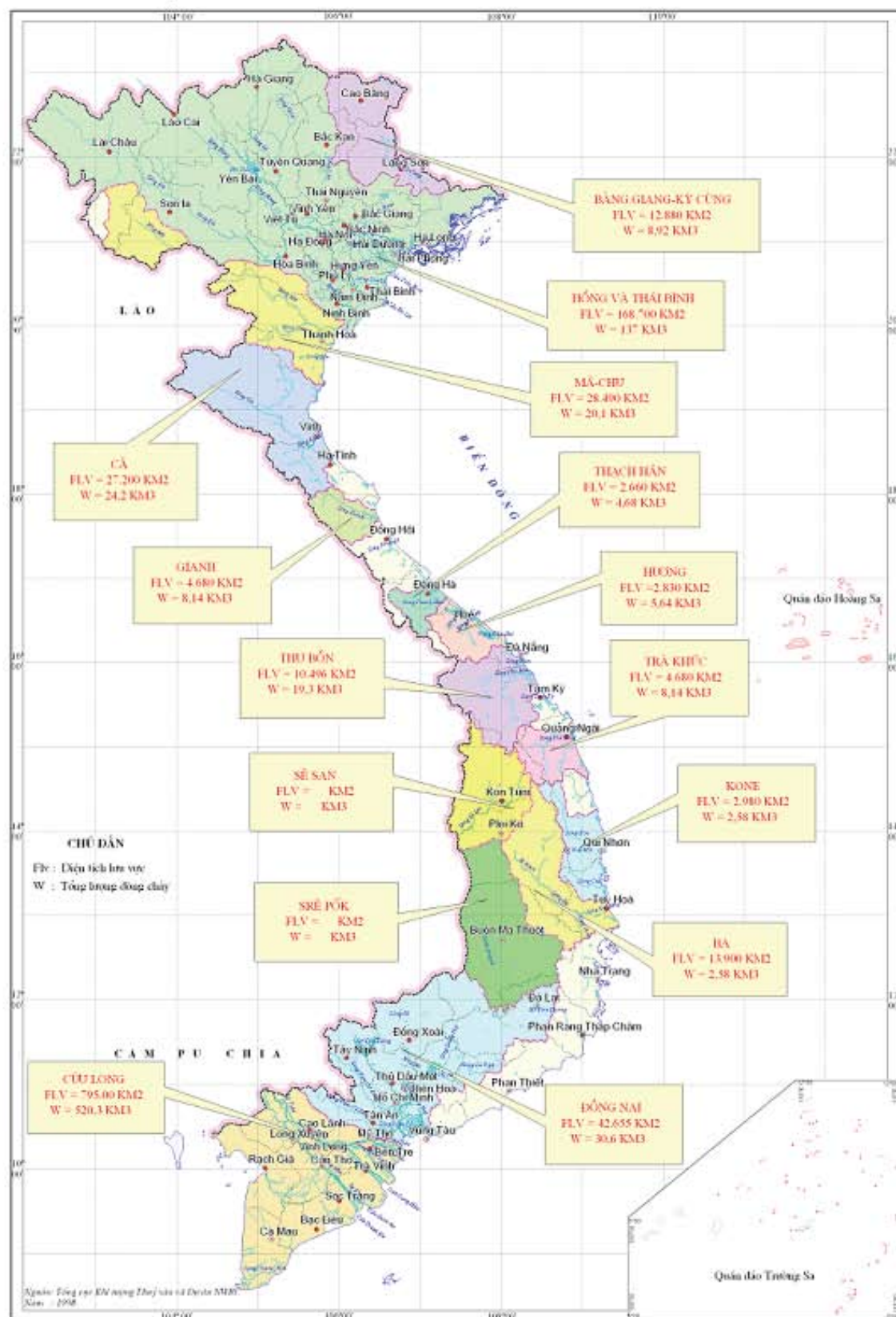


Figure 1: Map of major river systems in Vietnam

**Table 1: Area, population and water availability of member countries of GWP SEA**

	Country	Country Area (km <sup>2</sup> )	Population (x 1000 person)	Total available internal water resources (10 <sup>6</sup> m <sup>3</sup> /year)	Total available internal water resources per capita (m <sup>3</sup> /year)
1	Cambodia	181.060	14,131	133,600	9,500
2	Indonesia	1,904.570	245,540	1,852,576	7,500
3	Lao PDR	236.800	5,758	308,000	53,500
4	Malaysia	329.750	25,671	630,000	24,500
5	Myanmar	676.580	54,745	901,000	16,500
6	Philippines	300.000	82,664	226,430	2,700
7	Singapore	620	4,198	600	143
8	Thailand	513.120	64,470	216,123	3,400
9	Viet Nam	331.690	86,000	335,000	3,900
	Total	4.389.617	583,177	4,603,329	

*Source: ASEAN 2005, FAO, WRI, World Bank, GWP, Encarta 2007*

Table 1 shows that the total available internal water resources per capita of Viet Nam is rather low in comparison with those of the other countries in the SEA.

## **1. Water resources development and management in Viet Nam**

As with many countries in Asia and Southeast Asia, Viet Nam has a long history of paddy rice production that depends very much on water. Until the 1960s, water resources development and management of the country mainly focused on supplying water for agriculture, mainly for rice production. The main activities of water development were to construct series of irrigation and drainage systems serving the agriculture sector. The concept of water resources management meant irrigation and drainage systems management.

After 1975, especially in the two last decades, Viet Nam has achieved remarkable economic growth and reductions in poverty. The general poverty rate fell from 58.1 % in 1993 to 16% in 2006. Income per capita rose from USD 260 in 1995 to a 2007 level of USD 835. The rapid increase in population of the country and strong economic growth have been accompanied by increasingly rapid urbanization and significant increases in wages and quality of life. However, this growth has included some less positive changes, such as high rural–urban migration, and heavy pressures on the country's dilapidated infrastructure and fragile natural resource base, especially water resources.

Increasing competition for reliable water resources may constrain economic growth and the creation of livelihood opportunities. Currently, average annual per capita surface water availability that is generated within national borders is about 4,900 m<sup>3</sup>. Viet Nam can be

considered as a water deficient country and is predicted to face increasing challenges of water resources scarcity in the near future. It is expected that by 2025, given projected population growth and taking the expected impacts of climate change into consideration, average annual per capita surface water availability will be approximately 2,830 m<sup>3</sup>. Cross-border river flows increase the projected water availability to about 7,660 m<sup>3</sup> per capita, but this figure disguises substantial seasonal and spatial disparities.

Demands for water resources are growing rapidly, not just for extraction but also for increasing hydropower generation to meet the expanding economy and growing population. The extraction of groundwater is increasing both in rural areas and major urban centers. In some areas groundwater levels are falling dramatically which is resulting in land subsidence and, in turn, to damage to infrastructure. Some groundwater sources have elevated levels of arsenic.

However, the crucial role of water in the nation's sustainable development, human health, and life has not always been fully valued; Water resources - as a limited natural resource and economic good have not always been recognized. As a result, the protection and management of water resources has not been given adequate attention. In an earlier review of Viet Nam's water resources in 1995–1996 that had identified the problems and the range of options available to overcome them, the review had also formulated the strategies in guiding the Government's investment programs.

The water sector of Viet Nam is facing major challenges, including: i) increasing competition for heavily committed freshwater resources; ii) increasing pollution of rivers by industrial, municipal, and agricultural sources; iii) increasingly severe and frequent natural disasters affecting a rising number of population living in disaster-prone areas. These challenges highlight the urgency for the Government to complete sector reforms to separate the tasks of regulation, delivery of services, and policy leadership in the water sector. Groundwater is being extracted at unsustainable rates; few water service providers operate in a financially viable way; much of the existing water management infrastructure is in poor repair and needs to be replaced; and most suitable agricultural land is under irrigation with diminishing opportunities for increasing production. Furthermore, development of basic water services has not kept pace with economic growth, leaving around one third of the population without adequate water supplies and two thirds of the population without sanitation. Viet Nam is on target to meet the Millennium Development Goal (MDG) in halving the number of persons without access to safe water and sanitation in urban areas but progress in rural areas remains behind target.

In water resources management, Viet Nam faces a number of challenges. In the irrigated agriculture area, many irrigation systems suffer from low efficiency, and their management by irrigation management companies is poor and not cost-effective. Non-irrigation uses of water in rural production are widely neglected in development programs. Systematic challenges remain in the water supply, sanitation, and health field despite recent reforms. Natural disasters are a big concern threatening human life and economic development in many parts of Viet Nam, with flash floods, landslides, and coastal erosion. Water shortages occur frequently during the dry season,

and saltwater intrusion is advancing into coastal plains and delta areas, limiting opportunities for extraction of water for agricultural, domestic, and industrial uses. The high regional, seasonal, and annual variability of water supply is likely to become more extreme because of climate change associated with global warming. Pollution of surface and groundwater is emerging as a problem in many river basins because of population growth and rapid industrialization.

Since 1995 Viet Nam has made substantial progress in water sector reforms. Specific reforms include: i) passage of the Law on Water Resources in 1998; ii) establishment of the Ministry of Natural Resources and Environment (MONRE) in 2002; iii) establishment of the National Water Resources Council (NWRC), as the water sector apex body chaired by the Deputy Prime Minister; and iv) adoption of the “sustainability” concepts reflected in the: (a) National Strategy for Environmental Protection; (b) Strategic Orientation for Sustainable Development (Agenda 21); (c) National Water Resources Strategy toward the year 2020 (NWRS); (d) Law on Water Resources; (e) Law on Environmental Protection; and (f) adoption of a rural water supply and sanitation strategy following the multi-funding agency review of the subsector in 2005. These actions present an important shift toward recognition of the importance of a sustainable and healthy natural resource base. Such recognition is a critical ingredient in the Government's efforts to achieve sustainable socioeconomic development.

In the NWRS, Viet Nam defined the main objectives for the water sector in the next 15 years as the protection, efficient exploitation, and sustainable development of water resources on the basis of integrated and unified water resources management. The Government intends to meet water demands for people's living and socioeconomic development, while ensuring national defense, national security, and environmental protection as the country's industrialization and modernization proceed. The Government is encouraging proactive prevention to control and mitigate the adverse impacts of water-related disasters, while developing multi-sector industries that utilize water resources. Viet Nam places high priority on improved international cooperation and the harmonious sharing of water resources.

At the same time, the Government provides substantial investment funds for irrigation, flood protection, and hydropower development. National poverty reduction programs, such as Program 135 and the Rural Water Supply and Sanitation Program, also include large investments in water services. There have been a number of reform initiatives, including establishing river basin organizations, introduction of participatory irrigation management, and development of province-level water strategies. However, to date, these have been limited in scale and impact and are yet to be adopted nationwide. Sustaining economic growth in Viet Nam will require continuing investment in the water sector.

## **2. River basin organization management in Viet Nam**

Viet Nam approved the Law on Water Resources (LWR) in 1998. Following the basin approach of the LWR 1998, the 2006 National Water Resources Strategy has defined “Management of water resources should be implemented in an integrated and uniform manner on a river basin

basis". Since 2001 to date, 8 RBO with the common name "River Basin Planning Management Board-RBPMB" have been established for 6 main and 2 sub-river basins of the country, namely Hong-Thai Binh, Cau, Day, Ca, Vu Gia-Thu Bon, Srepok, Dong Nai and Cuu Long. Other initiatives on river basin organization were also adopted for water quality and environmental protection purposes. The establishment of these RBO reflects the urgent need for the improvement of water resources management of the country that will only be achieved by practicing IWRM at river basin level. However, river basin management with IWRM principles is quite new in the country. Before December 2008, according to the LWR, RBPMBs were coordinating bodies under the responsibility of Ministry of Agricultural and Rural Development (MARD). In terms of structure, a General Office of RBPMBs in the Department of Irrigation-Drainage, MARD, was established to coordinate all activities of RBPMBs. Each RBPMB has its small standing office that is located in the two Institutes of Water Resources Planning of MARD. The RBPMB can be classified as a coordinating body for planning of water resources within the basin, however, the roles and mandates of these RBPMB and their positions in the administrative system of water sector are not yet clearly defined. Moreover, RBPMB is located under the auspices of MARD, which prevented it from operating as a forum for discussion on water resources in general. The contribution of RBPMBs to the improvement of water resources management in the basin is very limited.

Together with the changes taken place in the water sector recently in Viet Nam, especially the transferring of the functions of water resources management from MARD to the Ministry of Natural Resources and Environment (MONRE) in 2002 and in responding to the new challenges in water resources management of the country, in December 2008, a new decree on River Basin Management (Decree No. 120/2008/ND-CP on River Basin Management) was approved by the Government of Viet Nam. This Decree provides for the management of river basins in order to protect the water environment, cope with water environmental incidents, regulate and distribute water resources, etc. The Decree further provides for: Principles for, and contents of, river basin management; lists of river basins; investment policies for sustainable development of river basins; basic surveys of the river basin environment and water resources; river basin planning; control of polluting sources and protection of river basin water quality; regulation and allocation of water resources and transfer of river basin water; international cooperation and implementation of treaties on river basins; river basin coordinating organizations; river basin management responsibilities; and inspection, examination and handling of violations. According to new Decree, a new form of RBO under name of "River Basin Committee" (RBC) has been recognized. The RBC will be under the responsibility of MONRE and have the following functions and mandates: Develop river basin plans, submit for approval and monitor the implementation; ensure the coordination between integrated planning management and local administration; Coordinate related agencies, ministries, sectors and provinces in basic investigation; water resources inventory and assessment; development, submission for approval and monitoring the implementation of plans for sub-basins under its river system; recommend solutions for disputes over water resources in its basin; coordinate with other relevant agencies to investigate and make recommendations and international cooperation (if necessary) in management, exploitation of water resources and other relating resources its Basin. Each RBC

will have an Office of RBC which is provided with qualified staff to help RBC in operation. The changes taking place in the RBO arrangement following the new Decree in Viet Nam is expected to embrace IWRM in river basins in a meaningful and practical way. However, so far no RBO arrangement following the new Decree has been established yet.

**Table 2: Existing River Basins Organizations in Viet Nam**

STT	Name of RBO and River Basin in Viet Nam	Date of establishment	Management Agency
RBO established by the Law on Water Resources 1998			
1	Red – Thai Binh River Basin Planning Management Board (RRBPMB) for Red – Thai Binh River Basin	2001	Ministry of Agriculture and Rural Development (MARD)
2	Đáy Sub-basin Planning Management Board (DRBPMB)	2001	Ministry of Agriculture and Rural Development (MARD)
3	Cau Sub-basin Planning Management Board (DRBPMB)	2001	Ministry of Agriculture and Rural Development (MARD)
4	Mekong (Cuu Long) Basin Planning Management Board (DRBPMB)	2001	Ministry of Agriculture and Rural Development (MARD)
5	Đồng Nai River Basin Planning Management Board (RNRBPMB)	2001	Ministry of Agriculture and Rural Development (MARD)
6	Vu Gia-Thu Bồn River Basin Planning Management Board (VTRBPMB)	2005	Ministry of Agriculture and Rural Development (MARD)
7	Cà River Basin Planning Management Board (CRBPMB)	2006	Ministry of Agriculture and Rural Development (MARD)
8	Srêpôk River Basin Planning Management Board (Srepok RBPMB)	2006	4 Provinces of Dak Lak-Gia Lai-Kon Tum and Dak Nong
RBO established by the Ministry of Natural Resources and Environment (MONRE)			
1	Dong Nai River Basin Committee for Environmental Protection for (DRBCEP)	2008	MONRE
2	Cau River Basin Committee for Environmental Protection for (CRBCEP)	2006	MONRE
3	Dong Nai River Basin Committee for Environmental Protection for (CRBCEP)	2009	MONRE

### **3. Viet Nam and RBO for shared river basin: Case of the Mekong River Commission (MRC)**

Viet Nam is a member of MRC that is the RBO established for Mekong River Basin, the largest shared river basin in Southeast Asia. MRC has a long history of cooperation among four GWP SEA Members, namely Lao PDR, Thailand, Cambodia and Viet Nam. Established in 1957, the

name of this RBO has been changed over time: Mekong Committee (MC) 1957 - 1975, to Interim Mekong Committee (IMC) 1/1978 - 1995 and to Mekong River Commission (MRC) 4/1995 up to the present. It has also been observed that along with time, depending on the changes of political situation in the Mekong region, the names, functions and structures of RBO for Mekong have also changed. In comparison with the Mekong cooperation in the past, MRC now is upgraded with a stronger legal framework (1995 Agreement and series of procedures) and with fields of cooperation more expanded and diversified. The 1995 Mekong Agreement stipulates “The parties agree: To cooperate in all fields of sustainable development, utilization, management and conservation of the water and related resources of the Mekong River Basin including, but not limited to irrigation, hydropower, navigation, flood control, fisheries, timber floating, recreation and tourism, in a manner to optimize the multiple-use and mutual benefit of all riparian zones and to minimize the harmful effects that might result from natural occurrences and man-made activities”.

Through different periods of cooperation, the Mekong organization mainly deals with the functions of a monitoring, investigating and coordinating body rather than a planning, management committee as classified in some materials. The evidence is that, through the different periods of Mekong cooperation, some basin plans were formulated (1970 Indicative Basin Plan under MC, and current BDP under MRC), but the members of the organization consider these basin plans as documents for reference with no enforced values.

The 1995 Mekong Agreement is considered as a good example of cooperation in a shared river. In a long period, “Mekong Spirit” had been a symbol for international river basin cooperation. Even now, while cooperation within the framework of 1995 Mekong Agreement is going ahead, the new situation in socio-economic development and some other factors seems to be challenging that cooperation. Two riparian countries at the headwaters of the Mekong Basin, namely China (with 16 % of total annual inflows) and Myanmar are not, so far party of 1995 Mekong Agreement. The 1995 Mekong Agreement, which is a good legal framework for cooperation among the four LMB countries, is considered as an umbrella, from which a series of procedures would be prepared and agreed upon by Member countries. So far four countries have approved four procedures, namely Procedures for Data and Information Exchange and Sharing; Procedures for Notification, Prior Consultation and Agreement, Procedures for Water Use Monitoring and Procedures for Maintenance of Flows on the Mainstream. Another important procedure that was being considered for approval by the MRC is the Procedures for Mekong Water Quality.

The management of water resources of the Mekong River now is also challenging with the development situation in the Mekong basin itself and in the basin countries as well. The population in the Lower basin increases rapidly (it is predicted that the population will reach 100 million people in 2025 in comparison with 60 million people at present). Accordingly, the high rate of industrialization, water and energy requirements will be significantly increasing. In meeting the need for energy, the hydropower potential of the mainstream of the Mekong is planned to be developed in the near future, following the strong development of hydropower systems in the upper part of Mekong in China (Lancang River). As a consequence, the



development of series of hydropower plants in China, Lao PDR, Thailand and Cambodia on Mekong mainstream will anyhow impact the flow regime and other conditions of the Mekong river. The mechanism of Mekong cooperation is following the broad principle of consensus of a flexible framework agreement with continuous processes of dialogues and negotiations. It will not be easy to resolve all requirements of all countries. Political goodwill, diplomatic compromises, technical support, donor support, mutual interests, basin-wise view etc., are all essential pre-requisites to a successful framework agreement. A framework agreement is possible even if some riparian countries do not sign the agreement. Cooperation between contracting parties and non-contracting parties through constructive dialogue is possible and essential.

#### **4. Recommendations**

River Basin Organizations (RBO) are recognized by the Law on Water Resources of Viet Nam as a mechanism for water and related resources planning and management in a river basin. River basin planning and management organizations are a new and very important part of the institutional reform of the water sector in Viet Nam. Under the existing legislation they have the responsibility to develop integrated river basin plans (taking into account various sectoral water users and uses), coordinate ministry, agency and provincial water related activities, coordinate water resource assessment and monitoring, and advise the Government on the resolution of water-related disputes within the respective river basins.

By issuing a new Decree on River Basin Management, Viet Nam has officially institutionalized and recognized that river basin organization is an advanced approach and necessary arrangement for more effective management of water resources of the country. However, if looking at the arrangement of new RBO that have been set up by the new Decree, there is a model of RBO (RBC) that will be set up for all basins (depending on the scale of basin). The mandates and power of new RBC have not been clearly identified. There are a number of issues concerning river basin governance that should be considered for establishment of any RBC in future:

Every river basin has a unique character and resources. This means that the establishment of each RBC should recognize and reflect a locally appropriate vision of the basin's future, and a locally appropriate process to ensure sustainable management to achieve that vision.

The members of the river basin organization as decided are representatives from various ministries and agencies. Each river basin organization also has its own operating regulations. Each river basin organization will be assisted by a river basin committee office located in MONRE and river basin committees are not powerful agencies but rather operate as coordinating agencies. Therefore, they do not have any power to solve any issues related to water resources in the basin.

In actuality, RBO in Viet Nam are a relatively young idea, and they need time for learning and overcoming the challenges.

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# Bird Migration and Ecotourism: Creating Demand for Mekong Wetlands

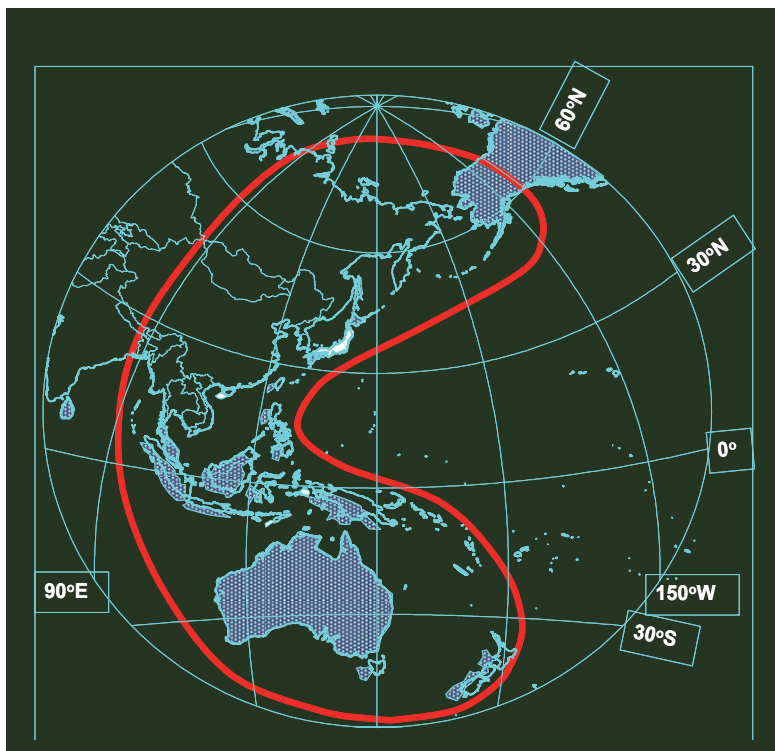
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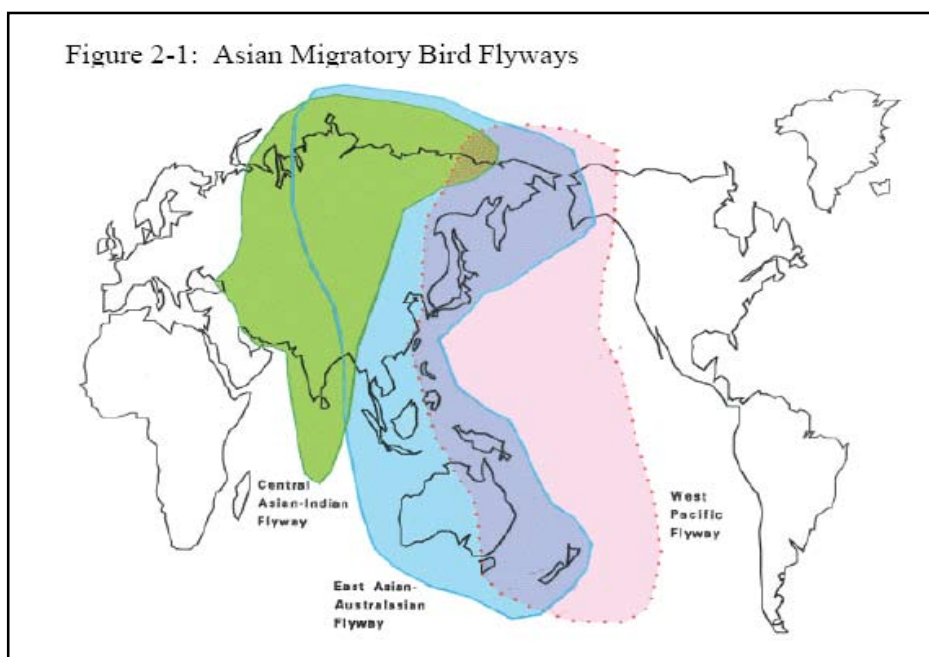
## Introduction

Bird migration is a regular movement of birds between two geographic locations, usually from a breeding area to a non-breeding area. Most migration is along north-south axis. During the migration flights, the birds stop over at wetland sites to feed and refuel. Birds stay for a week or two, get enough energy and fatten themselves in preparation for their next journey onwards. Monitoring of these birds, particularly the water birds and their wetland habitats is important for conservation and management. Thus, wetlands could be a potential resource base for ecotourism.

The Philippines, Lao PDR and the other Mekong countries are part of the East Asian/Australasian flyway.



**Figure 1:** East-Asian Australasian Flyway



**Figure 2:** Asian migratory bird flyway

Thus these countries within the spatial range of the said flyway serve as host to more than ninety species of migratory birds. Water birds coming from Siberia, Mongolia and Northern China migrate southwards before the start of winter to avoid the impact of harsh weather condition (Figure 2).

Many migratory water birds travel a round trip of 25,000 km each year between their breeding grounds in the northern hemisphere until Australia and New Zealand. During a 20 year lifetime, a long distance migrating water bird could travel over 400,000 km. Long-distance migration involves flights of 4,000 km and more - sometimes up to 8,000 km non-stop. Birds fly at speed of approximately 30 to 60 km/hour.

## 1. Mekong wetlands and current land use

The Mekong River Basin has a vast wetlands area, most of which are seasonal resource base for fishery and paddy rice production. The river deltas especially in the downstream countries such as Cambodia and Viet Nam, and southern part of Lao PDR and Thailand, a huge portion of the wetlands are important feeding grounds for migratory water birds.

Likewise, more than 60 million people living in the LMB and directly depend on waters and aquatic products for food, income and livelihood opportunities. Many of them live in poor conditions and are highly vulnerable to declining availability, quality, and diversity of these resources. Agriculture is the single most important economic activity in the LMB. More than 10 million ha of the basin's total cultivated land is used to produce rice.

Transforming the wetlands into ecotourism sites for bird watchers and bird enthusiasts would enhance the environment, cultures, aesthetics, heritage and well being of the local community. It can create livelihood for the local communities as well as bring added revenues to the country through the chain of services and other social and cultural activities that it can open for tourists and guests.

## **2. The Ramsar Convention for wetlands conservation in the Mekong**

Lao PDR's recent move to join the Ramsar Convention (International Treaty for the Conservation and Utilization of Wetlands) as a Contracting Party and designating two wetland sites to the Ramsar List of Wetlands of international importance is timely. Conservation actions are needed to address wetlands to conserve biodiversity not only because of the country's commitment to the Ramsar Convention and the Convention of Biodiversity but more so to conserve the natural heritage of the country, maintain the integrity of the sites and venture to promote the sites as ecotourism destinations.

Historically, the Ramsar Convention used to be named as the Convention on Wetlands of International Importance Especially as Waterfowl Habitat. The wetland habitats of the migratory water birds were then the main concern of the member countries of Ramsar. But it has since evolved thru the years as the Parties realized that more than the waterfowls, it is the social relevance that should be given main consideration. The wetland habitat of migratory water birds especially those included in the Ramsar list are potential ecotourism destinations. Thailand and Viet Nam had earlier joined Ramsar and so does Cambodia.

### *Wetlands and Ecotourism*

As per definition, "ecotourism is a purposeful travel to natural areas to understand the culture and natural history of the environment, taking care not to alter the integrity of the ecosystem while producing economic opportunities that make the conservation of natural resources beneficial to local people (Ceballo-Lascurin as cited by Reyes, D.P.T., 2008).

Real ecotourism is more than travel to appreciate nature (Kurt as cited by Honey, 1999). Ecotourism helps educate the traveler, provides funds for conservation, directly benefits the economic development and political empowerment of local communities, and fosters respect for different cultures and human rights.

Citing an example in one of the wetland sites in the Philippines, bird watching groups (calling themselves ecotourists) from mostly western countries visit a rural wetland area to watch and count migratory and endemic water birds. These ecotourists are willing to spend money, rough it out in tents and makeshift lodging to wait for the break of dawn and view the birds.

### *Employment Opportunities Generated*

The economic benefits that can be derived from the prospect of ecotourism include: invisible export, flow of foreign currency, development of infrastructure, redistribution of domestic currency, improvement of less developed areas, employment generation, and increased foreign investments.

Looking it from a chain of multiple benefits from top to bottom, ecotourism demands the following services as form of local employment:

- Transport group: Airline and bus operators, boatmen, and porters;
- Food and Accommodation: Hotel and restaurant operators, waiters, chambermaids, chef;
- Travel Agencies and tourist guides;
- Souvenir Shops and manufacturers of souvenir items (special group such as handicapped or physically challenged women sewers and embroiderers);
- Spa and massage clinic.

### **3. A case in a remote wetland area in the Philippines**

In 1982, about 100,000 ducks were observed in a single day at Candaba, Pampanga, a wetland of about 300 hectares. No other site in the Philippines has been known to support such large concentrations of Anatidae. Aside from ducks, there are more than 80 species of migratory birds visit the Candaba Wetlands. Since then, the Candaba wetlands are visited by local and foreign tourists for bird watching.

The Candaba Wetlands provide an opportunity to nature-oriented outdoor recreation group to visit the place as ecotourism destination. It provides significant revenue to the local government.

### **4. Global tourism facts**

Tourism is a booming industry in the Mekong subregion. Lao PDR alone accounts to about 10 percent of its yearly national revenue from tourism. Its economy has been growing steadily through the years because of tourism. It brought US\$ 233 million to the economy in 2007.

At the global scale, tourism contributed to 10.3% of the total global Gross Domestic Product (GDP) of about USD \$44 trillion in 2006. From this 40% is from ecotourism. Tourism-related employment demands 8.7 percent of total employment, or about 230 million jobs globally in 2006. About 40 million more jobs are expected to be created within 10 years (UN Atlas of the Ocean, 2004; World Travel & Tourism Council, 2006). Tourists spent almost USD \$3 trillion on personal travel in 2006 and only USD \$700 billion on business travel. This shows that most travels are tourism-related.

Considering the significant contribution of tourism to the national economy, such industry should be developed and sustained in countries where spectacular scenic beauties with natural and historical landmarks are notable. Sustainable ecotourism must be promoted not only for economic reason but one means to advance nature conservation.

The World Tourism Organization (WTO, 1990) defined sustainable tourism as a “form of economic development that is designed to improve the quality of life of the host community”. Sustainable tourism has the following characteristics: 1) increases travel to natural destination, 2) minimizes the negative impact of travels, 3) builds environmental awareness, 4) provides direct financial benefits to conservation, 5) provides financial benefits and empowerment to local people, 6) respects local culture, and 7) supports human rights and democratic movements (Honey, 1999).

## **5. Issues and concerns**

The Mekong wetlands, like in any other parts of the world, are faced with the following issues and concerns:

- Inadequate information about the extent of wetlands as water bird habitat within the Mekong subregion. There are a number of researches conducted on resource base particularly on water and forests as commodities, but there is still a dearth of information on wetlands as habitat of globally protected migratory birds;
- Lack of promotion of Mekong Wetlands as tourist destinations especially for bird watching groups (due to inadequate information). Wetlands at Mekong Sub-region are not well understood and recognized as a valuable resource for ecotourism;
- The value of wetland as ecotourism destination need to be expressed in monetary terms to make it attractive to investors and tourism promoters;
- Conversion of wetlands into other land uses. Wetlands used to be seen as wastelands and as breeding grounds of diseases causing organisms. Developers see wetlands could be put into good use if these are transformed into other land uses such as residential, commercial or industrial estates, thus changing their ecological character;
- There are few local bird enthusiasts within the Mekong River Basin that works for the conservation of waterfowls and wetlands habitat;
- Bird hunting poses a great threat to migratory water birds. During the long and arduous flight of these birds, they stop at wetlands to feed on benthic fauna. Unlike arboreal birds that enjoys canopy cover, water birds are so exposed while feeding at mudflats and swamps. They became easy target for bird hunters;
- Pollution from pesticides and fertilizers from agricultural lands causes endocrine disruption to wetland dependent organisms such as birds. This adversely affects their reproductive capacity that would eventually lead their decline in population and endangered status. The decline of bird population coming in during migration season, will affect the ecotourism industry.

## 6. Future actions

To address the aforementioned issues and concerns the following are suggested future actions for MRC and member countries in the Mekong to consider:

- Strengthen research and development activities on wetlands and waterbirds among countries within the East Asian AustralAsian Flyway to generate information that will guide the policy makers;
- Mainstream ecotourism as an important resource management practice in the Mekong River Basin. Involve tourism promotions offices;
- Conduct resource valuation of Mekong wetlands to include ecotourism and determine their potential economic benefits. Policy makers and investors would be greatly helped in their decision-making if the intrinsic value of wetlands is given market values or expressed in monetary terms;
- Conserve Mekong wetlands as a valuable resource in so far as ecotourism potential is concerned. Determining the presence of rare and endangered species visiting the wetlands is an added attraction;
- Hold wetland conferences that will be participated in by various stakeholders to bring about wide appreciation and awareness of wetlands and water birds among policy makers, legislators, policy implementers, local government officials, private business groups and cause-oriented groups;
- Come up with a unified action plan for sustainable tourism at wetlands in the Mekong;
- Form a network of experts that will continually generate information about wetlands and water birds within the Mekong Subregion;
- Promote information sharing among countries in the East Asian AustralAsian Flyway including the countries within the Mekong Subregion about migratory birds, their species and number, migration route and the extent of their feeding and roosting sites;
- Finally, the overall intention of this paper is to provide information and provocative ideas on how to strengthen policy formulation, development planning and management for decision makers on how to develop the ecotourism potentials of some wetlands of international importance in the Mekong river basin.

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# **Challenges in Fisheries Governance: A Case Study of a Province along the Mekong River of Cambodia**

Sok Serey  
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## **Introduction**

The formulation of the Community Fisheries (CFs) is the first thing to do for good “Fisheries Governance” which is indispensable for natural resources conservation and management in fishing villages. According to Blake (2004), Cambodia has put significant effort and commitment into transferring power from state to communities and from central to more local levels of the government for natural resources management and conservation. Vinner (2006) reveals that when the CFs are established, a co-management<sup>1</sup> exists in collaboration with the resource users and the Provincial Office of Fisheries (POF) for management, conservation and development. The CFs co-management program was established in Cambodia in 1994, although widespread implementation did not commence until 2001. The establishment of CFs responded to the escalating violence in the Tonle Sap region and empowers community ownership (Resurreccion, 2008).

Policy reform<sup>2</sup> in 2000 (under the Sub-decree in 2003) was vital to give poor communities access, user rights and management responsibilities of fisheries and inundated forests in the country including the Tonle Sap Lake in order to improve livelihood opportunities and food security. The Royal Government of Cambodia decided to relocate the bulk of fishing rights from the large-scale commercial fishers to the small-scale subsistence fishermen. As a result 56 percent (500,000 ha) of the former fishing lot areas allocated to the commercial sector were released to the local communities for management.

The number of CFs increased to 440 by 2005 with an average increase rate of 28.5% annually (MAFF, 2008). The latest release of legislation of community fisheries in January 2008 was an effort of the Fisheries Administration aimed to widely spread organization and management of community fisheries. The CFs are led and managed by the CFs Committee who are selected through elections among the local fishermen by the Congress. The members of CFs must be Cambodian local residents and at least 18 years of age. Members of CFs are able to enter and use

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<sup>1</sup> In Cambodian, this concept initially existed in 1998 when Oxfam Community Aid Abroad (OCAA), as a part of a wider rural development project within the village, assisted to establish a community fishery.

<sup>2</sup> Keynote Address by Samdech HUN SEN, the Prime Minister of the Royal Government of Cambodia, the National Forum on the Tonle Sap Initiative, the Hotel Inter-Continental, Phnom Penh, 5 March 2007.

fisheries resources in the community fisheries but they have to comply with the by-laws and internal regulations, management plans and all legal instruments. With the establishment of the CFs, the fishermen can create internal regulations, management plan, maps of their community fishing areas recognized by the competent authorities (FA, 2005).

## **1. The study areas and methods**

The study was selectively conducted in Kompong Pou commune of Krako district, Pursat province. Krakor is the westernmost district of Pursat province and borders Kampong Chhnang to the west. To the north of the district encompasses a portion of the Tonle Sap Lake and there are several villages on the edge of the lake. These are Tonle Sap floating villages and their location moves depending on the water level in the lake (Total Rod Atlas of Cambodian, 2006). We studied eight communes: Kompong Pou, such as Chhek Chhao, Po Robong, Pho Kotch, Mat Prey, Kompong Lo, Rolous Kandal, Rolos Khangket and Sna Reach. The commune has a total population of 1,283 households (5,908 inhabitants) with an annual growth rate of 4.6%. The main sources of income<sup>3</sup> were from rice cultivation, fishing, selling and external migration for employment. The CF was established in the commune in 2002 in the name of Stung Lok Yeay River CF with a land size of 1,075 hectares. The CF is accessible to fishermen by motorbike and bicycle and on foot during the dry season, but only by boat during the rainy season.

The primary data was basically obtained from a household survey with 301 sampled-fishermen, based on Yamane (1967) stratification into by female and male. The primary data collection methods were applied including field observation, key informant interviews, focus group discussions, community meetings and other participatory and social tools. The main hypothesis of the study was “there is an association between the educational level of the fishermen and their involvement in the CF”. It is very important to explore the influence of the fishermen’s education on the CFs’ involvement. It is assumed that the capacity of the local fishermen is quite significant to function the CFs which contribute to fisheries governance.

The research results are expected to make a contribution in how to improve the way policies and plans are formulated with regard to fisheries co-management in the the Tonle Sap Lake with an emphasis on effective engagement by users of fisheries resources such as governments, national and international NGOs and local people.

## **2. The findings of the study**

### **Involvement in fisheries**

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<sup>3</sup> Based on group discussions with the fishermen in the Kompong Pou commune of Krako district, Pursat province conducted in February 2010.

The majority of households in the Tonle Sap Lake may be considered as “fishing-dependent”, although the degree of dependency varies between village types (e.g. fishing, fishing cum farming, farming) and their location or proximity to the water. Low income households are mainly small-scale, subsistence fishers and farmers with high livelihood dependency on the Tonle Sap Lake (Navy, 2006). In this study, 301 fishermen were invited for interviews and all were all small-scale fishermen with their main or supplementary income emanating from activities such as rice cultivation, livestock, etc. In terms of gender, men represented 54% and women, 26% of the interviews.

Gum (2000) pointed out that accessibility to common property resources such as fisheries is significant for the villagers to recover their livelihood against agricultural risks. In general, people centered around the Tonle Sap Lake make their living through small-scale fishing, family fishing or survival fishing where family members usually use small gears such as bamboo fences traps and gill nets as a means of fish catching. It is true that the small-scale fishing is much more significant, as a source of livelihoods, food security, and national income, than most people realize (FAO, 2000). Thus, the decrease in accessing to fisheries resources is badly affecting the livelihoods of the rural poor villagers who have limited land ownership for agricultural activities (Gum, 2000 & Kaing el al., 2003).

The fisheries sector<sup>4</sup> contributes enormously to the national economy, accounting for 10 percent of the national Gross Domestic Product (GDP), in particular, the livelihood of the fishermen along the Mekong River (MAFF, 1999). Nonetheless, there is a higher percentage of poverty<sup>5</sup> along the Tonle Sap Lake than there is in the country side. In national terms, the Tonle Sap region has the highest incidence of poverty (38%), the second highest average population density (52 persons per km<sup>2</sup>), and 31 percent of the population. About 50% of villages have 40– 60 percent of households live below the poverty line, with a peak of 80% in parts of Siem Reap and Kampong Chhnang. The poor, as defined by low incomes and low consumption bundles, generally tend to have less access to productive resources<sup>6</sup> (ADB, 2007).

#### *The Education Level of the Fishermen*

The general literacy rate<sup>7</sup> in Cambodia has increased from 62.80% in 1998 to 78.35% in 2008. With this increase, the level of the literacy rate has raised from 78.51% to 90.17% in the urban

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<sup>4</sup> "According to the study by the Department of Fisheries, the annual total fish catch ranges from 300 000 to 450 000 tons with a value of US\$150 to 225 millions" (Minister of Agriculture, Forestry and Fisheries, 01 July 2004 [National Fish Day]).

<sup>5</sup> The poverty rate in Cambodia dropped to 30.1 percent in 2007 from about 47 percent in 1994 (MoP, 2008, IEC. 2008). On average, poverty has reduced at a rate of about 1 percent or 30,000 persons per annum.

<sup>6</sup> For example, poorer villages tend to be located where there is less access to natural resources or where there are lower quality natural resources (e.g., less productive land in areas more vulnerable to flood and drought).

<sup>7</sup> is the percentage of literacy population to total population aged 7 and more.

and 59.07% to 75.33% in the rural (NIS, 2008). The implementation of Education for All and the government political commitment to achieve a 9-year basic education suggested in the Millennium Development Goals (MDGs) is very significant to human development (World Bank, 2006). CIDA (2004) stated that basic education helps individuals reach their full potential as productive members of society.

**Table 1: Education levels of fishermen**

Education	Male		Female		Total	
	N	%	N	%	N	%
Illiterate	67	48.6	43	26.4	110	36.5
Primary School	65	47.1	92	56.4	157	52.2
Lower Secondary	5	3.6	21	12.9	26	8.6
Upper Secondary	1	0.7	7	4.3	8	2.7
Total	138	100.0	163	100.0	301	100.0

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
Education	301	2.78	2.834	.163

**One-Sample Test**

	Test Value = 6				
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
					Lower Upper
Education	-19.726	300	.000	-3.223	-3.54 -2.90

Source: Field Survey, 2008

The community cannot expect to integrate itself into local employment without equipping its people with basic skills through basic education (Delamonica et al., 2004). In particular, the low educated people are not able to express their problems faced as well as to dialogue for their community development. Care (1999-2006) also believes that education is at the heart of social and economic development. It has the power to stimulate economic growth, reduce poverty and inequality, and promote social cohesion and good governance. Educated people are more likely to gain access to deal with policy makers, and observations show that education contributes to the development of the community.

The study shows that the fishermen had average education levels of 2.78 grade and this was well lower than primary completion (sig=.000). The illiteracy rate was as high as 36.5% while male

fishermen (48.6%) had greater level of illiteracy than those female fishermen (26.4%). However, more female fishermen than male fishermen had more access to education, except higher education. The education of the fishermen in the study areas was relatively low if compared to the national standard.

#### *The Type of the Capacity Building Obtained*

In general, the CFs facilitated and supported by NGOs and aid agencies function significantly better than those organized solely by the fishery authorities. Some communities organized by powerful groups, former fishing lot owners and local elites become completely destructive and serve only the interests of a few at the top of the management structure (CUTS International, 2007). The main reasons were that NGOs and aid agencies have been accessible to findings and they have been working closely with the communities. In Kompong Pou commune, the CF<sup>8</sup> has been established since 2002 with support from the Provincial Fisheries Administration, the Provincial Environmental Office, NGOs. Basically, NGOs including FACT has been working to provide technical support to the CF regarding the legal instruments related to community fisheries and other advocacy-related tools.

In the present time, fishermen have complained about difficulty of fisheries' career. They mentioned that the natural resource in Tonle Sap Lake has rapidly reduced approximately up to 50% (FACT, 2004) because of a variety of illegal and destructive practices, rampantly threatening the sustainability of the fisheries resources (Asia Forest Network, 2004). The CFs' establishment is important to deal with the resources management by the community itself in order to solve the issues faced. Yet, the community has no enough capacity to run the CFs well without the facilitation from NGOs. So most of the NGOs are working to support the CF through building the capacity of the fishermen as well as through dialogue with the policy makers. Table 3.2 illustrated that the main capacity building types obtained by the fishermen were community which almost half of them (49.5%) could receive. Some of the fishermen (around 10%) also were involved in some development activities including impact assessment, social mapping, resources mobilization and campaign involvement and training.

**Table 2: Types of capacity building obtained**

Type of Capacity Building	Multiple Answers					
	Female		Male		Total	
	N=157		N=182		N=339	
	N	%	N	%	N	%
Community Meeting	72	52.2	77	47.2	149	49.5

<sup>8</sup> Many fishery communities were established, most of them by the Provincial Fishery Office, some with the involvement of NGOs and aid agencies, and some by local groups including former fishing lot owners and local elites.

Impact Assessment	14	10.1	16	9.8	30	10.0
Social Mapping	17	12.3	28	17.2	45	15.0
Planning	12	8.7	9	5.5	21	7.0
Resource Mobilization	10	7.2	12	7.4	22	7.3
Campaign involvement	15	10.9	18	11.0	33	11.0
Training	17	12.3	22	13.5	39	13.0

*Source: Field Survey, 2009*

In comparison, female fishermen seemed to have more change to participate in those activities except social mapping, campaign involvement and training. The involvement of opportunity in developing commune investment plan is very important for fishermen. The same figure shows that 7% of the fishermen experienced in the forum. However a serious question could be raised as to how the fishermen can argue and challenge in the commune council to insert their activities regarding their problems and issues faced into the plan. Before the meeting, CF did not plan it useful role to gather all its members to collect all the main issues which could be formed by a single voice. Therefore, the problems and constraints raised by the representatives were more likely the individual rather than collective experiences.

#### *Influence of education in involvement of CF*

The Chi-Square Tests was employed to test whether the suggested alternative hypothesis were accepted or not. It was assumed that “there is an association between the educational level of the fishermen and the involvement in the CF”. The result from the test was rejected as the facts that the involvement of the fishermen in the CF was not associated with the educational level of the fishermen (sig. =0. 096). It was now true that fishermen in all types of the education attainment were likely to involve in CF. However the main concern was that almost all of the fishermen were lower educated and the illiteracy rate was very high. There was only 2.7% of the fishermen who could complete from upper secondary school and there was none of them graduated from higher education which was very significant for the function and the management of CF.

Yet, the educational level of the CF committees was very helpful to be more affective to make the CF functioning. The same question was asked on how to find a qualified fisherman in the community to lead the CF already established. With the limited education attainment of the fishermen, NGOs have been playing far beyond their authority. In some sense, most of the CF was not able to continue or weekly function when the NGOs had phased out due to financial constraints. When NGOs were in the community, the CF committees played more roles to gather other fishermen for meeting and training organized by NGOs or the participants for the NGOs workshop to fake the large involvement from the community. However how much the CFs and local fishermen have rights to make the decision and whether they have the capacity to do so have remained questions to be answered.

**Table 3: Influence of education in CF involvement**

### Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	%	N	%	N	%
Education	301	1.0	0	.0	301	1

### Cross-tabulation

Count

		CF Involvement		Total
		Yes	No	
Education	Illiterate	31	79	110
	Primary	66	91	157
	Lower Secondary	7	19	26
	Upper Secondary	3	5	8
Total		107	194	301

### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.349	3	.096
Likelihood Ratio	6.415	3	.093
Linear-by-Linear Association	1.086	1	.297
N of Valid Cases	301		

The weakness of the CFs was due the low capacity of the CFs' committee and lack of resource tracking efforts for the operation, lack of ownership and authorization from the Provincial Office as well as influence from lot owners. Almost all of the CFs was established with facilitation rather than the local fishermen initiatives so they tend not to be sustainable if there is not support from NGOs any more. However, NGOs staff in the local community does not have enough capacity to cope with the problems systematically. The augment between the government and the civil society are still unsolved. Civil society has raised the concerns that the catch is declining while the government claimed to be increasing. The failure of the NGOs has been about being unable to scientifically prove the claim until today. This may be also the limited capacity in establishing the effective monitoring and evaluation system to produce a single and trusted data and information. Without solid data and information, civil society could not convince the planner and policy makers while they are strategy oriented. The negotiation power would be incurred unless the civil society has ability to translate all their communities work into evidence-base (Serey, et al, 2010).

The mutual relationship among the local fishermen involved officers and the civil society is important. However they seem not to have built the close cooperation due to conflict of interests and bias to the fishing lot owners by the involved officers. The local fishermen are more reliant on civil society who has no legal recognition. This could be because fishermen did not believe that the involved officers could help them if they faced problems.

Fishermen confirmed during the discussion that when the CF organize meeting they invite the involved agencies who seldom participate. In contrast, they did not prefer to invite CFs members if they organize meetings and crackdown, in particular, illegal fishing. The alignment and harmonization have not been in place to create a good enabling environment for all the actors in the communities. They work separately to maximize their own profits (Serey, et al, 2010).

### *Conclusions*

Based on the findings from this research, it can be concluded that the educational profile of the fishermen in the study was very low with an average of 2.78 grades. The illiteracy rate was high and it is relatively low if compared to the national standard. The female fishermen had higher percentage of educational profile if compared to that of male fishermen.

The higher education the fishermen have, the more authorization the fishermen can have in decision making and managing the existing CFs. The fishermen are basically entitled and empowered through owning and managing the CFs. However the current knowledge of fishermen is just able to own but not to manage the CFs. The CFs committees are leading with a deep dependence on the external support especially by NGOs. In practice, the establishment of CFs was not to manage the fishery resources by the communities but the fishermen were scared of losing their fishing territories.

The CFs establishment has been fragile as it has not been initiated by the local fishermen but the Fisheries Administration and NGOs' facilitation. The CFs may be dissolved or weekly managed when NGOs phased out. It was a fact that NGOs played more roles in managing the CFs rather than in facilitating the CFs. This may be a reason of too low capacity of the local fishermen and NGOs are more concerned about the failure of project implementation.

There was no association between the educational level of the fishermen and the involvement in the CFs. All of the fishermen were likely to be its members although the knowledge was very important to manage the CFs as well as to dialogue with the policy makers. They fishermen were not strong enough to make the FCs functioning well by themselves.

The capacity building for the CFs committees was fundamental regarding to law and legal frame work concerning fisheries but not administrative and logistic work for CFs operation. The CFs could be hardly functioning when NGOs phased out as the facts that the fishermen do not have skills in fund raising and administrative management of CFs.



More capacity-building support is required for the fishermen to make the CFs function well. Skills provided by NGOs could be provided not only with fisheries-related law and regulation dissemination but also with administrative and funding raising awareness. Since most of the FCs committees are also old and low educated so it important to build their capacity through coaching to implementing their daily work within a few years.

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# **An analysis of the necessity for Greater Mekong Subregion cooperation on hydropower dams**

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On the premise of sustainable development and mutual benefit, Greater Mekong Subregion (GMS) countries must make best use of experiences and lessons of other countries on water and power resource development. GMS countries need effective communication to develop hydropower to meet the increasing energy demand of China-ASEAN Free Trade Area and prepare in advance to solve water disputes that will happen because of scarcity of water resources in the future. They could work together on the policies and measures of environmental protection, and construct a good external environment and international atmosphere to develop an integrated outlook on water and power resources for GMS countries.

The GMS is extremely rich in water reserves and has great development potential which requires cooperation on the construction of dam projects.

## **Background**

The GMS is one of the richest areas of water resources in Asia, and has extensive rivers and abundant water. A number of dam projects have been built, and there are numerous water projects under development and construction. GMS is in a unique position to develop an integrated position on water and power development.

The Mekong River flows from China through Myanmar, Thailand, Lao PDR, Cambodia and Viet Nam, all of which countries have abundant water resources. The Mekong River flowing through Thailand comprises 976.3 km of the Lao-Thai border river, with a drainage area is 184,000 square kilometers. The Monte Creek, Tin River and other tributaries form a dense water network in Thailand, which has certain conditions for hydropower development. The Mekong River in Lao PDR is 777.4 km with a drainage area is 202,000 square kilometers. There are many tributaries of the Mekong in Lao PDR, of which more than 20 are longer than 100 km, such as the Nam Khan, Nam Ou River, South Russian River, Nam Theun River, etc. The Lao Government intends to build 50 hydropower dams in the river and its tributaries to develop hydropower and fisheries. The Mekong in Cambodia is 501.7 km with a drainage area of 155,000 square kilometers. Similarly, as Cambodia's largest river, the Mekong River runs through the whole territory. Major tributaries with larger water reserves include Color power Creek, Mulberry Creek, Forest River and Sleng Creek flowing into the Tonle Sap Lake. The Color power Creek is 354 km, with a fall of 1100 m, suitable for the construction of medium-sized cascade hydropower stations. Mulberry Creek's watershed area is 14,739 square kilometers, the fall is large and medium-sized cascade

hydropower stations could be built. The Mekong in Viet Nam is 229.8 km, the drainage area is 65,000 square kilometers, and there are, at least theoretically, large water reserves.

## **1. Promotion and development for cooperation in the GMS**

The enormous GMS water resources have brought great demand for technology, equipment, engineering design and construction of dams. GMS countries should enhance cooperation on this, especially for those countries experienced in dam construction and water resource management, which have a responsibility to help other countries and provide technology, personnel and financial support. Furthermore, new forms of cooperation could be actively explored, such as technology services and outsourcing.

The Yunnan Provincial People's Government promulgated "Yunnan Work Views on Lancang-Mekong River Sub-regional Economic Cooperation" on June 20, 2008, and pointed out that Yunnan should use its knowledge of water resources and technology, and actively carry out cooperation in hydropower development in GMS countries. It advocated constructing a China-GMS economic corridor of energy, promote the process of power interconnection and electricity trade steadily within GMS, and participate in constructing a GMS cross-border power grid and a regional electricity market together with all GMS countries.

## **2. Energy demand in ASEAN countries**

Presently, the demand to develop dams is increasing gradually in ASEAN countries in proportion to their steady economic development. The unbalanced distribution of water resources led to a disparity between supply and demand of energy in ASEAN. Energy became the "bottleneck" which constrained the development of ASEAN countries and had a serious impact on industrial and agricultural production and people's livelihoods. From now on, the energy demand of whole ASEAN countries will increase significantly. According to the Malaysia Energy Forecast Center, the investment on energy by ASEAN will reach 1,800 billion U.S. dollars in the next 20 years; and the energy consumption of ASEAN countries will take account of 32% of total world demand by 2020. Hydropower as a type of renewable clean energy is one important part of energy planning around the world. It plays an important role in the energy balance and sustainable development.

There have been three summit meetings of GMS countries, involving national leaders. All of the summits signed agreements on GMS power cooperation. From this we can see that power cooperation plays a very important role in GMS cooperation.

With the background of a general situation of power shortage, transnational power networking to enable power trade could achieve the optimal allocation of resources and the goal of mutual benefit. It will contribute to deepening the cooperation and implementation of dam projects; to strengthen the relationship between ASEAN countries; to further expand foreign trade and

economic cooperation in the world by further active participation and promotion of a sub-regional power network interconnection and trade, make use of the best regional experience on power management, project development and construction, as well as in the areas of power grid operation and electricity market reform.

On the basis of the power interconnection agreement between China and GMS countries, China has transmitted power to Viet Nam, Lao PDR, and is developing dam projects with water resource-rich countries including Myanmar, Viet Nam, Lao PDR and Cambodia.

At the second summit of GMS on July 5, 2005, the Chinese government published “the report of china’s participation in GMS cooperation”. This "Report" clearly pointed out that China would strengthen cooperation on power with GMS countries. On the overall network model design, China would change from ‘point to network’ to ‘network to network’ or ‘region to region’, thus greatly improving the reliability of power trade technologically. China is willing to actively pursue the participation of Lao PDR, Myanmar and Cambodia's water resources development and utilization on a mutually beneficial basis. China attached importance to the power transmission project with Thailand, and will set up the Technical Working Group as soon as possible together with Thailand and Lao PDR, to jointly launch a study of "the feasibility of the three million KW power transmission project". China will also carry out GMS rural electrification training and provide technical personnel for GMS-related nations.

### **3. The integrity of human systems in GMS**

The Mekong River is the sixth longest river in the world, the average flow ranked eighth in the world, with the name of "the Oriental Danube". The water resources of Lancang-Mekong River play an important role in the socio-economic development in six countries. The potential demand of this region for energy is huge because of the relatively dense population, economic development potential and fast economic growth rate. Although Myanmar, Thailand, Lao PDR, Cambodia, Viet Nam five countries are rich in water reserves, including China, the sub-region has varying degrees of energy shortages which limit national economic development. Currently, power shortages exist in northern Viet Nam, northern Lao PDR, Myanmar and Thailand. This has great significance for these region’s priorities for construction of dams, development of hydropower and promotion of development of related industries. However, this river is a complete, indivisible system ecologically. It connects six countries, 2.5686 million square kilometers of land and 3.2 billion people, and partial exploitation could cause effects on the whole system. The development of GMS water resources is increasingly becoming a sensitive issue, and many problems should be studied comprehensively.

In the process of water resource development, the GMS countries should consider the basin as a whole, strengthen sustainable development, overall coordination, integration management, look for multiple ‘wins’, and develop dispute resolution processes that include compensation mechanisms for partial losses of benefits. In order to achieve the above goals, cooperation should be enhanced. The GMS countries should work together on some important watershed issues, such

as an environmental monitoring system of dams, environmental tracking evaluation on implementation of dam planning and dam operation; and further improvement of immigration policies to protect the legal rights and interests of migrants. Comprehensive planning of watersheds is the fundamental basis for basin development to regulate various watershed exploitation activities. The planning should include the analysis of power needs and water supply and select project construction programs (including non-dam options).

Hydropower projects will produce some environmental problems due to barriers, reservoir inundation, land degradation, changes in hydrology and aquatic species etc. Many studies have been done about the ecological environment and negative impacts on human society because of hydropower. Furthermore, western society and NGOs have set off, one by one, waves of anti-dam protest. The "water politics" arising from Lancang-Mekong River's development is a typical problem of regional ecological safety. Making full use of water resources in their own territories is the will of the Mekong River Basin countries, which are at the beginning of exploitation. Meanwhile, there is the possibility of conflict in the development process. Therefore, it is a big problem as to how to make full use of the water resources of Mekong River and take ecological safety and environmental benefits into account reasonably. Dam development and environmental protection are not diametrically opposed, dams should be developed to some extent in order to achieve economic development and meet the energy demand; the key is to build a bridge between dam development and environmental protection, rather than isolating them. GMS countries should pay more attention on the latter.

Sub-regions should pay great attention to the challenges and problems and solve them based on multi-win, optimisation and sustainable development. Environmental Impact Assessment is the best way to avoid or mitigate ecological impacts on the environment. GMS countries should carry out environmental impact assessment on the construction of dams, allocate professional institutions, organizations and personnel, set up common norms and standards, and implement environmental impact assessment for watershed planning, exploitation planning of water resources and hydropower development. Integration of environmental impact assessment into all of the construction and management processes is necessary, by institutionalizing these procedures.

Through years of practice, dam construction in China today has more emphasis on coordination and coexistence with the nature based on basin-wide social, economic, and sustainable development. China has accumulated some experiences on evaluation and research on different kinds of impacts caused in the whole basin. China would like to cooperate with GMS countries in this field.

# **The role of IWRM-based development on the utilization and protection of the Lancang-Mekong River: A case study from Yunnan Province, China**

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## **Introduction**

The "World Water Development Report" by the United Nations in 2006 indicated that it was inadequacies in water resource management, institutional arrangements and infrastructure construction of global water resources which led to poverty, poor health conditions, deterioration of water quality, and scarcity of agricultural water.

Lancang-Mekong sub-regional economic development is directly related to the water resources of the basin and is inseparable from the development and utilization and protection of water resources. Most of the regional economic development plans and strategies are built on the basis of the water resources of the basin.

Therefore, it is necessary to implement IWRM-based development to achieve sustainable utilization of water resources and economic development in the Lancang-Mekong Sub-region.

## **1. Relevant research in China**

China has abundant water resources, so research into water resources management started very early and much has been learned. One milestone was the project named "Integrated Watershed Management in China" which was sponsored by WWF and completed by the China Environment and Development Council for International Cooperation. In 2004, this research project submitted the policy research report entitled "Promoting Basin Integrated Watershed Management and Reconstruction of the River of Life of China" to the central government. According to this report, integrated watershed management in China should be managed by the unit as a whole basin, with government, business, public participation and application of administrative, marketing, legislative means, and should be well coordinated, planned and sustainable in order to maximize public welfare (Pan Jingpeng, Zhang Wang, Wang Haifeng, 2009).

In April 2007, with the sponsorship from the Australian International Development Agency and WWF, the project named "Strategy of basin IWRM in China" was conducted, which finally formulates the conceptual framework and policy recommendations for basin IWRM in China.

The common definition of IWRM by Chinese scholars can be summarized as: Through interdisciplinary and cross-disciplinary approaches to research, the development and utilization of water resources and other resources needs to consider multi-sectoral coordination and balance various interests in order to achieve its objectives (Fang Qunfang, 2007). A decision-making management system for the utilization of water and related resources to achieve sustainable social development is required (Fang Qunfang, 2007). In addition to its general meaning, "integration" also includes administrative jurisdiction, unified management of surface and groundwater, integration of upstream and downstream, the balance between the environment and human needs, the coordination of supply and demand, the balance of water quality and quantity and integrated utilization of water in a cross-regional basin (Liu Heng, 2007).

## **2. Overview of water resources in the Lancang River in Yunnan**

The Mekong River, an important transnational river in Asia, originates from the Tanggula Mountain Range on Qinghai-Tibet Plateau, running through Qinghai Province, Tibet Autonomous Region and Yunnan Province of China as well as Myanmar, Lao PDR, Thailand, Cambodia and Viet Nam from north to south, and flows from the vicinity of Ho Chi Minh City, Viet Nam into the South China Sea. The section of the Mekong River within the Chinese border is called the Lancang River. With about half of its length in China, it flows for 4,880 kilometers, covers  $81 \times 10^4 \text{ km}^2$  and has an annual average runoff  $4750 \times 10^8 \text{ m}^3$ .

The full length of the Lancang-Mekong River in China is 2161.2 km, and the length of the section in Yunnan Province accounts for more than 50%. It flows into Yunnan from southwest of the province and the outflow is in Mengla County with the average annual runoff  $741 \times 10^8 \text{ m}^3$  and average underground runoff  $160.5 \times 10^8 \text{ m}^3$  (Yang Jing, Li Duo, Bi Pan, Fu Xiaogang, 2009). There are 15 reaches of the Lancang River in Yunnan Province with some large tributaries along the river, such as Heihui, Luozha, Wei yuan, Nanla etc. (Yunnan Water Resources Bulletin, 2010)

The river's estimated per capita water resources are about  $8000 \text{ m}^3$  and the total reserves of hydropower are about  $9456 \times 10^4 \text{ kW}$ . The per capita water resources of Yunnan Province are estimated to be about  $1.2 \times 10^4 \text{ m}^3$ . This is five times of the national level of China, and only 5% is utilized and developed. In the upstream area, the main objective is to develop hydropower, supplemented by shipping and irrigation. With that, the other main objective is to prevent environmental degradation and erosion.

## **3. Status of various sectors of development**

### *Hydropower development*

The total potential hydropower reserves are about  $2550 \times 10^4 \text{ kW}$  for the Lancang sub-catchment in Yunnan. Sixteen cascade hydropower plants in Yunnan have been developed or are under development by the central government. Eight of them (with a total installed capacity of  $1615 \times 10^4 \text{ kW}$ ) will be built in the upstream of the river while another eight will be built



downstream with an installed capacity of  $2645.5 \times 104 \text{ kW}$ . All of the hydropower plants will be developed completely by 2020. At that time hydropower installed capacity will reach  $2200 \times 104 \text{ kW}$ . Yunnan will be the national hydropower base in China.

#### *Status of shipping resource development*

The Lancang River has great potential for shipping. Currently, only the section downstream of Erhai Lake has been developed. The section of the Mekong River up to Jinghong has become navigable for 300t vessels over 293km in length (Ministry of Foreign Affairs, PRC, 2008).

#### *Status of agricultural irrigation*

The cultivated area is approximately  $57 \times 104 \text{ hm}^2$  where the Lancang River flows through in Yunnan Province, and the irrigated area is about  $18.67 \times 104 \text{ hm}^2$ . Currently, the water resources in the lower part of the Lancang River basin are mainly for agricultural irrigation which supply production bases of fruit, sugar, bio-medicine, tea and tobacco.

### **4. Role of IWRM-based development on the utilization and protection of the Lancang River in Yunnan province**

Most research on the Lancang-Mekong River Basin has been focused on the development needs and issues in Yunnan Province in China; however, the region is an important area for the protection of biological diversity. Over the past 30 years, many international cooperation projects have been primarily focused on the protection of biodiversity in the Lancang-Mekong River Basin. In addition, in recent years, with the development of agriculture, industry and urbanization, resource management has become even more complex. Evidence shows that implementation of IWRM in Yunnan Province plays an important role to solve these problems.

#### *Cooperation with Lower Mekong Countries*

To support the implementation of the Lancang-Mekong River Development Project, the central government of China set up an agency named "Lancang-Mekong River Basin Development & Coordination Preliminary Research Group", led by the State Planning Commission and State Science and Technology Commission. The Group has a diverse membership, including the Yunnan Provincial Government, Ministry of Foreign Affairs, Bank of China and 19 other ministries and departments. This Group agreed to adopt IWRM to manage the water resources of the Lancang Basin. Since 1992, this has created a mechanism for engaging with and enabling cooperation with the countries of the Lower Mekong basin. This has occurred under four international mechanisms: The Greater Mekong Sub-Region Program led by the ADB; the BDPP Program by MRC; ASEAN-Mekong Basin Development Cooperation Program by ASEAN and the Golden Four Corner Program by China, Thailand, Lao PDR and Myanmar.

#### *Co-developing hydropower projects*

Paunglaung Hydropower Project is the largest project in terms of foreign trade and economy in Yunnan Province. The installed capacity is 280MW (4×70MW). The total contract value is USD 170 million, provided by Chinese Government on seller's credit basis. Yunnan Provincial Government is strengthening its leadership, coordination, and supervision of the project. Yunnan Provincial Government attaches great importance to this project and has set up a Committee for the Coordination and Management of the Paunglaung Project with Mr. Shao Qiwei, Vice Governor of the Province, as the Chairman of the committee.

Jinghong hydropower project is 70% invested in and owned by Thailand GMS company. In China's history of large hydropower construction, this will be the first-ever introduction of foreign direct investment in the construction of a hydropower station, and the first ever power station that transfers all the electricity to foreign countries. The Jinghong Hydropower Plant is located in the lower reaches of the Lancang River, in Xishuangbanna, Yunnan Province. It is the sixth of the eight-dam cascade in the middle and lower reaches of Lancang River. The dam wall is 120 meters high with a capacity of 1.04 billion cubic meters, and the planned generation reaches 7 billion kwh. It is built mainly to transfer power to Southeast Asia.

#### *Co-developing of channel regulation and tourism*

The Chinese government regard the river as an important trade link with neighboring countries and started to dredge the 260-kilometer section of river in Yunnan in the 1990s. Water course deepening and cleaning projects continued throughout the dry seasons since 2002 and the river's transport efficiency improved significantly. The transport capacity on the upper reaches rose by 50 percent to hit 250 tons, costs were cut by 30-40 percent, and the navigation season was extended to 11 months from the former six to seven months. Yunnan Province also launched projects to further improve navigation on the river. The channel from Nande Dam to Xiaolan Dam, extending 104 km in length, has been regulated completely with 100-ton barge navigable capacity. A principal part of the project, building a 71 km five-star navigation channel along the Lancang River from Jinghong to the 243rd marker of the China-Myanmar border has been accomplished, with the work of renovating the channel and eliminating hazards already basically finished.

#### *Framework of cross-border water allocation*

Since 1993, the State Council listed development of the Mekong River as priority project of "China's 21 Century Agenda ". After which, Yunnan Province launched many projects under the framework of the Agenda, and finally defined principles to manage the water resources of the Lancang-Mekong River as follows: The river basin as a unit is to be managed; to plan, develop and manage by domestic and international stakeholders with multiple objectives and coordination; to seek an approach to make sure the harmonious development among the economic growth, resources and environmental protection. There are seven components in this Agenda: Lower Mekong Integrated Development Planning, Poverty Eradication and Rural Development, Geographic Information Systems, Environmental Monitoring Networks, Biological Resources Development in a Tourism Area; human resources development Training and

International Trade Development. Yunnan provincial government has also set up corresponding organizations to conduct relevant research including into the distribution and utilization of international river water resources, water environment and ecology, legislative frameworks for sub-regional cooperation and transport & energy construction.

From 1996 to 2005, Yunnan Province focused on the research of theory ideas and scientific issues related to rational utilization of water resources of international rivers and coordination of management, and studied the Lancang - Mekong River as a case. Finally, a framework of multi-objective utilization of trans-boundary water resources and a possible conceptual model of water allocation were proposed for provincial governments to make policies. The basic data for the Lancang-Mekong River Basin related to water allocation needs to integrate all countries' information, including the proportion of drainage area, precipitation, river runoff and dry season runoff amplitude, water requirements, water consumption (water consumption for ecological, social and economic development), the population supported by basin river water resources and the amount of water required for the maintenance of ecological systems. The River Basin Water Resources Allocation Scheme should be formulated through negotiation and consultation among the basin countries resulting in a series of real, rational and scientifically based data.

The state scientific and technological program "Research on Overall Allocation of Transboundary Water Resources of the Lancang River," has developed a multi-level and multi-objective water distribution model, and accordingly has formulated the first cross-border water allocation scheme for an international river basin in China. The modelling suggests that the Lancang-Mekong River is the main connectivity watercourse, with a low level of watershed development, and it is important to emphasize capacity-building with neighboring countries in terms of legislation and institutions, and it is suitable for overall water allocation

#### *Utilization and protection of water resources*

Water resources development planning attaches great importance to comprehensive utilization of resources and environmental protection requirements, to mainly meet the energy needs and to coordinate flood control, water supply, shipping, tourism and ecology. For instance, the principles of developing hydropower has been changed from "develop as much as possible" to "develop rationally". According to the principles along the river basin, four reservoirs (Rumei, Gushui, Xiaowan, Nuozhadu) were designed to optimize basin-wide joint regulation, distribution and control, in order to achieve maximum benefits of water resources development. The planning Nianguo Hydropower plant has been abandoned because it is located in the "Three Parallel Rivers Region" which is certified as world natural heritage. Meanwhile, environmental assessments and protection measures are being conducted in the basin (Duan Xinglin, 2009).

Lancang-Mekong River water resources development is not only a requirement of China's energy development and an important part of construction of a national large-scale energy base, but also the necessity of coordinating economic development of the east and west China and participating in the Greater Mekong Sub region program. The total investment of Mekong hydropower development will be more than 300 billion RMB, as a result of a strong impetus for local

economic development and accelerating the pace of poverty alleviation in minority areas. In addition, by using the approaches of "industry nurturing agriculture", "urban area supporting rural area", in recent years, the Mekong hydropower development programs have invested more than 70 million RMB to implement of the Mekong "100 million project" action plan to improve the condition of infrastructure, science, education and health in rural areas, especially the "new countryside construction in the basin" has made remarkable achievements. In Yunnan, after the Mekong River Basin Centralized Control Center was built and the water regime automatic forecasting system was established, the operation scheme hydropower stations have been standardized and optimized through management to ensure the process of discharging without conflicts among transport, irrigation, ecological and other requirements, as well as the implementation of " Lancang River Basin Shelterbelt System Planning".

In summary, implementation of IWRM in Yunnan Province has always followed the principles of coordination. The characteristics of a transnational, public river and the diversity of usage require that its resources protection and management should be integrated.

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