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MRC SEA FOR HYDROPOWER ON THE MEKONG MAINSTREAM

INCEPTION REPORT

13 December 2009

The MRC SEA of Hydropower on the Mekong mainstream comprises 4 main phases: (i) scoping, (ii) baseline assessment, (iii) opportunities & risks assessment, and (iv) avoidance, enhancement and mitigation assessment.

This Inception report formally concludes the scoping phase of the SEA and reports on the outcomes of the scoping consultations as well as the methodology and design of the SEA for the subsequent phases.

The Inception report has five volumes including supporting materials and reports:

VOLUME I: Main Inception Report
VOLUME II: *Mainstream project profile summaries*
VOLUME III: *National scoping consultation summaries*
VOLUME IV: *SEA Theme papers and additional studies proposals*
VOLUME V: *The SEA Communications, Consultations and Capacity Building Plan*

Disclaimer

This document was prepared for the Mekong River Commission Secretariat (MRCS) by a consultant team engaged to facilitate preparation of a Strategic Environment Assessment (SEA) of proposals for mainstream dams in the Lower Mekong Basin.

While the SEA is undertaken in a collaborative process involving the MRC Secretariat, National Mekong Committees of the four countries as well as civil society, private sector and other stakeholders, this document was prepared by the SEA Consultant team to assist the Secretariat as part of the information gathering activity. The views, conclusions, and recommendations contained in the document are not to be taken to represent the views of the MRC. Any and all of the MRC views, conclusions, and recommendations will be set forth solely in the MRC reports.

This document is a record of stakeholder consultations and subsequent analysis. Whether they attended meetings or not all stakeholders have been invited to submit written contributions to the SEA exercise via the MRC website.

For further information on the MRC initiative on Sustainable Hydropower (ISH) and the implementation of the SEA of proposed mainstream developments can be found on the MRC website: http://www.mrcmekong.org/ish/ish.htm and http://www.mrcmekong.org/ish/SEA.htm

The following position on mainstream dams is provided on the MRC website in 2009.

MRC position on the proposed mainstream hydropower dams in the Lower Mekong Basin

More than eleven hydropower dams are being studied by private sector developers for the mainstream of the Mekong. The 1995 Mekong Agreement requires that such projects are discussed extensively among all four countries prior to any decision being taken. That discussion, facilitated by MRC, will consider the full range of social, environmental and cross-sector development impacts within the Lower Mekong Basin. So far, none of the prospective developers have reached the stage of notification and prior consultation required under the Mekong Agreement. MRC has already carried out extensive studies on the consequences for fisheries and peoples livelihoods and this information is widely available, see for example report of an expert group meeting on dams and fisheries. MRC is undertaking a Strategic Environmental Assessment (SEA) of the proposed mainstream dams to provide a broader understanding of the opportunities and risks of such development. Dialogue on these planned projects with governments, civil society and the private sector is being facilitated by MRC and all comments received will be considered.

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About the MRC SEA of Hydropower on the Mekong mainstream

The Mekong River Commission (MRC) is an inter-governmental river basin organisation that provides the institutional framework to implement the 1995 Mekong Agreement. The Governments of Cambodia, Lao PDR, Thailand and Viet Nam signed the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin. They agreed on joint management of their shared water resources by cooperating in a constructive and mutually beneficial manner for sustainable development, utilization, conservation and management of the Mekong River Basin water and related resources and for poverty alleviation as a contribution to the UN Millennium Development Goals. The two upper states of the Mekong River Basin, the People's Republic of China and the Union of Myanmar, are dialogue partners to the MRC.

In a region undergoing rapid change and economic growth, the MRC considers the development of hydropower on the Mekong mainstream as one of the most important strategic issues facing the Lower Mekong region. Through the knowledge embedded in all MRC programs, the MRC is conducting this Strategic Environment Assessment (SEA) to assist Member states to work together and make the best decisions for the basin.

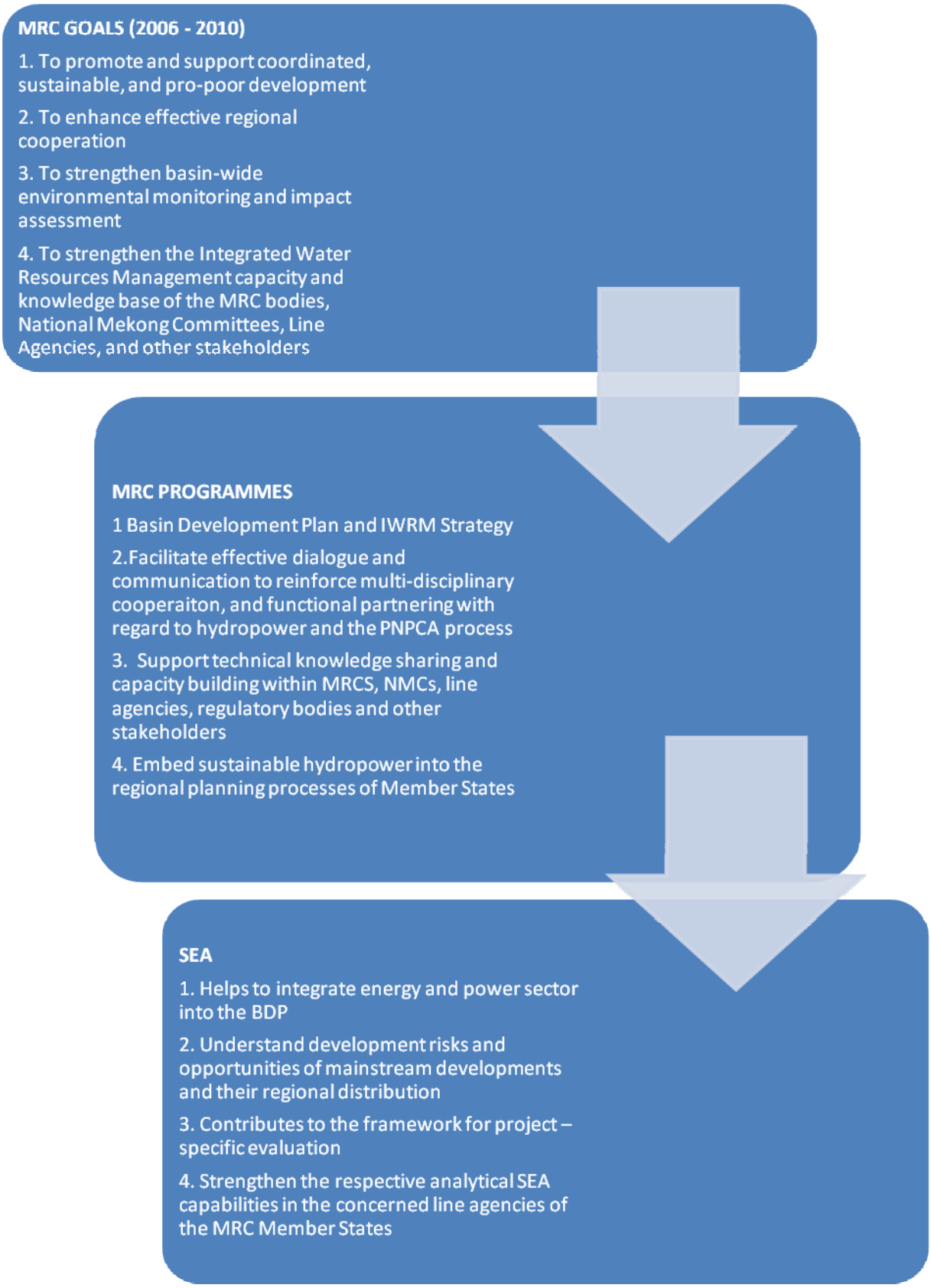
Twelve hydropower schemes have been proposed for the Lao, Lao-Thai and Cambodian reaches of the Mekong mainstream. Implementation of any or all of the proposed mainstream projects in the Lower Mekong Basin (LMB) could have profound and wide-ranging socio-economic and environmental impacts in all four riparian countries.

This SEA seeks to identify the potential opportunities and risks, as well as contribution of these proposed projects to regional development, by assessing alternative mainstream Mekong hydropower development strategies. In particular the SEA focuses on regional distribution of costs and benefits with respect to economic development, social equity and environmental protection. As such, the SEA supports the wider Basin Development Planning (BDP) process by complementing the MRC Basin Development Plan (BDP) assessment of basin-wide development scenarios with more in-depth analysis of power related and cross-sector development opportunities and risks of the proposed mainstream projects in the lower Basin.

The SEA is being coordinated by MRC's cross-cutting MRC Initiative for Sustainable Hydropower (ISH) working with all MRC programmes. The SEA will directly enhance the baseline information and assessment framework for subsequent government review of project-specific EIAs prepared by developers. It will also inform how the MRC can best enhance its support to Member Countries when the formal process under the 1995 Mekong Agreement for prior consultation on any individual mainstream proposal is triggered (i.e. the Procedures for Notification, Prior Consultation and Agreement or PNPCA). The SEA findings will also inform steps that MRC programmes may consider in the next MRC Strategic Plan Cycle (2011-2015) to help address the knowledge gaps and the key areas of uncertainty and risk concerning proposed mainstream developments.

The SEA began in May 2009 and is scheduled to complete the final report and recommendations by mid-2010. This document is one of a series of documents arising from an intensive program of consultations in the Lower Mekong Basin and detailed expert analysis of the issues associated with developing hydropower on the Mekong mainstream. The intention is to consolidate SEA activities and progressively make conclusions and outputs available for public and critical review, so that stakeholder engagement can contribute to the SEA in a meaningful way. A full list of documents is available on the MRC SEA website.

The context and aims of the MRC SEA of Proposed Hydropower Schemes on the lower Mekong mainstream



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1 INTRODUCTION

1.1 AIMS OF THE INCEPTION REPORT

This inception report marks the end of the inception phase of the MRC SEA of proposed hydropower developments on the mainstream Mekong River. After a background scoping phase, the preparation scoping has been extended over five months from May to September 2009 in the full SEA due to the importance of the issues involved and the need for the Lower Mekong Basin (LMB) countries to lead and be thoroughly engaged in the process. The inception report aims to:

(i) Review the purpose and objectives of the SEA
(ii) Record the results of the intensively consultative first phase of the assessment including the definition of the SEA scope and methods
(iii) Set out the framework of guidance for the next phase of the SEA – the baseline assessment

1.2 PLANS FOR HYDROPOWER ON THE MAINSTREAM MEKONG

Twelve hydropower schemes have been proposed for the Lao, Lao-Thai and Cambodian reaches of the Mekong mainstream (Map 1). Implementation of any or all of the proposed mainstream projects in the Lower Mekong Basin (LMB) could have profound and wide- ranging socio-economic and environmental effects in all four riparian countries. The twelve proposed mainstream projects are the focus of this SEA and are described fully in Section 5.

The proposed development of mainstream dams represents one of the most important strategic decisions the four Mekong Member States since signing the 1995 Mekong Agreement, and in particular for Cambodia and Lao PDR in their modern development history. They are important to Cambodia and Lao PDR because of the magnitude of the proposed investments – some US$ 25 billion in foreign direct investment – and because they relate to the exploitation of a natural system shared with Thailand and Vietnam – the Mekong River.

At this stage the initiative for planning and considering these projects rests with the Governments of Lao PDR and Cambodia. Ten proposals fall within Laos and 2 within Cambodia. Two of the Lao projects are on reaches of the River bordering Thailand – but the Thai Government has not been involved in the project preparation, which in all cases is being driven by the companies involved under MOUs or Letters of Agreement with the respective governments.

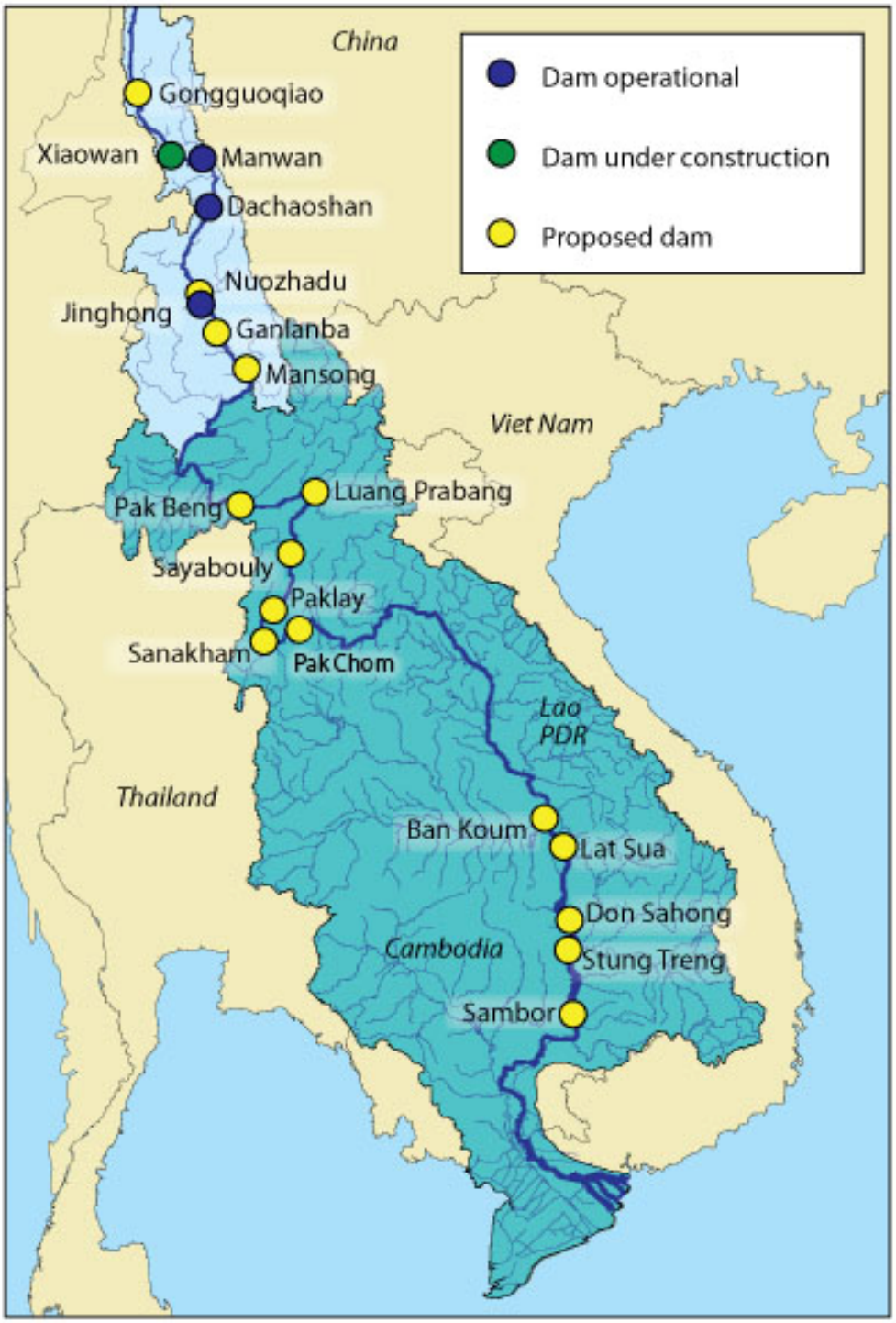
1.3 THE DEVELOPMENT PLANNING CONTEXT

Planning for mainstream hydropower development is moving forward mainly on a project by project basis under an overarching policy for hydropower development and cross-border power trade, and bilateral MOUs for power exchange, but without overarching national plans integrating these mainstream dams for the use of the Mekong River in any of the four LMB countries, or without an agreed regional plan for the use of the Mekong.

This planning is moving forward within the confines of one sector in each country – the power sector – with limited involvement of other users of the Mekong River – either development sectors or communities.

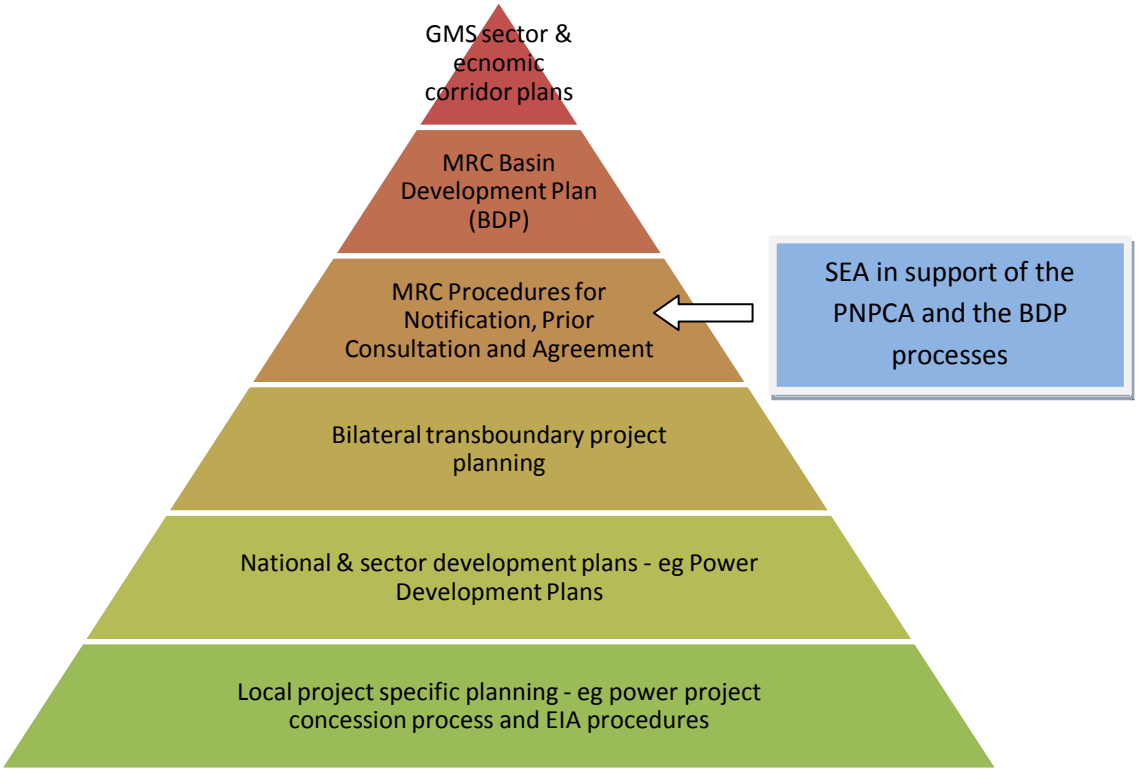
However, there are various development planning levels which provide an opportunity to support decision makers in adequately considering the risks and opportunities and broad trade-offs relating to the proposed projects (Figure 1). The BDP scenario assessments including scenarios for "with and without mainstream dams" is one example of these planning exercises. The SEA fits within these layers of planning and has the potential to contribute to each of them.

Figure 1 Map of mainstream hydropower project proposals (Source: MRC[1])



[11] The SEA team is preparing a comprehensive set of maps in which spelling for all proposed hydropower projects is consistent as follows: Pak Beng, Luang Prabang, Xayaburi, Pak Lay, Sanakham, Pak Chom, Ban Koum, Lat Sua, Don Sahong, Thakho diversion, Stung Treng, Sambor. For the purposes of the inception report Map 1 taken from the MRC website uses alternative spelling for Xayaburi.

Figure 2: the development planning "platforms" in the Mekong region



Local project specific planning: Within the overarching planning framework defined by governments, each mainstream project proposal is subject to the normal project planning and regulatory procedures of the power development sector in Lao and Cambodian and the respective national environmental impact assessment procedures (Figure 2). In considering the mainstream proposals submitted by companies under the power sector regulatory framework, those procedures are starting to show the limitations and constraints to good project decision making in the absence decisions or agreement on the overarching development plans. Those limitations relate, for example, to:

(i) consideration of the cumulative effects of many projects on the one system,
(ii) the distant downstream effects within the mainstream channel and floodplain
(iii) multiplier effects on areas and communities outside the main channel,
(iv) the trade-offs between all development sectors impacted, and
(v) the effects of upstream management of the Yunnan dams and others on the operation of downstream projects on tributaries in the Lower Mekong

MRC Procedures for Notification, Prior Consultation and Agreement: Article 2 of the 1995 Agreement on Cooperation for the Sustainable Development of the Mekong River Basin calls on signatory countries to promote, support, cooperate and coordinate in the development of the full potential of sustainable benefits to all riparian States and to prevent wasteful use of Mekong River Basin water.

In 2003, the LMB countries adopted *Procedures for Notification, Prior Consultation and Agreement* on uses of Mekong waters and. That 2003 PNPCA protocol and its 2005 procedural guidelines require Member States to notify each other through the MRC of proposed uses of the Mekong tributaries and mainstream so that the potential impacts on multi-stakeholder rights and interests can be assessed and optimal water use determined. The MRCS must take a proactive role to assist the Joint Committee in assessing whether the use is reasonable and equitable, whether greater benefits can be derived through cooperation and trade-offs and to ensure due diligence in the planning process. The PNPCA process requires that the Joint Committee aim to arrive at an agreement and issue a decision containing conditions relating to the proposed use (PCA 5.4.3.).

In considering proposals for mainstream hydropower developments under the PNPCA, the Joint Committee must try and avoid inter-state disputes by resolving and determining if the development:

- Optimises water use;
- Provides better benefits than can be derived through cooperation and trade-offs;
- Has an established right of claim against further proposed uses;
- Assesses the potential impacts on multi-stakeholder's rights and interests; and
- Provides for planning security.

During 1995 to 2008 there were 28 notifications submitted to the MRC all relating to developments on tributaries. The MRC took little action other than informing Member States. In early 2009, the situation changed –initial information on a number of mainstream dam proposals was submitted to MRC by Lao PDR, Cambodia and Thailand. This is the first time mainstream proposals have triggered the PNPCA process. It is the first time many projects have been initiated by developers at the same time along the same stretch of river.

In 2008 the MRCS was instructed by the Joint Committee to take two important steps to inform members and facilitate planning: (i) to conduct a strategic environmental assessment of all mainstream projects in the pipeline and, in parallel, (ii) to prepare Design Guidance for Mekong Mainstream Dams in the Lower Mekong Basin. Under the 1995 Mekong Agreement, the MRC needs to formulate a consistent approach to assessment of proposed mitigation measures of mainstream dams. Also, the Joint Committee will need to refer to certain design considerations during the prior consultation process for mainstream dams that related to different aspects of the Agreement. The guidance is project specific, while the SEA is to explore the broader economic, social and environmental system implications of the projects collectively.

During the Lao and Cambodia consultations on the scope of the SEA, government officials often asked "where does the SEA fit in with the national project planning and assessment process?" and "what authority does the SEA have – do Member States have to abide by its recommendations?" In response to those questions:

- The Joint Committee will need to reach agreement concerning the mainstream projects, individually via procedures like the PNPCA and collectively via the BDP processes.
- The SEA (like the Preliminary Design Guidance of proposed mainstream dams) is advisory in nature – it is intended to guide and help shape the Joint Committee's considerations and agreements under the PNPCA process – that is its main function.
- The SEA is not being conducted as a formal requirement under the 1995 MRC Agreement and Protocols. It is a pilot to explore the potential usefulness of the tool in regional development planning. More specifically as a tool when needed to support the Joint Committee fulfill its role in guiding reasonable and equitable use of the Mekong waters;
- The SEA is not addressing one development plan or one in preparation but a group of project proposals for the same river;

- The projects are all in the project preparation stages so, in principle, the SEA can contribute to national planning and decision making with respect to the individual projects – at the discretion of individual MRC Member States in their national planning and regulatory systems;
- Most of the projects have not yet been subject to full EIA processes or their review, or any form of cumulative impact assessment under national procedures so the SEA can help shape the requirements for those more specific studies (Figure 3).

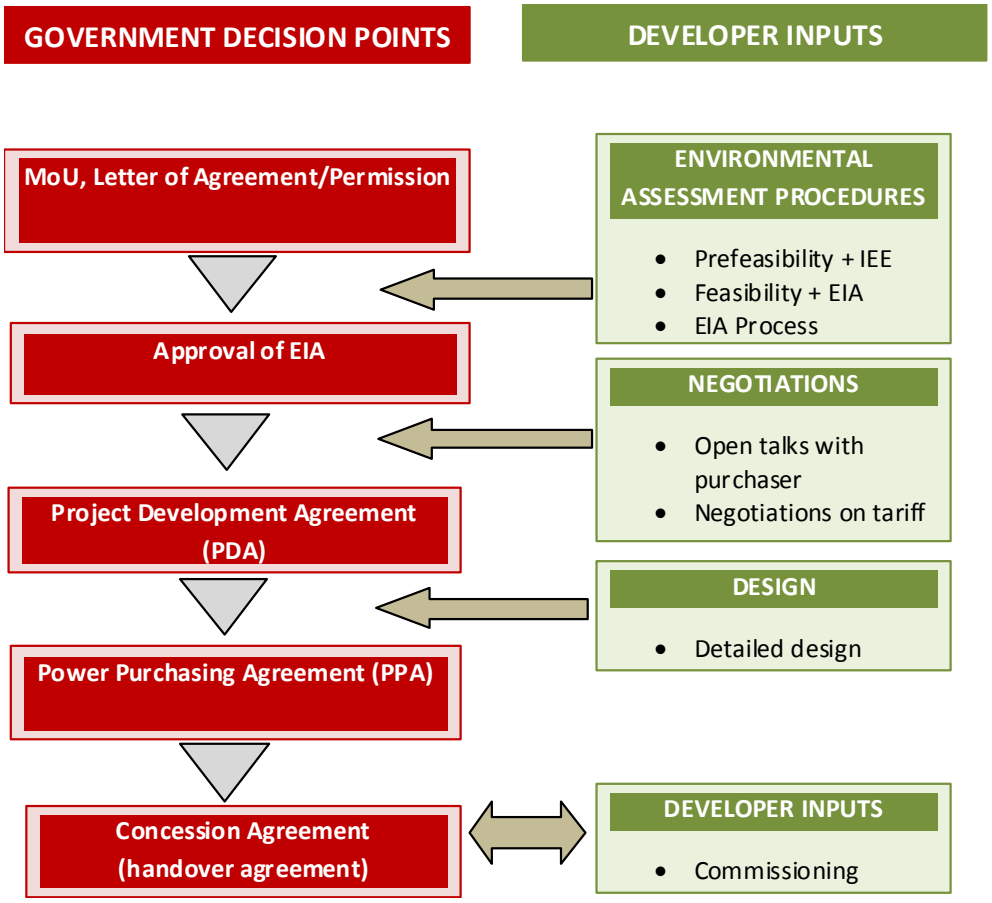
In addition, there are other planning platforms which can benefit from the SEA process and outcomes:

- **The MRC Basin Development Plan** is under preparation – the SEA can contribute to that process.
- **National power development plans** are under review and preparation therefore open to influence.
- **The GMS-level activities that fall under the Inter-Governmental Agreement on Power Trade In The Greater Mekong sub-Region (2003)** including the ADB GMS - RETA No 6440, "Facilitating Regional Power Trading and Environmentally Sustainable Development of Electricity Infrastructure in the GMS" one component for which supports SEAs for sustainable strategies and the road map for implementing regional power trade . [2]

The national power development plans and GMS road map are discussed further in section 4.

[2] http://www.gms-powertrade.net/

Figure 3: Simplified summary of hydropower project planning process in Lao PDR and Cambodia



1.4 THE MRC BASIN DEVELOPMENT PLAN

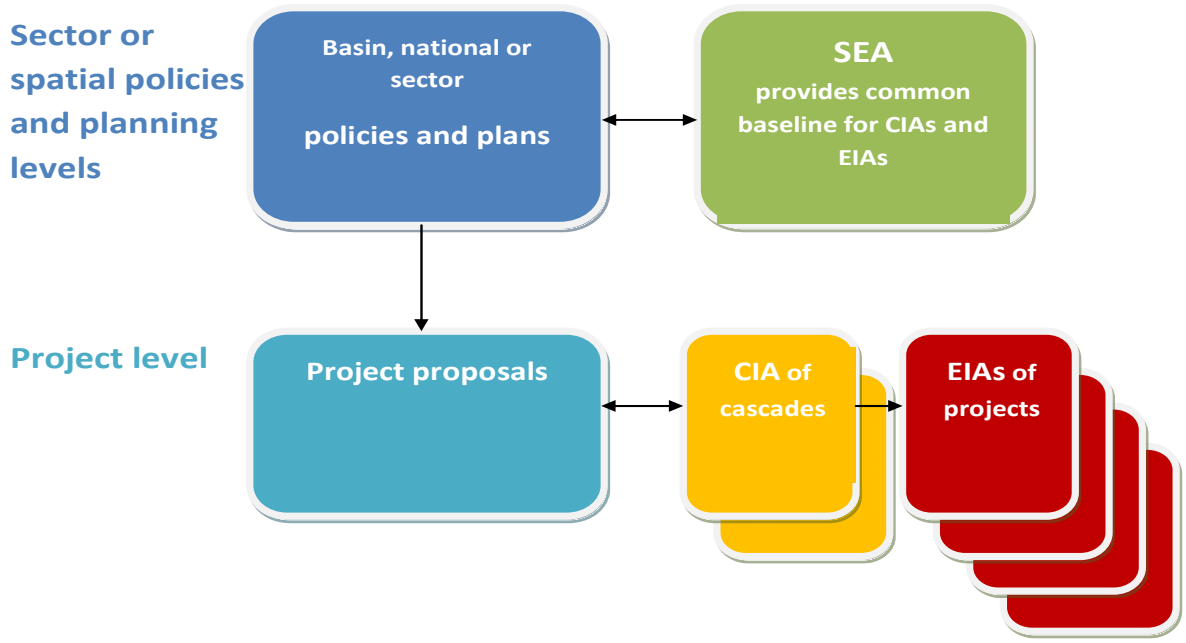
The LMB countries decided that a Basin Development Plan would be the main vehicle for implementing the 1995 MRC Agreement. The BDP planning process is working toward adopting a framework of environmental, social and economic safeguards for each of the main development sectors and for sensitive areas within the basin. The process of discussions and negotiations between the LMB countries is on-going now supported by a comprehensive assessment of development scenarios, including those with and without the eleven mainstream projects. The SEA has an important contribution to make to the BDP. The BDP is taking a basin-wide perspective and exploring options for all development sectors. The SEA is much more focused – it is situated within one sector – hydropower – and assessing the implications of proposed hydropower projects on the mainstream Mekong and the sectors which use its resources.

2 THE SEA TOOL

Why is SEA an appropriate tool to support the PNPCA process? Many strategies, plans and large projects have broad reaching socio-economic and environmental implications that cannot be adequately or efficiently captured in the context of project-specific environmental assessment.

Strategic Environmental Assessment (SEA), which includes assessments of cumulative impacts, addresses the broader strategic issues usually relating to more than one project and defines approaches for managing them. SEAs follow similar steps to EIA but have much larger boundaries in terms of time, space and subject coverage. SEAs serve as an umbrella level of analysis that feeds more specific EIAs and improves their quality (Figure 4).

Figure 4 Relationship between SEA and more specific environmental assessments



The overarching purpose of an SEA is to assess the risks and opportunities associated with a major strategic decision so that planners are better informed of the trade-offs involved between sectors, areas and communities and take into account the interests and views of stakeholders.

Usually an SEA is linked to a development policy or plan – it seeks to enhance the sustainability of the policy or plan, which by definition includes assessing the balance between economic, social and environmental considerations for current and future generations of Mekong people. In this instance, "the plan" to be assessed is the proposed mainstream hydropower projects that have emerged so far in response the overarching power policy and regulatory framework.

An SEA process integrates environmental, social and economic dimensions of sustainability and seeks to improve the quality of strategic decision making. An SEA is a tool for reinforcing good practice in spatial and sector planning. The intention is for SEAs to influence decisions to enhance their equity and sustainability. SEAs can lead to revisions and adjustments to strategic decisions and their implementation, for example, through area wide and cross sectoral mitigation, overarching safeguards and zoning to ensure valuable assets are maintained and enhanced, innovations to planning and management procedures, assessment of a wider range of options to meet the development goals, and guidance on more detailed studies and plans.

In summary the multiple uses of the SEA include informing:

- Recommendations on opportunities and risks & regional distribution issues (e.g. significance, avoidance, mitigation and enhancement)
- Implementation of PNPCA for individual mainstream dams (e.g. issues, methods, cooperation)

- MRC Strategic Plan 2011-15 e.g. on identifying gaps and new work to address and better understand key uncertainties and risks
- Basin Development Plan (BDP): as the integrating platform for basin and multi-sector planning that will contribute to reaching an agreement among the Lower Mekong Basin (LMB) countries on coordinated development of water and related resources.
- Possible Future Updates of the MRC's Preliminary Design Guidance for proposed mainstream projects
- Wider stakeholder constituencies on mainstream developments
- Other development planning platforms such as the GMS–level work supported by the ADB to develop use of SEAs to ensure environmental sustainability considerations in the cross-border power trade road map and cooperation on defining sustainable energy futures more generally.

3 SEA OF HYDROPOWER ON THE MEKONG MAINSTREAM

3.1 SEA PURPOSE

This SEA seeks to identify the potential opportunities and risks as well as contribution of hydropower to regional development by assessing alternative mainstream Mekong hydropower development strategies, in particular the regional distribution of costs and benefits with respect to economic development, social equity and environmental protection.

The SEA will consider all planned and committed hydropower and other development activities focusing on the mainstream Mekong River. The assessment will demonstrate the process and benefits of SEA in identifying likely positive and negative effects on environmental, social and economic variables in the LMB. Key outputs will include recommendations on the mitigation and monitoring of impacts and technical, policy and institutional guidance for SEA and hydropower development in the LMB.

The SEA will act as a pilot and demonstration and potential assessment framework and multi-stakeholder consultation arrangement for its application in the PNPCA process and for regional and transboundary development planning. The SEA will also build capacity in applying the tool, principally within the NMCs, national agencies responsible for power development and those concerned with facilitating application of SEA and EIA. Government staff will receive on-the job training and will participate in each component of the SEA.

The SEA is a MRCS process led by cross-programme MRCS working group.

2.1 SEA OBJECTIVES

The SEA will identify the potential opportunities and risks as well as contribution of hydropower to regional development by assessing:

(i) Alternative mainstream Mekong hydropower development strategies,

(ii) The regional distribution of costs and benefits with respect to economic development, social equity and environmental protection.

Specifically, the SEA will have two main sets of objectives relating to (i) sustainable mainstream hydropower and (ii) SEA as a tool in transboundary development planning:

Sustainable hydropower:

1. Provide an understanding of the implications of mainstream hydropower development
2. Provide specific policy-level recommendations on whether and how those hydropower projects should best be pursued;
3. Provide an initial baseline and assessment framework for individual mainstream project EIAs, thereby supporting the Procedures for Notification, Prior Consultation and Agreement

SEA as a tool in transboundary development planning:

1. Serve as a methodological framework for sub-basin hydropower SEAs in the LMB, which will be carried out as input to MRC's Basin Development Plan; and
2. Include capacity building to strengthen the respective analytical SEA capabilities in the concerned line agencies of the MRC Member States.

3.2 FOUR STEPS IN THE SEA PROCESS

The SEA process is following four steps (Figure 4). The first step is to settle on the coverage or scope of the assessment. What are the most important concerns and development issues facing the mainstream Mekong River to consider when assessing the proposed projects as a cascade of for different groups of projects? Which are the issues of greatest strategic concern to development of the mainstream Mekong River? The second step is what is referred to as the baseline assessment – which involves gathering information in each country and at regional level on the most important development concerns and analyzing their past trends and current status. The main purpose of the SEA is addressed in the third step – at this stage the risks and opportunities from the proposed mainstream projects for the strategic development concerns are assessed. The fourth step involves defining measures to enhance the benefits and to avoid or mitigate the negative effects of the propose projects (Figures 5 and 6).

Figure 5 Main steps in the SEA process

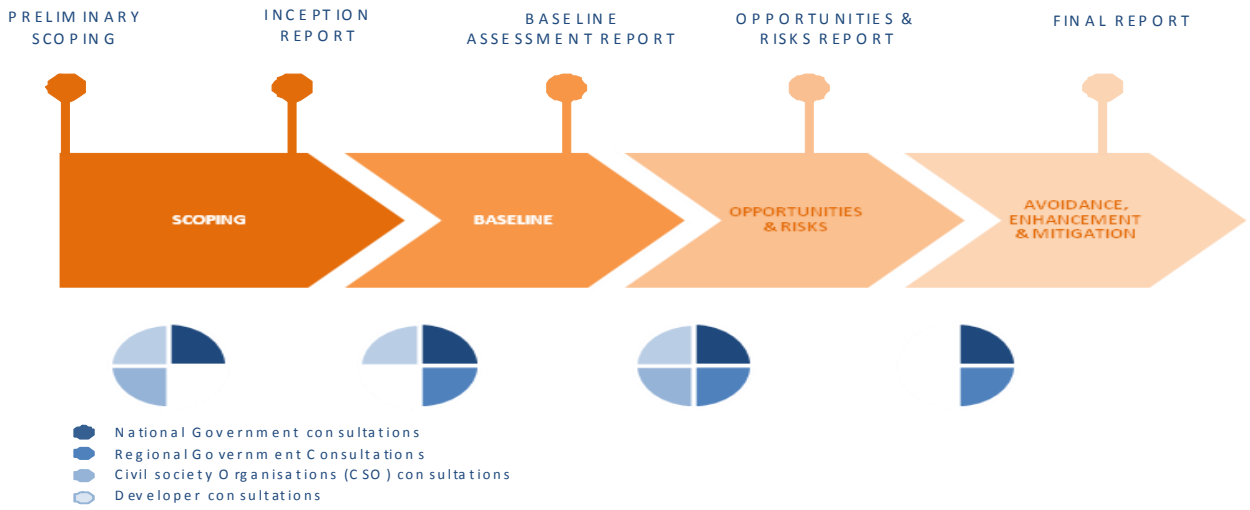
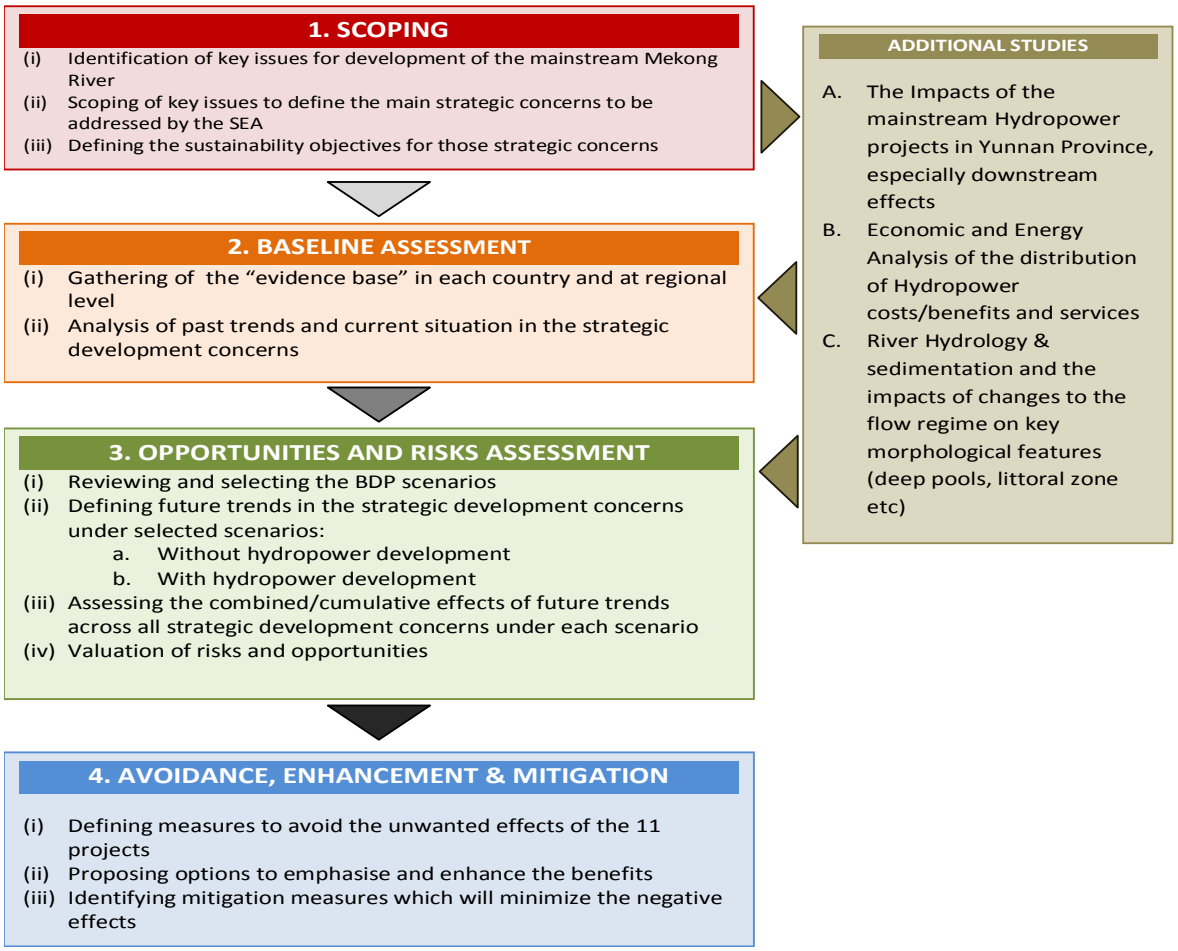


Figure 6 The four steps of the SEA process



4 DEFINING THE MAINSTREAM PROJECTS FOR THE SEA

4.1 POWER DEVELOPMENT PLANNING IN THE MEKONG REGION

Power development planning and review proceeds in the Mekong region at various levels. The four most important are:

(i) The Inter-Governmental Agreement on Power Trade In The Greater Mekong sub-Region (2003)
(ii) Existing Bilateral MOUs on power exchange between the four LMB Countries
(iii) The MRC Procedures for Notification, Prior Consultation and Agreement, for the hydropower developments it covers (e.g. mainstream and significant tributaries)
(iv) National Power Development Plans
(v) Power project planning (summarized in Figure 2)

The inter-linkage and integration between these levels is not systematic but is evolving as countries increasingly recognize the benefits of collaboration and consistency. The main impediments to systematic power development planning and review are: (i) an absence of broad regional and

national spatial and integrated energy sector plans; (ii) constrained institutional capacity within each country and (iii) the limited authority delegated to the MRC by Member States to plan and regulate.

The MRC Procedures for Notification, Prior Consultation and Agreement relate to any development of the Mekong tributaries or mainstream which would affect water availability, hydrodynamics or quality as well as other services and characteristics of the river system. It is a mechanism for review of projects which have potential transboudary implications for the use and management of a shared river system. The PNPCA process is intended to inform and enhance the project development planning processes at national and regional levels. The PNPCA is directly linked to the national project planning process. Only projects which have entered the national pipeline of projects under consideration and review will trigger the PNPCA process. It requires that individual Member States submit details of the proposed project to the MRC.

To date the PNPCA process has only been triggered for tributary projects in the LMB, however, Cambodia, Lao PDR and Thailand have all provided official confirmation of their intentions to explore mainstream development prospects. The SEA has been initiated to assess the overall implications of the mainstream power project proposals and to support the application of the PNPCA process. Yet, the PNPCA process is advisory and not formally linked to either the GMS power development planning or to the national PDP process. The SEA will need to explore and analyse those linkages – and to suggest how they should be established – if its findings and recommendations are to be of use to the LMB countries.

At this stage, the mainstream Mekong project proposals for hydropower only appear formally in one adopted power development plan – the Sambor and Stung Treng proposals in the national PDP for Cambodia. Even so, planning for most of the proposals is moving forward rapidly under the overarching policy and regulatory framework of Lao PDR and Cambodia which private developers are responding to under their MOUs with government by preparing the required project development studies.

The Inter-Governmental Agreement on Power Trade In The Greater Mekong sub-Region (2003) : The six Mekong countries come together regularly to agree and implement a Greater Mekong Subregion (GMS) Economic Cooperation Program. In the power sector this cooperation includes the activities under the Inter-Governmental Agreement on Power Trade In the Greater Mekong sub-Region (2003). This is centred on the power sector with a special focus on cross border electricity trading and connecting growth centres with strong energy demand with rich indigenous energy resource centres. Stated objectives are to to continue with the development of interconnections between their respective networks and expand capacity and energy trade to provide further opportunities to: (i) enhance the reliability of supply, (ii)coordinate the installation and operation of generation and transmission facilities, (iii) reduce investment and operating costs, and (iv) share in other benefits resulting from the interconnected operations of their systems. The broader rationale is that each Mekong country has individual energy needs and different energy resources. Some national markets are too small to justify large investments needed to achieve economies of scale. Integrated regional planning and coordination will allow for identification of most cost-effective

energy projects and overall reduced costs as well as diversification of sources and enhances regional energy supply security based on indigenenous and renewable energy resources.[1]

The ADB is supporting work to develop and adopt a road map for implementing the Regional Power Trade (RPT) and to agree on a regional power interconnection master plan; (ii) help GMS countries develop strategic integrated environmental conservation programs; (iii) build on the results of this work and extend it to environmental planning and environmental monitoring of future power projects during their construction and operation. GMS energy road map to implement this is intimately linked and seeks to influence and help shape the national power development plan (PDPs). It is being revised with support from ADB and in conjunction with review, revision and preparation (ie in Lao PDR) of national power development plans through the same regional technical assistance package. Past and current drafts of the GMS energy road map do not refer to the mainstream Mekong project proposals.

Bilateral Power trade Agreements: The MRC Member states a number of MOUs for cross-border power trade and power exchange. For example, Lao PDR and Thailand have signed MOU on power exchange in 1993 and 1996 for 3,000 MW which has reportedly since been expanded to 7,000 MW. With current exports and propose projects du to complete by 2012 there are close to 3,600 MW of identified projects. The MOU provides the authorization and framework for specific negotiation for further export from Lao PDR to Thailand on power purchase agreements for individual projects which could potentially include the additional tributary developments as well as mainstream dam proposals. Lao PDR and Vietnam signed an agreement for 3000 MW in 1998 and in 1996 this was subsequently increased to 5000 MW. At present Lao PDR exports to Vietnam are about 250 MW.

Lao PDR also has power exchange agreement with Cambodia. Similarly, Cambodia has agreements with Vietnam and Thailand.

National power policies and power development plans (PDP): The power sector policies for the different LBM countries are important as a basis for the regulatory frameworks they have established to invite private sector participation in tributary and mainstream development, in particular Cambodia and Lao PDR. Lao PDR policy fore example is to promote power exports as well as domestic power supply to meet Government development objectives; meet commitments under intergovernmental MOUs and agreements with Thailand, Vietnam and others and integrate the poser sector to maintain its economic development as a whole through power exchange programmes and expanding foreign direct investment opportunities.

As reflected in the SEA energy theme paper (appears in Volume 3 of this inception report), recent updates of the PDPs of LMB countries are at various stages of review and adoption. At this stage the Thai PDP does not refer to the mainstream projects – either as power development projects within its infrastructure plans or as a source of imported power. Lao PDR is still in the process of preparing its PDP – so the mainstream projects are not yet recognised in an endorsed national

[1] ADB, 2009, Greater Mekong Subregion Economic Cooperation Program, Road Map for Expanded Energy Cooperation in the Greater Mekong Subregion (GMS), 17 June 2009
http://www.adb.org/Documents/Events/2009/15th-GMS-Ministerial-Conference/Road-Map-for-Expanded-Energy-Cooperation.pdf

development plan. The Cambodian PDR recognises the importance of the two proposals on its reach of the Mekong River in meeting its national development goals – i.e. through the export of power. Vietnam's PDP does not refer to the mainstream proposals.

4.2 THE FOCUS OF THE SEA – 12 MAINSTREAM PROJECT PROPOSALS

This situation presents the SEA with a complex and dynamic situation to undertake the assessment.

Normally an SEA is initiated to:

(i) evaluate an existing policy, programme or plan (to improve performance in on-going implementation)
(ii) contribute to the revision of the existing policy, programme or plan, or
(iii) contribute to preparing a new plan or policy (so that it addresses sustainability concerns as planning takes shape).

In this case, the SEA is addressing a group of projects that are still at various stages of feasibility but for which informed decisions need to be made by the LMB countries individually and collectively. Moreover, there is no comprehensive plan with these projects, only scenarios. This means that much of the regional analysis, rationale and justifications for major projects which normally are to be found in overarching plans are absent in this case – the SEA needs to fill and analyse those gaps as thoroughly as feasible. It also means that the SEA should carefully define and target the appropriate decision-making and planning platforms so that its recommendations and supporting materials are shaped to meet the need.

In summary, the SEA is assessing a group of project proposals which:

(i) continue to change design
(ii) are not fully integrated into national power plans
(iii) are not recognised in national or sub-basin spatial plans
(iv) are not reflected in adopted regional plans at GMS or basin level

But, and most important, project proposals which

(i) are being promoted as an essential ingredient in the national development of Lao PDR and Cambodia
(ii) are progressing through the Lao and Cambodian power project planning processes and require decisions by the two national governments (Figure 2)
(iii) have potential developers and investors taking an active lead in the design and planning of the projects
(iv) have triggered the MRC PNPCA process in terms of notification, but have yet to trigger the consultation element of the procedures that require the Joint Committee representing the four countries to reach and agreement.

The "plan" the SEA is addressing: Project characteristics of the mainstream projects are influenced by the design of the dam and the surrounding topography. A summary of design characteristics and the status of the 12 mainstream projects are presented in Table 1 while more detailed project profiles appear as Volume 2.

Broadly there are two generic types of hydropower dams (i) storage projects or dams with larger reservoirs that may provide seasonal or multi-annual storage, and (2) various forms of what are called run-of-river schemes that may only utilize the river flow or have some capacity for daily regulation of river flows for peaking or daily generation.

Reservoir dams are usually large structures with the capacity to store large volumes of water, alter the seasonal flow regime of the watercourse, and may inundate large areas of land if the topography is flat. There is less inundation if the reservoir is formed in a step, narrow river valley in a mountainous area. The latter are characteristic of the large storage dams in the upper basin in Yunnan Province of China where the gradient of the Lancang-Mekong is steep as compared to the lower basin. A run-of-river project by definition has no storage or limited storage relative to the inflow, and thus have limited or no capacity regulate the river flow.

General Characterization of proposed mainstream projects: The currently proposed mainstream dams are characterized as low head dams that span part of, or the entire mainstream channel in the Lower Mekong Basin. These projects would employ what are known as Kaplan or ship propeller-type turbines, which function effectively with low heads and high volumes of water to generate power. The gross heads of these projects would vary between 6.5 m to about 35 m, though this vertical head (the distance between the normal water level in the reservoir behind the dam and the tailwater level below the dam) would vary significantly between monsoon periods (when the head is small but the flow is large) and low-flow seasons (when the head would be the greatest due to the much lower river flows and consequent lower tailwater levels).

The actual dam height as measured from the bottom of the foundations in the river bed to the top of the dam structures can be as high as 80 m. As a reference, the eight dams on the mainstream in China that are completed, under construction or planned vary from 67 m to 248 m head (for Jinghong and Xiaowan respectively).

The 12 proposed mainstream developments are of three of three general types:

1. ***Dams that span the mainstream Mekong that involve limited inundation outside the mainstream channel***: The 6 proposed dams from Pak Beng (the upper most dam in Lao PDR) to Pak Chom share similar broad characteristics. They typically span the Mekong river where it is 800-1,200m wide and has steeper valleys. The reservoirs forming behind these dams, typically 100 to 120 or more km would generally be confined to the river channel, except at confluences with major tributaries and other natural floodplain where the reservoir will flood land areas. The dams further downstream at Ban Koum and Lat Sua have wider channels and some floodplain areas that would be inundated.

   Typically these dams will hold the water at close to what is normally the high flood level all year round and thus eliminate annual cycles of raisin and lowering water levels. Typically these reservoirs have a storage capacity in the order of a few days at most and are expected to operate continuously, though with some daily fluctuation expected not to exceed 2 m. [3]

[3] Communication with Lao PDR, Ministry of Energy and Mines (DOE)

Supply levels in the reservoirs can be greater such as for a 5 m draw down from normal water levels in advance of major storm events. Live storage is generally under 500 million cubic meters (with the exception of Luang Prabang). These projects have an installed capacity of about 700 MW – 1,400 MW, and a design discharge through all turbines of 3,000-12,000 m^3/s. In the wet season the majority of the flow would be over the spillways.

2. **Dams that span parts of the braided Mekong mainstream or diversion schemes**: This includes the proposed Don Sahong project (240 MW) which is the only dam project which does not span the entire width of the Mekong mainstream, consequently the project is smaller than the others. It also includes the Thakho (60 MW) run-of-river diversion project that will divert a portion of one of the main braided channels around Khone Falls, which does not involve a dam. It is in the same area as the proposed Don Sahong.

3. ***Dams that span the mainstream Mekong or several branches that involve significant inundation outside the mainstream channel:*** For the two proposed floodplain projects in Cambodia (Stung Teng and Sambor) the approach is to have concrete dams span the main river channels flanked by earth embankment dams totaling between 10 km and 18km respectively in length. The reservoirs forming behind these structures would inundate larger areas of floodplain with total areas ranging from 200 to 620 km^2. Installed capacity range from 980 MW (Stung Trek) to 2,600MW (Sambor) with a maximum discharge through the turbines of 18,000 m^3/s at Sambor (though Cambodia notes that a scaled-down version of Sambor is also feasible). [4] Like the other projects, the storage capacity of these projects is limited to a few days or less and they would propose to use low-head Kaplan generation units.

Project profiles: Profiles for the 12 mainstream projects have been prepared during the inception phase (Volume 2). These profiles have been built up from:

(i) the information in the MRC database,
(ii) field visits and consultations with developers,
(iii) review of feasibility studies and environmental assessment reports (EIAs, IEEs), and
(iv) the Government of Lao optimization study, prepared by CNR (Table 1) .

Details contained in the profiles are based on the most up-to-date information available as of August 2009. Again it should be recognized that the design of all these projects is evolving as developers gather more detailed information on the sites; and as the uppermost 5 proposed dams In Lao PDR adjust their proposed designs to accommodate the results of the Lao government optimization study, and otherwise adjustments and negotiation with the Governments proceeds. The developers have also been asked to take into account the MRC preliminary design guidance that is founded on MRC programme work. Efforts will be made to continue consultations with developers to ensure that information used in the SEA is current and otherwise best available in a dynamic situation.

[4] MRC Developers Meeting in Cambodia, May 2009

Table 1 Mainstream projects covered in the SEA

No.	MAINSTREAM PROJECT	DEVELOPER	SOURCE OF INFORMATION FOR THE SEA
1	Pak Beng	Datang International Power Generation (China)	▪ MRC hydropower data base ▪ IEE prepared by NorConsult, ▪ Optimization Study
2	Luang Prabang	PETROVIETNAM Power Corporation (Vietnam)	▪ MRC hydropower data base ▪ Consultation & field visit with PetroVietnam, ▪ Optimization Study
3	Xayaburi	SEAN & Ch. Karnchang Public Co Ltd (Thailand)	▪ MRC hydropower data base ▪ EIA and discussion with TEAM Engineering consultants, ▪ Optimization Study
4	Pak Lay	CEIEC & Sino-Hydro (China)	▪ MRC hydropower data base ▪ IEE for Pak Lay by Norconsult, ▪ Optimization Study
5	Xanakham	Datang International Power Generation (China)	▪ MRC hydropower data base ▪ Optimization Study
6	Pak Chom	Joint feasibility study being prepared by Panya consultants on behalf of Ministries of Energy in Thailand and Ministry of Mines and Energy in Lao PDR	▪ MRC hydropower data base
7	Lat Sua	Italian Thai Asia Corp. Holdings (Thailand)	▪ MRC hydropower data base ▪ Feasibility study prepared by Team Engineering consultants
8	Ban Koum	Charoen Energy & Waters Asia Co. Ltd	▪ MRC Hydropower database
9	Don Sahong	Mega First	▪ MRC hydropower data base ▪ EIA 2007
10	Thakho	Compagnie Nationale du Rhone and EDL	▪ IEE prepared for CNR and WWF
12	Stung Treng	Open Joint Stock Co. Bureyagessttroy	▪ MRC Hydropower database
12	Sambor	China Southern Power Grid	▪ MRC hydropower data base ▪ Consultations with China Southern Grid rep in PP ▪ Review of the feasibility study

Table 2 Summary details on the mainstream hydropower projects (as of August 2009)

DAM	EARLIEST POTENTIAL DATE FOR COMMISISONING	DESIGN STATUS	ENVIRONMENTAL ASSESSMENT STATUS	RESERVOIR AREA (km2)	LENGTH OF DAM (m)	HEIGHT (m)	MEAN ANNUAL ENERGY (GWh)	PLANT DESIGN DISCHARGE (m3/s)	NO. RESETTLED
Pak Beng	2016	MoU, feasibility	IEE submitted	87	943	76	5,517	7,250	4,250
Louang Prabang	2016	MoU, feasibility	Feasibility study,	90	1,106	68	5,437	3,812	5,920
Xayaburi	2016	MoU, feasibility	Feasibility and full ESIA submitted	49	810	32	6,035	6,018	2,440
Pak Lay	2016	MoU, feasibility	IEE submitted	108	630	35	6,460	4,500	5,010
Sanakham	2016	MoU, feasibility	Not yet	81	1,144	38	5,015	5,918	1,890
Pakchom	2017	MasterPlan	Not yet	68	1,200	55	5,318	5,720	N/a
Ban Koum	2017	MoU, feasibility	Not yet	40	780	53	8,434	11,700	2,750
Latsua	2018	MoU, pre-feasibility	Pre-feasibility study submitted	13	n/a	na	3,504	9,600	N/a
Thakho									
Don Sahong	2013	Project Development Agreement (PDP) , detailed planning	Full EIA submitted, Additional studies requested	290 (ha)	1820-720-2730	10.6-8.2-8.3	2,375	2,400	66
Stung Treng	N/a	MoU, pre-feasibility	Not yet	211	10,884	22	4,870	18,493	9,160
Sambor	2020	MoU, pre-feasibility	Pre-feasibility submitted	620	18,002	56	11,740	17,668	19,034

TOTAL									**50,520**

5 SEA SCOPING PHASE

5.1 SCOPING PHASE ACTIVITIES

The main aim of the scoping phase of the SEA was to settle on the boundaries of assessment in terms of time, space and subject coverage. The scoping phase was also the inception period in which extensive consultations within LMB countries were conducted and a network of experts established, SEA methods discussed and refined, and the next phase – the baseline assessment – was designed.

5.1.1 AIM

The aim of the SEA scoping phase consultations was to facilitate the engagement of a wide range of stakeholders in shaping the coverage and approach to the SEA. Specifically, the objectives of the scoping phase were to:

(i) ***Scope:*** Define the scope of the SEA and key strategic issues for development of the mainstream Mekong River;
(ii) ***Methods:*** Review and finalise the methods and phasing for the assessment;
(iii) ***Additional studies:*** Identify and design additional studies required as part of the SEA;
(iv) ***Define the mainstream projects and scenarios:*** Prepare detailed profiles of the 12 mainstream projects, and define the scenarios for assessment;
(v) ***Communications:*** Develop a communications and consultation plan for the SEA which all stakeholders will respect as balanced and appropriate way to engage them in the process;
(vi) ***Working links with MRCS:*** Establish collaborative Define collaborative relationships between SEA activities and other MRC initiatives and programs and embed the SEA into the MRC operational and institutional structures and processes;
(vii) ***Baseline assessment design:*** Identify data sources and define operational plans for the baseline assessment and information gathering in each country.
(viii) ***Consultations:*** conduct extensive consultations within LMB countries with government line agencies, NGOs and civil society and with developers

5.1.2 CONSULTATIVE APPROACH

This SEA is a consultative process involving a wide range of stakeholders. An SEA communications, consultation and capacity building plan (CCC) was developed to keep the SEA transparent, focussed, and effective in stakeholder consultation and feedback (Volume 5). Stakeholders (local, national and international) are grouped into three categories: (i) government (ii) developers, (iii) non-government (iii) wider development partners of LMB countries, and the (iii) general Mekong public and interested international observers. A consultation approach was defined to engage each stakeholder group in the assessment, including a program of workshops and meetings (Table 3) and six phases of activities:

1. Background scoping
2. Government line-agency meetings
3. National scoping workshops
4. National Civil Society Organisations (CSO) Scoping meetings
5. Field missions

6. Donor community meetings

The partnerships established during the scoping phase are fundamental to the success of the SEA as they integrate national agendas, priorities and principles into the SEA process, findings and results.

Table 3 SEA Scoping Phase consultation activities

STAKEHOLDERS	*WORKSHOPS*	*MEETINGS*[+]	*FIELD MISSION*	*WEBSITE/WRITTEN SUBMISSION*
Government	4	40	1	Open submissions via website
Non-government	4	5	-	
Developers	1	2	1	
General public	-	-	-	
Donors	2*	3	-	

[+] does not include meetings undertaken as part of the Background Scoping activities in March-April 2009
* the LMB Donor community participated in two meetings

The SEA website was created to reach wider national and international interests including networks representatives of different groups that may be active locally.

5.2 BACKGROUND SCOPING

The SEA began in February-April 2009 with a preliminary round of scoping consultations in each of the four LMB countries, undertaken by the Stockholm Environment Institute (SEI). The aim of the preliminary scoping activities was to:

(i) Introduce stakeholders to the SEA and its objectives
(ii) Explore the scope, context and approach to the SEA
(iii) Identify potential data needs and availability
(iv) Generate an initial working list of issues for the SEA to consider

Activities were undertaken over a period of three months culminating in a Background Scoping Paper.[5] The Paper serves as a general introductory briefing for government, non-government, civil society and private sector stakeholders in the four MRC member states.

5.3 NATIONAL SCOPING WORKSHOPS

National scoping workshops were organised in each of the four MRC member states. Between 15 – 40 representatives of government line agencies came together, with between five to eight SEA team members as well as representatives from the National Mekong Committees, and MRCS ISH, BDP and Fisheries Programs, to present their perspectives on the key strategic issues of concern for the mainstream Mekong and to discuss the relationships with other sectors. The specific aims of the workshops were to:

(i) Explore the key strategic issues and broader themes relevant to the national interest and the development of the mainstream Mekong River;
(ii) Define the key strategic issues/themes to be addressed by the SEA and their different national and sectoral levels of focus;

[5] Available from the MRC ISH SEA website

(iii) Identify government policies, plans and targets for future development in those themes;
(iv) Discuss and share lessons learned from undertaking other SEAs of hydropower in the region

Government workshops were of 1-2 days duration. Workshops included a combination of presentations, plenary discussion and focus group sessions and, in some, an SEA capacity building component. Government representatives identified key strategic themes and issues for development of the Mekong River with particular attention on Mekong riparian provinces and districts. Participants explored the key national policies, targets and sustainability objectives for the development themes they identified as a framework for the later SEA opportunities and risks assessment.

In total, workshops involved more than 150 participants from a wide range of government line agencies. A summary of workshop scoping conclusions is presented in Section 6 with more detailed workshop summaries appearing in Volume 3 to this report.

5.4 NATIONAL CIVIL SOCIETY (CSO) SCOPINGMEETINGS

Civil Society Organisations (CSO) are non-government, academic, development sector and mass community organisations which play an important role in development in the LMB region. The SEA seeks to maximise participation by CSO stakeholders throughout the SEA process, by making the SEA website an interactive information sharing portal (Section 10), and by consulting directly with CSOs through a program of workshops and meetings.

As part of the scoping phase, CSO meetings have been undertaken in Vietnam, Cambodia and Lao PDR, with the Thai scoping meeting scheduled for 03 November 2009. The aims of the CSO meetings were to:

(i) Define the key strategic issues to be addressed by the SEA and their different national and sectoral levels of focus;
(ii) Explore opportunities for collaboration and sharing between the SEA and the work of the CSO community

CSO workshops were of half to one day duration and included introductory presentations by the SEA team on the objectives, methodology, and timing of the SEA. The MRCS described the institutional context for the SEA and linkages with the LMB decision making processes. Participants gave both formal and informal statements from their organisations relating to the mainstream projects. Also, CSOs identified potential opportunities, relevant projects and other working groups/workshops with which the SEA could engage during the ensuing phases.

In total, the SEA team met with some 50 CSO representatives and summaries of all CSO workshops appear in Volume 3 to this report.

5.5 NATIONAL LINE AGENCY MEETINGS

In each country, one to one meetings were held with 10-15 key government line agencies. Each meeting was based on a set of focus questions circulated beforehand (an example appears as Annex 5) and involved a group of agency technical staff. The SEA team introduced the SEAs objectives, scope and timing, and government officials provided an overview of their department and mandate

and responded in detail to the team's questions. Meeting participants discussed the key issues of concern to their sector, identifying policies and development targets as relevant.

The line agency meetings provided the first focussed point of contact with key government partners and, together with the National scoping workshops, form the foundation of important relationships and information for the baseline assessment. In total, the SEA team met with more than 160 government representatives from more than 50 line agencies throughout the LMB countries.

5.6 FIELD MISSIONS

The scoping phase included field missions to the following proposed project sites – Luang Prabang, Xayaburi, Pak Chom, Sanakhan, & Pak Lay. The missions included inspections of the project sites, upstream reservoir sites and downstream reaches.

The Field missions involved 10-20 members of the SEA team, government representatives and representatives of two of the project developers (Xayabouly and Luang Prabang). The developers made informal presentations of project plans, made available existing studies and discussed issues relating to the SEA with the team.

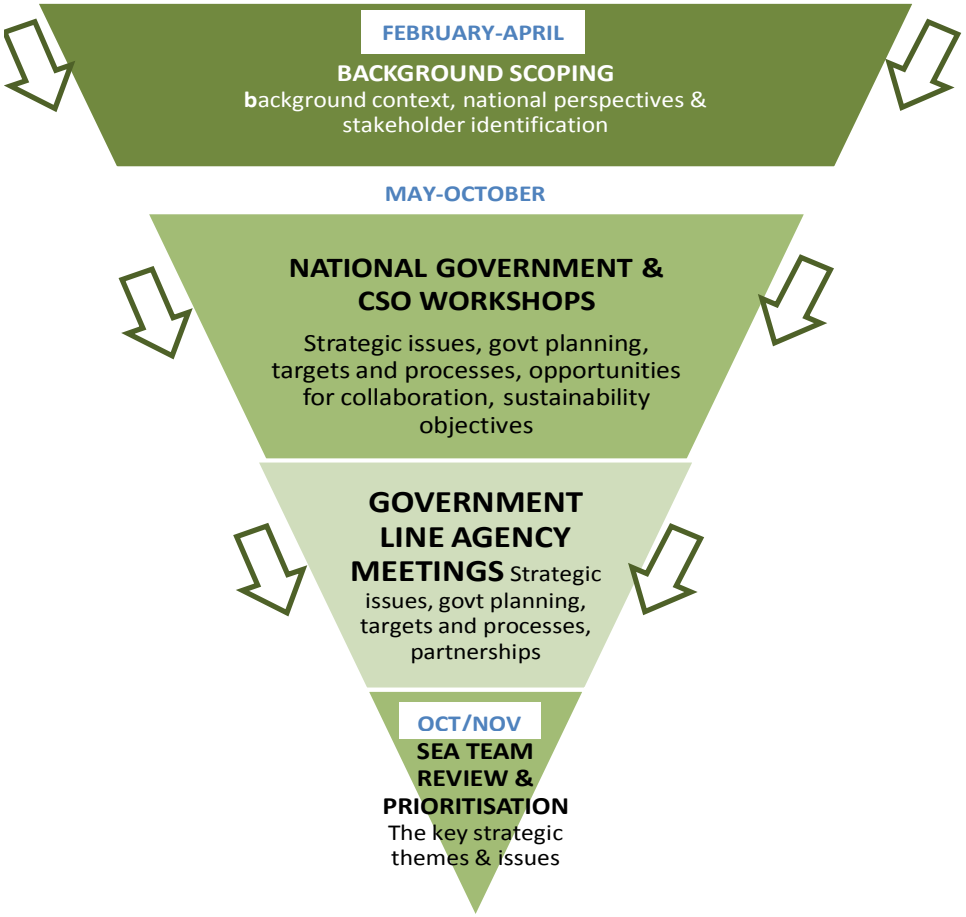
Government representatives attending the field mission came from the Lao PDR Ministry of Industry, Mines and Energy as well as the Water Resources and Environmental Agency, and local government officials, allowing for discussion amongst these key stakeholders in the Lao project review and approval process.

The field missions helped identify the issues and concerns of some of the developer community as well as improved team understanding on the specific design and operational nature of the projects.

6 SCOPE OF THE SEA

The scoping process followed three main stages: (i) background scoping and stakeholder identification, (ii) the program of national government and civil society workshops in each country and (iii) the program of meetings with government line agencies (Figure 6). This section summarises the outcomes of those stages leading to an overall synthesis in section 7.

Figure 7 The scoping "funnel" – three main stages in the scoping process



6.1 OUTCOMES OF BACKGROUND SCOPING

The background scoping carried out in February to April 2009 concluded that mainstream Mekong dam construction is the most significant issue facing the river basin in contemporary history and the most challenging issue that MRC needs to address in the foreseeable future. Hydropower is a complex multi-faceted development force in the LMB, with a wide range of issues considered to be strategically significant (Table 3). Many stakeholders were concerned about those potential effects of the proposed projects which would be irreversible, for example, relating to fisheries, livelihoods biodiversity loss and relocation.

During the background scoping, substantive issues identified were collated at regional and national level. In general, there was no noticeable variation between different stakeholder groups (for example, government & NGOs) but stakeholders gave higher priority to issues directly related to them.

Table 4 Synthesis results from the Background Scoping

KEY STRATEGIC ISSUE	Cambodia	Lao PDR	Thailand	Viet Nam
Economic development				
Generating foreign exchange revenue	3	4	4	4
Ensuring energy need	4	4	4	5
National energy security	4	3	4	5
Low cost power production	4	3	4	3
Social/Livelihood issues				
Relocation of affected people and their participation in the planning process.	5	5	5	5
Cultural impacts (especially ethnic minorities)	5	4	4	4
Poverty reduction/livelihoods security/access to natural resources (e.g. fish, forests)	4	5	3	4
Environmental sustainability				
Eco-system changes (land, air, water) and its consequences (health, diseases, etc.)	5	4	5	4
Impact on water resources	5	4	3	5
Biodiversity	4	4	4	4
Climate change mitigation	3	3	3	4

Scores were given on a 5-point scale

5	*Very Important*
4	*Important*
3	*Average/No Opinion*
2	*Unimportant*
1	*Very Unimportant*

6.1.1 REGIONAL ISSUES

Regional issues focussed on livelihoods, ecosystem integrity, recognition of the need for better analysis and the need to effectively integrate social and environmental concerns into hydropower planning. Mainstream dams were seen to present the first real ***test of the MRC PNPCA*** process as well as its influence on regional decision-making structures. It was noted that ***national capacity*** to implement environmental and social impacts assessments and mitigation regulations as well as operations of many projects on the same river still needs improvement. Stakeholders stressed that the block of 12 mainstream projects would have ***cumulative effects*** that transcend project level

impacts and expressed concern about how those would be taken into account. From the energy sector perspective it was widely recognized that growing power demand is the driving factor for the dams and extent of investment returns, while also being an area of short-term electricity market uncertainty. The region needs a comprehensive and credible future regional power demand projection – this was a major focus of concern among many stakeholders. There was disagreement concerning whether or not the mainstream dams were needed to meet demand. There was wide-spread agreement that a comprehensive assessment of other power generating sources is needed.

6.1.2 NATIONAL ISSUES

CAMBODIA: The complexity of the Cambodian context arises because it is a potential beneficiary of the opportunities of mainstream hydropower and also the country where impacts are likely to be severe. There is wide-scale interest in the SEA process and a desire to see it help explore complex trade-offs between sectors. Key strategic issues revolved around fisheries, river flow, sedimentation and erosion, livelihoods of riverine communities and most stakeholders saw the geographical scope extend from the Mekong provinces to include the Tonle Sap system. In the Cambodian context there are clear linkages between the integrity of natural systems and community livelihoods, while the government position is in favour of the dams it is conscious and concerned that adequate safeguards would need to be put in place to ensure impacts on natural systems and livelihoods is minimized. Capacity building and recommendations in this area would be valuable contributions from the SEA.

LAO PDR: National development is one of the predominant strategic concerns amongst most Lao government stakeholders. Foreign exchange earnings through the hydropower development and power trade are seen as one of the most favourable options to stimulate development along with the large FDI. The domestic electricity market and electrification of Lao PDR was not considered a driver of mainstream hydropower. The second critical issue broadly acknowledged by stakeholders is that of institutional capacity within government to review ESIAs, enforce regulations and to effectively manage many power projects on the same stretch of river. The disparity between a desire for rapid socio-economic development and the capacity to enforce government regulations – especially of social and environmental assessments – emerges as a key strategic national issue for Lao PDR.

THAILAND: The dominant concern for Thailand is the vulnerability of the riparian communities and provinces of Thailand. Accelerated erosion, changes to the sediment regime, habitat loss, diminished ecological resource availability and changes to water quality and availability were identified as the predominant concerns of these communities which typically manifest lower levels of socio-economic development and higher poverty rates than the national average. The Thai national energy demand and future energy security were seen as of little relevance to national stakeholders because of a growing perception that:

(i) future energy demands have been overestimated and, in any case,
(ii) because mainstream hydropower is considered as only of minor importance in meeting demand.

More so than the other LMB nations, Thai stakeholders expressed strong concerns for the wider environmental impacts and upstream/downstream implications of mainstream hydropower for the

whole LMB region. At a national level these strong concerns have been expressed formally through the Government of Thailand.

VIETNAM: Broadly speaking, Vietnamese concerns focussed on the Mekong Delta. Stakeholders felt that there is little benefit for Vietnam in the mainstream projects though there is strong likelihood of risks for the Delta. Changes to the flow regime, to sediment and nutrient flows, on fish migration patterns and biodiversity, on the extent and severity of saline intrusion of surface and ground waters and other possible changes were expressed as concerns for both national as well as regional interests. Concern was also expressed that mainstream hydropower would have a multiplying effect on some of the stressors and threats posed by climate change to the Mekong Delta. Concerns were also expressed over the limitations of transboundary decision making arrangements in the LMB and specifically inadequacies in the level of information and analysis supporting these decisions.

6.2 OUTCOMES OF NATIONAL GOVERNMENT SCOPING WORKSHOPS

The results of the background scoping were fed into the program of national scoping workshops in each country. It helped provide a framework for discussions and for the more focussed working sessions of government sector experts.

Box 1 lists the strategic themes identified by the national governments during workshop sessions. For each theme, the most important issues for development and maintenance of the Mekong River mainstream were identified – in addition to a list of principles for achieving sustainability within the theme. In Cambodia, Lao PDR and Vietnam government officials then ranked the themes in order of strategic significance for the Mekong River. Both working sessions and plenary discussion were used in this scoping process. In Thailand, the themes were identified by plenary discussion and it was decided to not rank the themes at this stage of the process.

In summary, for each theme a record was kept of the key strategic issues, relevant government policy and sustainability objectives. The themes and their ranking are summarized in Table 4.

Fisheries consistently ranked in the top two places in all countries, though the economic importance of fisheries to national development and local livelihoods varies. For example, in Lao PDR and Cambodia fisheries was clearly framed by issues of livelihoods, poverty and food security, whereas in Vietnam economic growth and trade in fisheries was a more prominent concern. Both Thailand and Lao PDR were also concerned about the cultural and biodiversity significance of key species to riparian communities (e.g. giant Catfish).

Similarly, the Power and Energy theme ranked consistently high in all four workshops but the focus within that sector varied between countries. In Lao PDR, the critical concern was foreign export earnings from hydropower development as a foundation stone for national economic growth. This was a recognized issue in Cambodia as well, but discussion focused much more on rural electrification and national reliance on fuelwood and diesel as the key strategic issues. In Vietnam, the discussion centred on the Mekong Delta, consequently power generation remained an unranked issue. In the Thai context, energy security and energy poverty were the focus of discussions in the power and energy theme. Energy security and reducing reliance on energy imports was the dominant national level concern, whereas the low level of socio-economic development and the

high levels of unemployment in the Mekong provinces made energy poverty the predominant Thai concern.

Table 5 Key strategic themes for development of the mainstream Mekong River defined by government experts

THAILAND	LAO PDR
A. Fisheries B. Agriculture C. Wetlands & biodiversity conservation D. Navigation E. Health F. Local Livelihoods & Poverty reduction G. Migration H. Irrigation I. Energy Security/ energy poverty	A. Fisheries (1) B. Power generation (2) C. Navigation (2) D. Tourism (3) E. Manufacturing/processing Industry (4) F. Water Quality, sedimentation & erosion (5) G. Resettlement & cultural heritage (6)
CAMBODIA	**VIET NAM**
A. Fishery (1) B. Power & Energy (1) C. Poverty and livelihood (2) D. Hydrology and water quality (2) E. Agriculture and water supply (3) F. Terrestrial ecology and land use (3) G. Aquatic diversity and ecosystems and fisheries (3) H. Navigation (8)	A. Agriculture (1) B. Fisheries (2) C. Transport & inland waterways (3) D. Ecosystem integrity and environment (3) E. Hydrology and climate change (4) F. Power generation (unranked)

The agriculture theme saw two main groupings of issues arise: the Mekong waters as a resource, and food security. Of all the Mekong countries, Thailand is the only one to have not consistently pursued the use of Mekong waters for agricultural expansion. Since the 1960s feasibility studies have been undertaken for major Thai diversion projects abstracting irrigation water from the Mekong into the Chi and Mun farming areas, however the obstacles of transboundary cooperation and internal politics meant that to date none of these projects have been completed. At the other extreme, Vietnam has extensively utilised mainstream flows in the Mekong delta, servicing a large agricultural area throughout most of the delta via an intricate network of canals and sluices. For Thailand Mekong waters are an untapped, politically sensitive option to improve agricultural yields, reduce water scarcity and stimulate growth in the Mekong Provinces, whereas for Vietnam, Mekong waters are the heavily exploited foundation of the Delta's socio-economic growth. Regional hydropower developments are seen to threaten the security of the agriculture sector there. The agricultural use of mainstream waters in Cambodia and Lao PDR is limited primarily by the level of development and infrastructure, though they expressed similar issues to Vietnam at a much reduced scale.

In terms of food security, agriculture sustained by the Mekong was a pivotal component in the achievement of national rice self-sufficiency for Cambodia, Lao PDR and Vietnam, and in these three countries Mekong agriculture remains a strategic concern of national food security. For Thailand,

Mekong agriculture is more an issue of provincial and local food security and livelihoods within the poorest region of the country.

The national perspective on mainstream development under the remaining themes is summarized as follows:

VIETNAM: The strategic development concerns for the Mekong delta reflect the high level of development and the importance of the region to the national economy. On the one hand the history of development has seen the emergence of environmental management (ecosystem integrity, climate change, water quality, acid sulphate soils) as an important strategic issue. On the other hand, the expansion of key socio-economic sectors (inland waterway transportation, agriculture, aquaculture) is driving the development agenda as a means to continue stimulating national growth.

LAO PDR: The comparatively lower level of development in Lao PDR manifests a dual perspective on the Mekong River. Through issues of livelihoods, poverty reduction, fisheries, small-scale agriculture, bank erosion and resettlement emerged an awareness of the dependency of Mekong communities on their natural resources and local vulnerability to change. While, issues of power trade, tourism, navigation and industrial growth saw a clear focus on the role of Mekong provinces in stimulating future economic growth.

CAMBODIA: like Vietnam, identified two main groupings of themes: the environmental implications of development (water quality, changes to the flow regime, Tonle Sap connectivity, extinction of aquatic species, loss of forest); and the need to stimulate development in order to improve rural livelihoods and alleviate poverty (agriculture and aquaculture expansion, power generation, infrastructure development, promoting land-concession agreements)

THAILAND: The Thai development concerns for the Mekong provinces are focussed on the livelihoods and economic growth. Most issues discussed were framed within this context (livelihoods, poverty alleviation, health, migration, agricultural expansion, cultural heritage). More than any of the other countries the Thai concerns for the Mekong were expressed overwhelmingly at the provincial and local level not the national.

For the top ranking strategic themes and issues in each workshop, participants then identified: (i) the government development objectives, (ii) the relevant government policies and plans, and (iii) the government sustainability principles which define the principles behind planning and management direction. Two examples from the Cambodian workshops are given in Figures 7 and 8. Those examples explore the main key strategic issues identified for each of the agriculture and fisheries themes. Workshop Templates for each theme are attached to the workshop summaries in Volume 3.

Figure 8 Cambodian Fisheries: Objectives, targets, principles & issues for the development

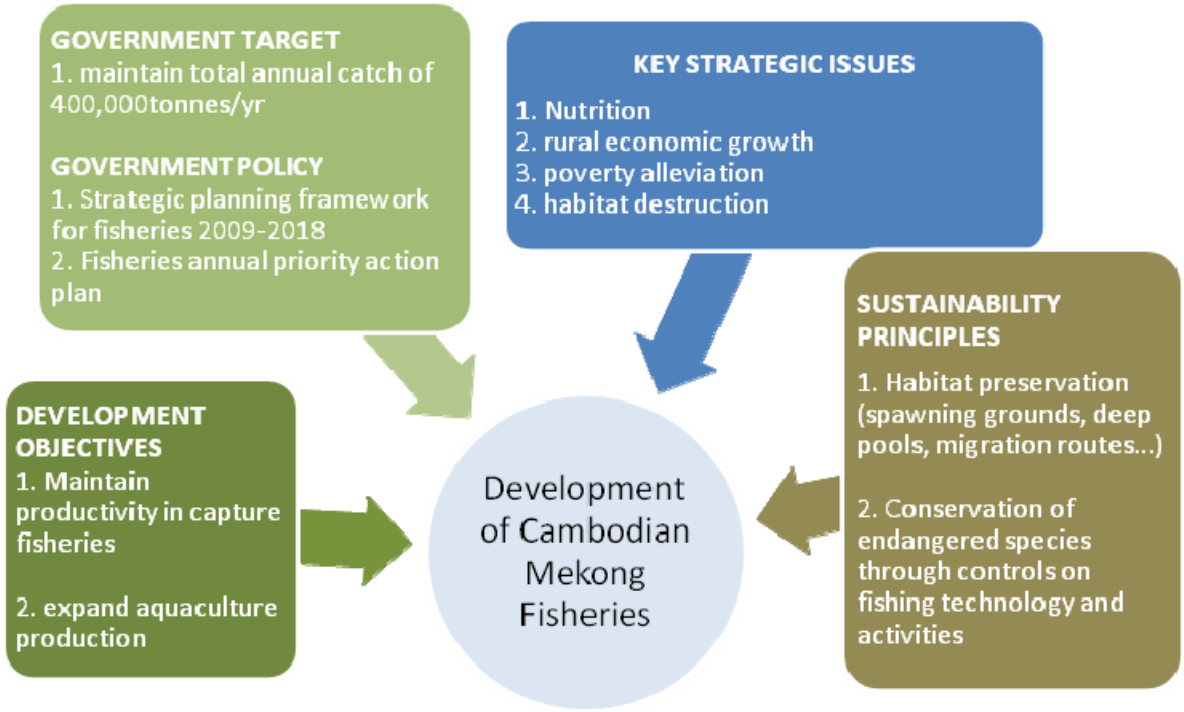
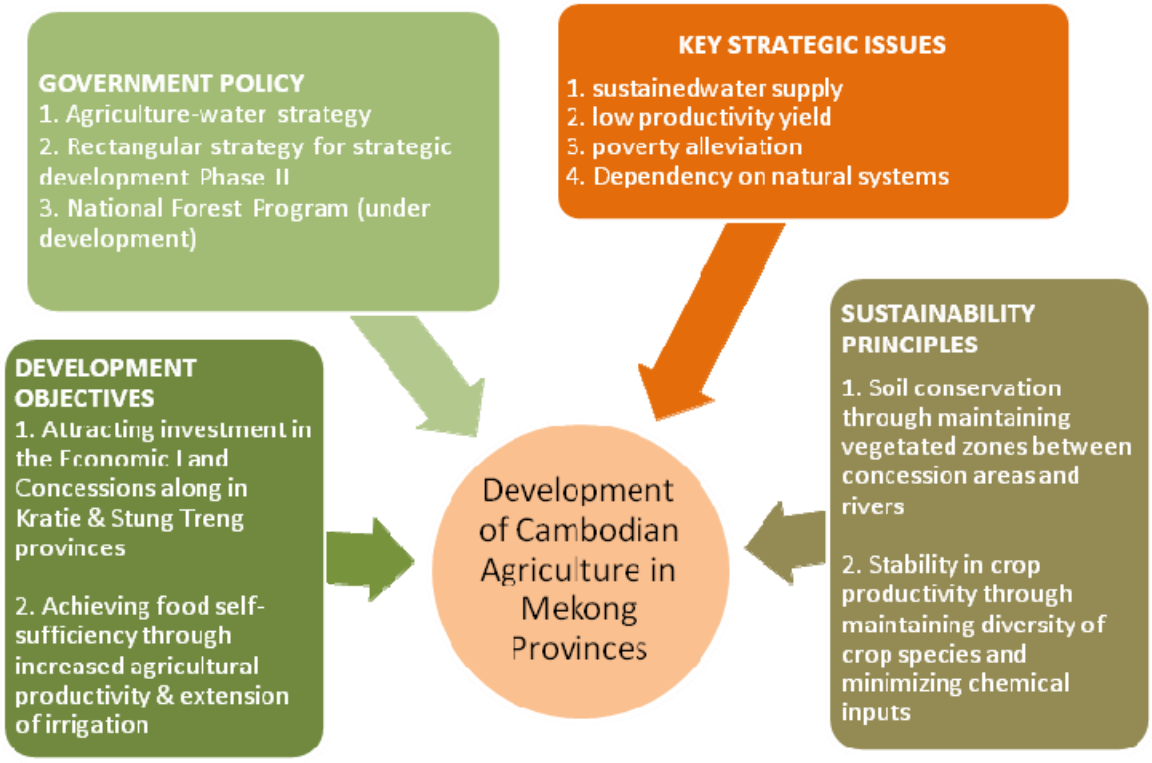


Figure 9 Cambodian Agriculture: Objectives, targets, principles & issues for the development



6.3 CSO SCOPING OUTCOMES

The NGO and civil society scoping workshops followed a more informal approach. Detailed summaries of the CSO meetings in Cambodia, Lao PDR and Vietnam appear as Volume 3 to this report. The summaries record the meeting facilitation methods, the substantive and operational issues discussed as well as the opportunities for further CSO involvement in the SEA process. In addition IUCN and WWF presented statements on the mainstream projects which have been summarized in the Lao meeting summary.

A synthesis of some of the strategic issues raised by CSO representatives follows.

6.3.1 CAMBODIA

Fisheries & livelihoods: Fisheries are the fundamental natural resource, industry and food source for Cambodia. The opportunities of mainstream hydropower must be seen in the context of a trade-off with the country's predominant economic and livelihoods activity.

Institutional capacity: Several participants noted that Cambodia has limited experience within government agencies in developing large-scale hydropower, indicating that such projects require significant technical and institutional capacity to manage effectively.

Regional advocacy: Participants acknowledged that there is socio-economic inequity between LMB nations and were concerned that advocacy of Cambodia's national interest may be compromised due to its lower level of development. This led into broader discussions on the challenges of regional cooperation in the LMB with significant disparities in levels of national development;

Energy demand: Several participants questioned the need for the mainstream dams and the accuracy of energy demand projections for the LMB. There was concern over the uncertainties of markets for the power within the region at reasonable cost and the potential for heavy economic burdens on Lao PDR and Cambodia if large government subsidies were required to ensure exports go ahead.

SEA influence on power development decisions: The plenary noted that there are significant obstacles which the SEA must address if it is to be useful:

- Planning and decision processes on the mainstream dams are progressing rapidly – can the SEA deliver useful outputs in time to inform decisions on the mainstream projects.
- Convincing LMB governments to actively participate in the SEA and utilize its findings
- The capacity of MRC – as a regional body – to follow up and use the Joint Committee to promote the SEA recommendations and to convince governments to listen.

6.3.2 LAO PDR

ESIA quality: Several participants noted that the quality of ESIAs submitted to WREA by developers has been very low, including those from four of the mainstream dam companies. In general, biodiversity and cross sectoral effects do not receive adequate attention. In Lao, biodiversity

remains crucial for local livelihoods. A poor quality of documentation from developers is requiring a great deal of effort in terms of technical review from the government.

Institutional capacity for environmental assessments: The EIA department of WREA is a new and growing institution. At present capacity for reviewing environmental assessments of very large infrastructure projects remains low, which combined with the document quality issue, slows and makes more complex the environmental assessment process.

Land-use dynamics: The Mekong riparian zone is an important component of the total national arable area and the country's topography provides little capacity for the development of new rice growing areas at higher altitudes. A recent study by the Chinese looking to develop an additional 1million ha, concluded that there is not the potential for large scale expansion.

Farmers affected by mainstream dam developments are likely to become shifting cultivators utilizing slash and burn practices, or experience lower yields in less suitable land. Already 640,000ha of paddy have been lost along the mainstream and in river valleys in the tributaries due to urban development. Experience of growing populations and urbanisation of Vientiane Capital City (VCC) indicates that growing urban centres and resulting infrastructure development in arable areas has a strong impact on local food security.

Groundwater connectivity: The SEA should not ignore the implications of the mainstream dams on groundwater, especially in the floodplains where the seasonal groundwater level can be close to the surface. Implications should be considered both in terms of impacts of reservoirs on water levels and quality, as well as on the shift in water use dynamics and groundwater demand induced by mainstream projects.

National energy drivers: Hydropower development should respond to domestic development power needs – in this case, 10 % of the power from the projects would be for domestic supply . A major component driving Lao national energy demand is rural electrification. The plenary recommended that the SEA assess the suitability of the centralised mainstream schemes in meeting this market rather than decentralised options, drawing on the well-studied lessons from China's experience – China having the largest decentralized power program in the world.

Distribution of benefits: Mitigation measures or benefits from mainstream hydropower may not profit affected communities when considered in relation to: new skills set required, migration patterns, urbanisation and increased access. The plenary gave the example of aquaculture as a mitigation measure, is likely to shift production from current fishers to a new set of stakeholders, living existing fisher families behind.

6.3.3 VIETNAM

Community representation: A number of CSOs expressed concern that there is a disparity between the stakeholders who make decisions on mainstream hydropower and those who are likely to be affected. This is likely to manifest at the international level, but also at the local level. There was strong emphasis – over a number of issues (resettlement, flooding, poverty, water quality, fisheries) – that the SEA must attempt to connect with stakeholders at each level so that decision making can be fully informed of their views and concerns.

Mitigation: The effectiveness of mitigation measures is often exaggerated. At the conceptual phase, this can increase support for project feasibility by down-playing the ramifications of impacts. For example, the plenary urged the SEA team and LMB governments to be realistic about what physical (fish ladders) and process (flow management) mitigation measures can achieve based on international experience, before endorsing or rejecting a project. Many of the mitigation measures being proposed by mainstream developers appear effective in theory but there is not the monitoring and institutional framework, nor the proven track record to make them effective in practice.

Connectivity: The strategic issues are related to connectivity in the basin and the SEA should focus on the intimate connections between sectors, environmental and social wellbeing, natural resources and livelihoods, flooding and agriculture if it is to fully explore the strategic issues.

Benefits sharing: The plenary noted that there is considerable experience with benefit sharing form hydropower in Vietnam. The critical lesson is that benefits sharing cannot be a one-off event and must be a long term, consistent and systematic process. The notion of a 'trickle-down' of benefits from hydropower is yet to be successfully realised in Vietnam. The challenge has been the multiplicity line agencies involved at all levels of government and uncertainties over operational and budgetary responsibilities.

6.3.4 THAILAND

The Thai CSO meeting is scheduled for 03 November 2009, and results of this meeting will be summarized in a report and made available on the MRC SEA website.

6.4 NATIONAL PERSPECTIVES ON SCOPING PRIORITIES

The situation is not straight forward for any of the LMB countries. Each country has a diversity of constituents and users which bring their own special interests and needs to the table when considering the mainstream hydro projects and other development options for the River. The national government's themselves bring various perspectives and goals for the Mekong River which are not always consistent, sometimes conflicting, which make a concerted and agreed position difficult to establish. For example, on the one hand Thailand is a potential consumer of the mainstream project power and it has private sector interests as an investor and developer of the projects. On the other hand, it has concerns as a downstream country and user of Mekong River waters and resources.

The national workshops of government officials and of NGOs and civil society discussed those differing perspectives and interests within each country. Those discussions can be summarized as follows:

Thailand: Thai participants identified seven distinct interests:

(i) ***Communities impacted:*** Local concerns regarding flooding of Mekong districts by some project reservoirs
(ii) ***Private sector developers:*** Private Thai companies are involved as investors and developers in mainstream projects

(iii) ***Power importer:*** Thailand is a potential power importer and consumer
(iv) ***Competing resource users:*** Thailand is a downstream user of Mekong River waters and resources (eg irrigation and fisheries)
(v) ***Local livelihoods:*** Thailand's priority concern for poverty reduction in disadvantaged Mekong Provinces and the NE region of the country
(vi) ***Tributary developer:*** Thailand is a developer of Mekong tributaries and contributing to Mekong River conditions
(vii) ***Potential mainstream project planner:*** Some proposed mainstream projects are on the Thai-Lao PDR border – potential Thai Government involvement as project planner

Vietnam: Vietnamese participants identified four distinct interests influencing the position of various groups within the country to the mainstream projects:

(i) ***Tributary developer:*** Vietnam is moving forward with intensive hydropower development in the Mekong tributaries in its Central Highlands with downstream mainstream Mekong (and potentially Mekong Delta) implications
(ii) ***Mainstream project investor and developer:*** Vietnamese state owned companies and developers are involved in one mainstream project and in other Mekong tributary projects outside Vietnam
(iii) ***Power importer:*** Vietnam is identified as one of the two key consumers of mainstream project power, especially from the Sambor project in Cambodia.
(iv) ***Downstream impacted country:*** The overriding concern is potential downstream effects on the Mekong Delta of the mainstream projects.

Cambodia: Cambodian experts identified five main interests in the mainstream projects:

(i) ***Government promoter of mainstream projects:*** The Cambodian Government has formally committed to developing the two mainstream projects in its territory as part of its national power development plan and overall plan for socio-economic development.
(ii) ***Public sector investor:*** The Government would likely become a share holder in the projects and provide various subsidies and exemptions to developers.
(iii) ***Downstream impacted country:*** There are concerns about the effects of the 17 upstream Yunnan and Lao PDR mainstream projects on the floodplains and Tonle Sap hydrodynamics and the agricultural and fisheries sectors in Cambodia
(iv) ***Mekong districts and communities directly affected:*** The two mainstream projects in Cambodia have relatively large reservoirs and dams and would overflow the main channel into surrounding districts requiring relocations and land use adjustments
(v) ***Competing development sectors:*** Fisheries and agriculture sectors will be affected by the Cambodia projects. They compete in uses of the Mekong River system.

Lao PDR: The Lao participants identified a similar set of interests to Cambodia as follows:

(i) ***A development planner:*** The Lao Government is considering 9 mainstream projects, six in a cascade, and has had to become proactive in the development planning process. The optimization study it commissioned is having significant influences on project design.

(ii) ***Public sector investor:*** The Government would likely become a share holder in the projects and provide various subsidies and exemptions to developers.

(iii) ***Downstream impacted country:*** There are concerns about the effects of the 8 upstream Yunnan Province mainstream projects on the operation of its own projects and on river hydrodynamics.

(iv) ***Mekong districts and communities directly affected:*** Reservoirs of the mainstream projects in Lao PDR are mainly confined to the Mekong channel but many districts and communities along the mainstream will be affected by relocations and modifications to livelihoods.

(v) ***Competing development sectors:*** Fisheries and agriculture sectors will be affected by the nine projects. They compete in uses of the Mekong River system.

7 SEA SCOPE BY THEME – A SYNTHESIS

The SEA relies on the four governments of the LMB to define, prioritise and qualify the development issues and policies for the mainstream Mekong River which might be affected by the mainstream hydropower proposals and which need to be considered in the assessment. The results from those scoping activities were summarized in the preceding 4 sections.

The SEA team consolidated the 10 themes and linked key strategic issues identified by LMB countries into a list of eight, which serve as the substantive backbone of the SEA – ie its scope (Table 5):

(i) economics,
(ii) energy,
(iii) hydrology & sediment,
(iv) terrestrial systems,
(v) aquatic systems,
(vi) fisheries,
(vii) social systems and
(viii) climate change

A theme paper has been prepared for each of the 8 strategic themes outlining their objectives, methodology and detailed coverage (Volume 4).

Table 6 Consolidated key strategic themes and issues defining the scope of the SEA

Theme	Issue
1. TERRESTRIAL SYSTEMS (including agriculture)	1. Changes to terrestrial biodiversity and changes to agricultural and land use patterns along the mainstream
2. FISHERIES	1. Changes to the unique features of the Mekong River fisheries ▪ biodiversity, ▪ migration patterns, ▪ catching techniques 2. The importance of fisheries to local livelihoods and national/provincial economies
3. HYDROLOGY & SEDIMENT	1. Changes to the hydrological processes of the Mekong River 2. Fate and transport of sediment through the Mekong River

	3. Changes to water quality
4. ENERGY	1. Importance of mainstream power generation for regional power demand and expansion generation needs 2. Feasibility of alternative energy sources for the region 3. Compatibility of mainstream hydropower and domestic electrification and energy poverty alleviation 4. The importance of foreign exchange earnings to national and local development 5. Contribution of mainstream dams and secondary stimuli to national and provincial development
5. SOCIAL SYSTEMS	1. Changes to poverty alleviation, economic development, livelihood resource base, land acquisition and resettlement, in mainstream Mekong provinces 2. Effects on mainstream Mekong river communities water, energy and food needs, as well as potential to improve life styles in view of existing opportunities and constraints 3. Changes in social equity within Mekong provinces and nationally
6. ECONOMICS	1. The impacts of mainstream dams on broader energy economics and macro-economic trends in the LMB region 2. Distributional and sectoral changes in population, infrastructure, and public health, as well as other key development sectors or economic sectors including: agriculture, fisheries, navigation/transport, and tourism. 3. Economic evaluation of non-monetized environmental services 4. Significance of mainstream hydropower for long term power supply in the region, and the extension of electricity distribution networks
7. AQUATIC SYSTEMS	1. Productivity and biodiversity of aquatic habitats 2. The nature and importance of Mekong River ecosystems services
8. CLIMATE CHANGE	1. Predicted changes to the LMB climate system, in particular hydrological variability and extremes 2. The vulnerability of mainstream hydropower to a warming climate 3. The vulnerability of proposed mitigation measures to a warming climate 4. The net potential CHG emissions reductions from mainstream hydropower 5. Linkages between mainstream hydropower and national commitments under the UNFCC for climate change mitigation and adaptation 6. Carbon financing options for mainstream hydropower

8 OVERVIEW OF SEA METHODS

The SEA relies on consultation and expert opinion to focus efforts on the most important and strategic issues of concern to the development and management of the mainstream Mekong River. The three main approaches are:

A. Step by step assessment to focus on the most strategic issues of concern
B. Trend analysis based on available information and field survey
C. Intensive consultation with government, civil society and private sector and gathering of expert opinions at each step

Combining those three approaches in this SEA involves stakeholders in:

(i) Identification of key strategic issues for development of the mainstream river

(ii) Analysis of past trends and current situation in these issues
(iii) Analysis of future trends in these issues:
    a) Without the hydropower development – important as the basis for assessing the affects of hydropower
    b) With the hydropower development – identification of opportunities and risks
(iv) Assessing the combined effects on all future trends in the key issues
(v) Identifying enhancement and mitigation measures

8.1 TREND ANALYSIS

Accurate trend analysis is one of the most important aspects of any strategic assessment. It can be defined as an interpretation of changes in the key strategic environmental, social and economic issues over time.

Trend analysis focuses on the key issues of concern addressed by the SEA. It helps to trace any trends or patterns in the four LMB countries and regionally in time periods covered by the SEA – ie ten years in the past and future trends to 2025 (when all projects might be operational) and 2040 (to accommodate climate change). As described more fully in Annex 1, in this SEA, trends are described mainly through:

- Qualitative story-lines describing the main drivers, geographic dimensions and key concerns;
- Quantitative analysis when data available
- Maps showing spatial dimensions of key environmental, social and economic issues; and
- Simple graphs that used available data to illustrate changes in key issues and/or drivers over time. In some cases complex graphs that provide comprehensive overview of correlation between evolution of drivers overtime and the corresponding (sometime delayed) changes in the issues addressed by the analysis.

The trend analysis plays a key role in the analysis of the past trends and current situation. Also, it is important for predicting future impacts without the proposed hydropower projects since some trends can be safely extrapolated once the information about their future drivers has been obtained. Last, the trend analysis plays a very important role in the assessment of opportunities and risks of the 12 proposed hydropower developments – by analyzing their effects on the trends in the key strategic themes of concern to development along the mainstream Mekong River (Figure 6).

Trend analysis often faces many challenges and limitations. In this regard, it is important to be aware that:

- there are often situations where it is not possible to obtain relevant or sufficient data (in such situations if the trend still needs to be outlined in quantitative terms, it becomes important to use appropriate proxy indicators); and
- trend analysis plays an important role only in medium-term forecasts (a precise analysis of long-term trends can obtained only through modeling which has the capacity to consider counter-trends or breaking points).

This SEA will draw from the MRC hydrological and climate change modeling for the "with" and "without" the mainstream projects scenarios to bring greater precision to some of the trend analysis.

Trend analysis relies on building a good understanding of past trends and the current situation, together with expert judgment to project trends into the future according to specified scenarios. Trend analysis can consider uncertainties and cope with data gaps.

In summary, in this SEA trend analysis:

(i) Identifies and interprets changes in the key environmental, social and economic issues over time

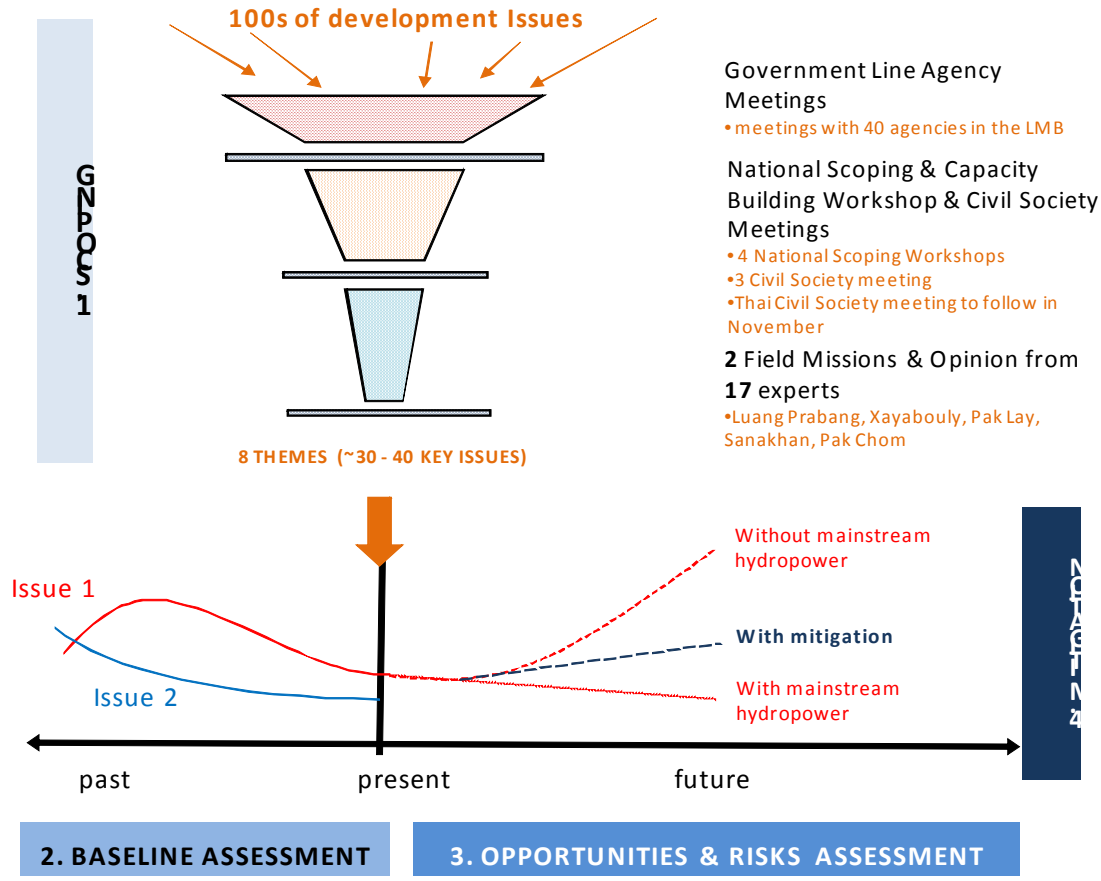
(ii) Traces key trends or patterns in the study area (ii) over the past 10 years and (ii) with an outlook of up to 2025 (ie 15 years ahead) and 2040 (ie 30 years ahead to assess the added effects of climate change).

A trend analysis guide and template to be used by the SEA team towards the end of the baseline assessment appears as Annex 1. The trend analysis approach is summarized in Figures 10 and 12.

The trends analysis uses numbers when available, for example, on capture fisheries (example below), otherwise expert judgment interprets trends and drivers.

Capture fisheries: According to respective national statistics, the inland fishery sector in the four countries of the Lower Mekong produces around 755,000 tonnes each year. By comparison, the total production of inland capture fisheries worldwide amounted to 10.1 million tonnes in 2006 (FAO 2009); thus according to national statistics, the Mekong fisheries produce 7.1% of the world's freshwater fisheries. There is no evidence from national statistics that the yield from capture fisheries is declining. However, recent reviews emphasize the fact that capture fisheries yields are becoming static and that little or no growth is to be expected from that sector in the years to come (Lymer *et al*. *in press*; Kirby *et al.* 2008). In Cambodia the only long term database of field-based catch records, from the *dai* fishery in Cambodia, indicates no upward or downward trend in yields between 1995-96 and 2007-08 (Halls *et al*., 2008). Baran and Myschowoda (2008) examined long-term trends in catches in the Tonle Sap area and concluded that over the last 60 years there has been a decline in the catch per fisherman because the fish biomass, although it increased substantially over time, did not increase as fast as the human population.

Figure 10 SEA scoping and trend analysis process



8.2 CUMULATIVE AND SYNTERGISTIC EFFECTS OF FUTURE TRENDS

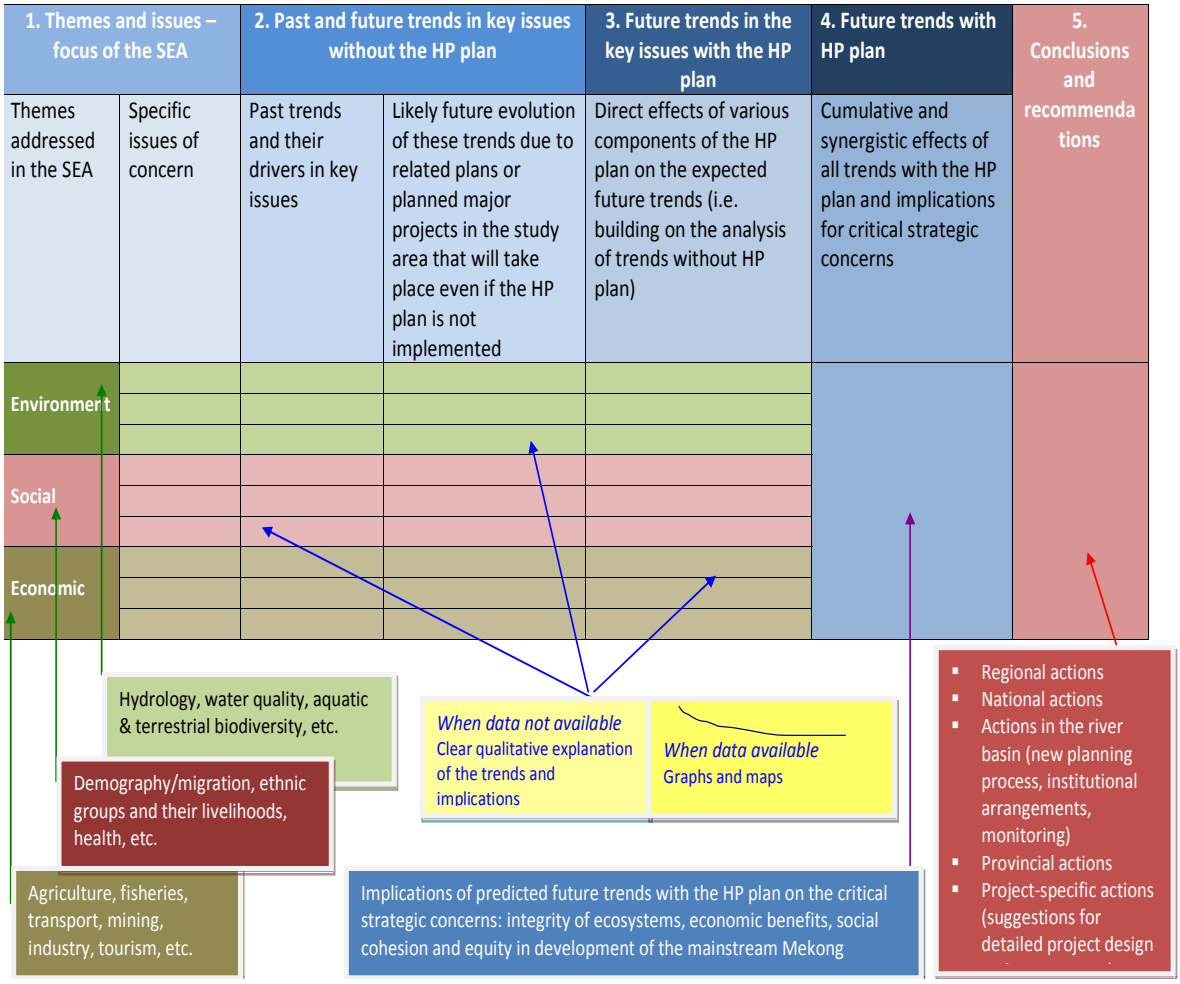
When assessing the strategic implications of many proposed developments on the one natural system, the effects of various layers developments on the future trends become especially important.

Cumulative effects of many projects: Cumulative effects are combined effects of multiple proposals on one specific theme or issue. Those effects can be analyzed through GIS, matrices, expert judgment and modeling. These effects are called future trends in this SEA.

Initial assessment of effects of the proposed projects on the key trends will be outlined through description of:

- Character and duration of the effect
- The geographic scale of the effect
- The reversibility of the effect
- Probability of the effect and key uncertainties (and identification of detailed studies needed to more precisely analyze the effect)
- Opportunities to minimize adverse effects or to maximize positive effects

Figure 11 Overview of trend analysis approach in the SEA



Using this information, the SEA team will outline cumulative effects of many projects. Cumulative impacts of many proposed projects on the key trends will be outlined through description of, for example,

- Which hydropower projects will influence the future trend and how?
- Does the trend reach any critical bottom-lines or turning points (considering their carrying capacity)? How far will the future situation be from any established thresholds or targets?
- Does the trend affect any important ecosystem services?
- Does this trend pose any significant constraints for future developments in the study area?
- What measures can be adopted to manage these cumulative impacts? (e.g. measures for minimizing or off-setting adverse impacts and enhancing beneficial impacts)

Synergistic effects of effects in more than one theme: Synergic effects result from synergies and knock-on influences between various cumulative effects. They can be analyzed through expert judgments, GIS and networks/system diagrams.

In this SEA, the overall (synergistic) effects of the proposals on all three dimensions of sustainability – integrity of ecosystems, economic gains and equity issues and social cohesion – will be outlined. This will be done against the sustainability principles associated with each theme identified by government specialists during the national scoping consultations. The kinds of strategic questions which will be posed in assessing the synergistic effects of future trends are, for example:

Ecosystem functions

- *How will the planning options affect the functioning of entire ecosystem in the Mekong mainstream and beyond - do the planning options help maintain or improve the core ecosystem functions & services?*

Economic opportunities

- *Will the predicted social and environmental effects (future trends) limit or expand economic opportunities?*

Social equity

- *Who will benefit and who will lose as a result of these effects?*

Vulnerability

- *Do the planning options change vulnerability of the Mekong River mainstream to other natural or anthropogenic risks?*

Screening themes and issues for strategic significance: The trend analysis process allows for a further focusing of the SEA on the BIG concerns – or the strategic issues of greatest concern to the development and maintenance of the mainstream Mekong River. Criteria which have been applied at various stages of the SEA to *screen themes and issues for strategic significance* can help in that focusing process:

- *Influencing a critical national policy priority* (eg poverty reduction and support to ethnic groups in mountainous areas).
- *Probability of risk:* A high probability that the risk will occur
- *Population affected:* A large number of people affected
- *Geographical scope* - the impact has a relatively large geographical scope beyond project sites
- *Effect on local livelihoods:* Substantial impacts on local livelihoods (eg likelihood of marked impacts on fisheries production)
- *Direct and immediate impacts:* Extensive, severe direct impacts on key areas of development concern to the basin (eg biodiversity, ecosystem integrity and ecosystem services)
- *Duration of impact* – The effect will be of long duration
- *Permanent/irreversible*: the effect is likely to be permanent/irreversible
- *Cumulative impacts* – the effect will have far reaching impacts on other sectors
- *Cost/benefit* – the effects will involve major economic costs not accounted for in decision making

Ideally, the SEA scoping and trend analysis work in the baseline assessment would a lead to a further focusing of the opportunities and risks assessment just on those themes of greatest strategic concern – down from the current eight to, say three themes and their respective strategic questions.

8.3 CONSIDERATION OF ALTERNATIVES

Assessment of alternatives is at the heart of the strategic environmental assessment process.[6] One of the original reasons for the development of the SEA process was to enable the consideration of

[6] "Alternatives" and "options" can be considered synonymous.

alternatives at the strategic level. Normally an SEA is conducted on a plan in which reasonable alternatives are identified, described and evaluated taking into account the objectives and the geographical scope of the plan.

This SEA is dealing with 12 individual projects proposed for the lower mainstream Mekong River in addition to 8 more in the upper Mekong. Alternatives have not been considered and documented as part of an overall plan for hydropower development of the mainstream Mekong River. The 12 projects are "the plan" for the lower Mekong. This project approach makes it more challenging to analyse the implications of strategic alternatives – because first the SEA needs to stand in the shoes of the planners in defining what those alternatives might be.

In doing that the SEA process will:

1. As a first step, more clearly define the objectives of "the plan" – what are the LMB government's seeking to achieve in considering the mainstream hydropower projects?
2. recognise that there are alternatives/options to meeting the objectives of "the plan".
3. identify and document the essential strategic choices that need to be made as part of the plan-making (decision-making) process, and discuss alternative approaches to dealing with these early on.
4. propose alternative ways to (a) deliver "the plan" objectives and (b) deal with further issues (or problems) identified during the scoping stage.
5. include discussion on the likely range of alternatives to be considered when consulting on the scope of the SEA.
6. consider, where appropriate, different tiers of alternatives, for example:
   - broad alternatives (which shape the underlying strategy for "the plan");
   - thematic alternatives; and
   - alternative sites, designs, technologies.

   (When considering detailed alternatives the SEA would focus on those that are consistent with the underlying strategy).
7. consider the alternatives hierarchy, by asking:

   (i) are the develops necessary? If not are there strategic alternatives to meeting the overall objectives. If there developments are necessary:

   (ii) how should they be done?

   (iii) Where should they go or not go?

   (iv) Timing, staging and detail of implementation

The question of 'need' is more important at strategic level than alternatives for type, location or implementation details for specific developments.

Consideration of alternatives illustrates issues and tensions which should be addressed as the preferred options are refined. The SEA should help prepare a preferred option for meeting "the plan" objectives that combines the best sustainability outcomes. Alternatives need to be considered that lead to the most sustainable solutions. Sustainable development involves pursuing new and innovative approaches to future development.

During the scoping phase, discussion with relevant line agencies in Lao PDR and Cambodia lead to the definition of a number of broad strategic objectives which would be addressed in considering the mainstream hydropower projects including:

- Meeting energy demand

- Meeting energy supply
- Increasing foreign direct investment
- Promoting foreign exchange
- Poverty reduction
- Achieving food security

Those overarching strategic objectives provide possible categories within which alternatives or options can be considered by the SEA.

The main challenge will be in setting reasonable boundaries to consideration of alternatives within the SEA. An SEA cannot replace an effective planning process involving the development and consideration of realistic alternatives to meeting strategic policy objectives. It is a demanding and exacting process involving effective stakeholder consultation. The SEA can contribute to that analysis and provide a framework and priorities for further planning. One way of generating alternatives is through the use of scenarios.

8.4 SCENARIOS

At the outset of the SEA, the SEA team reviewed all the scenarios for hydropower development of the Mekong and tributaries which had been discussed and used for different purposes by various organizations (ie World Bank, MRC, ADB, World Fish Centre) during the past ten years. That review appears as Annex 2 to this report. The aim was to settle on a small number of scenarios which would provide a framework for the opportunities and risk assessment in the SEA. Different development scenarios would have different effects on the future trends in the critical strategic issues of concern. The review found many scenarios adopted which were overlapping and sometimes contradictory. It also found that the use of the term "scenario" was sometimes interpreted as a real development plan instead of a tool to explore options and their effects.

The conclusions of the review were that the SEA should:

(i) avoid the use of the term scenario except when referring to the BDP 2 scenarios

(ii) not define new scenarios tailored to the 12 projects and the mainstream Mekong

(iii) adopt scenarios already prepared through the BDP 2 process and adopted by LMB countries for that purpose

(iv) limit the number of BDP 2 scenarios assessed to the two specifically linked to the 12 proposed mainstream hydropower projects.

Using the above guidance, the SEA has adopted the following BDP scenarios "with" and "without" the 12 mainstream hydropower projects:

(i) **LMB mainstream dams scenario**: 45 dams overall. Corresponds to Definite Future scenario+ 10 mainstream dams planned. In fact in this scenario only 16 dams are actual mainstream dams (6 China mainstream dams plus 10 mainstream dams in LMB); the scenario, despite its name, also includes 29 tributary dams.

(ii) **LMB tributary dams scenario**: 45 dams overall (but not the same as in the mainstream dams scenario). Corresponds to the Definite Future scenario + 10 dams planned on tributaries, but none of the 10 dams planned on the mainstream.(this scenario includes the 6 dams on the Mekong mainstream in Yunnan province in China)

(iii) **Sensitivity of different groups** – as in my email comments and section below.

The SEA will be considering all proposed dams on the mainstream, rather than the 10 specified in the BDP 2 scenarios. Also, the SEA team is reviewing the number of tributary dams in operation, under construction or approved to update that component of the baseline.

Within the extremes set by those two scenarios, the SEA team will assess the effects of various groupings of proposed projects depending on the requirements of each strategic theme. The groupings of hydropower schemes that might be considered include:

(i) The cascade of six dams between Pakbeng + Vientiane
(ii) The two Lao-Thai dams near Savannakhet
(iii) The Don Sahong, Stung Treng and Sambor dams

Climate change: In addition the SEA is taking advantage of recent modeling by MRC of the implications of climate change on the "mainstream dams scenario". The baseline situation represented by the LMB tributary dams scenario includes the Yunnan Province mainstream Mekong dams and all existing dams on tributaries – although the number identified in the BDP scenarios does not fully reflect all tributary dams which are in operation.

9 ADDITIONAL STUDIES

The SEA design envisages a number of additional or supplementary studies would be required where information gaps in fields of strategic importance for the assessment became apparent. In this section options are presented, which were considered during the scoping phase and assisted in the final definition of the additional studies. Taking the full analysis and results of the scoping phase into account the MRCS SEA Working Group decided that the following additional studies will be conducted as part of the SEA baseline assessment:

- Downstream effects and lessons from the Yunnan dams
- Hydrology and sediment dynamics
- Economics and regional distribution analysis
- Power and energy alternatives
- Assess historical water level fluctuation from existing Chinese mainstream dams

9.1 BACKGROUND

The original MRC Request for Proposals (MRC RFP 08-334) made provision for additional studies to be undertaken in the Lower and Upper Mekong basin. These studies were designed to feed into the baseline assessment and fill knowledge gaps in the SEA evidence base following priorities of the SEA Team.

Based on initial team review and analysis during the scoping phase as well as consultations with all MRC programs in May 2009, the SEA Team identified ten potential topics for additional study:

1. **Sediment dynamics modelling:** Impacts of mainstream dams on the hydrology and sediment discharge in the Mekong
2. **Energy demand and supply studies**: for the GMS region based upon a critical review of existing studies that have been carried out, and feeding these into the trend and scenario analysis
3. **Fish Migration**: Impacts of the mainstream dam groupings upon fish migration, fisheries in different parts of the river and mitigation measures, such as fish passes, if these are appropriate.
4. **Livelihoods:** Impacts of mainstream dams upon resettlement and livelihoods. This would use the concept of the 3 Rs of hydropower development – Roles, Responsibilities and Risks amongst the stakeholders – developers, government agencies and riparian communities upstream and downstream.
5. **Chinese Dams:** Impacts of the Yunnan Province dams on the downstream conditions in the Mekong.
6. **Socio-economic case studies:** Detailed social assessment case-studies of potentially affected communities
7. **Regional Macro-economic study:** economic, trade and sectoral implications
8. **Mainstream hydropower cost-benefit analysis:** articulate the full cost-benefit implications of the mainstream proposals through the detailed valuation of unmonetized resources
9. **Climate change:** implications for the Mekong River mainstream projects
10. **Tonle Sap-Mekong Interactions**: a detailed modelling study of the hydrological connectivity between the Tonle Sap and Mekong River.

9.2 ADDITIONAL STUDIES SELECTION CRITERIA

That initial list of candidate studies was assessed by the SEA team against the following criteria:

(i) **Critical gap in the SEA evidence base:** the SEA team undertook a detailed schedule of consultations with MRC programmes, national governments and CSO actors which identified the existing information, studies and work available. After completing the theme papers which outlined the methodology for assessment, a gap analysis was undertaken to identify area of strategic and significant weakness in the evidence base;

(ii) **Feasibility**: An assessment was made as to whether the study could be completed in time to be useful for the SEA process and whether there was budget available to undertake the study to a sufficient level of rigour. For example the detailed study on sediment dynamics of the Mekong mainstream was deemed not to be feasible for the SEA;

(iii) **Availability**: The availability of information from other sources also influenced selection. For example, a Climate Change additional study was omitted because the MRC Environment Programme (EP) was in the process of conducting a similar study.

(iv) **Prior Commitment:** the SEA team has a contractual obligation to undertake an additional study in Yunnan, China.

9.3 THE SEA ADDITIONAL STUDIES

Based on the review against those criteria and further analytical activities, three additional studies are identified:

1. Downstream impacts of the Yunnan cascade on the LMB
2. Economics & distributional analysis (including foreign direct investment and foreign exchange)
3. Hydrology and sediment
4. The alternatives for electricity demand and supply

9.3.1 YUNNAN CASCADE: DOWNSTREAM IMPACTS FROM THE YUNNAN CASCADE

The 8 mainstream dams in the Yunnan Province cascade are of a significantly different design to the dams on the LMB mainstream. They lie outside the scope of the MRC advisory and decision making processes. The Yunnan additional study aims to consolidate understanding on the design and implications of the Yunnan cascade on the LMB and to open up avenues of collaboration with one the MRCs important dialogue partners.

PROGRESS TO DATE: The MRC and SEA Team have opened discussions with ESCIR (Chinese Ecosystem Study Commission for International Rivers) and a technical visit was planned for mid-October 2009. This meeting is postponed until later this year.

The availability of data is a key factor in the design of the Yunnan additional study. As a preliminary assessment, the SEA team anticipates that the study will draw together and utilize the following information:

(i) The Research and assessment on Eco-environment and downstream impacts of Lancang River hydropower development, jointly conducted by China Hydropower Engineering Consultation Group Co. (CHECC) and China Institute of Water Resource & Hydropower Research.
(ii) The Research on cross-boundary impacts and its counter measures of Lancang River hydropower development, done by Asian International River Center of Yunnan University.
(iii) Special research on downstream impacts of Lancang River hydropower development, conducted by Duron Environment Scientific Consulting Co. Ltd of Canada.
(iv) The Strategic Environmental Assessment conducted on the Lancang River hydropower development in Yunnan Province by China (China Institute of Water Resource & Hydropower Research?)
(v) The hydropower plans and feasibility studies for the mainstream projects in the Yunnan cascade

The scope, methodology and outputs of the additional study await detailed discussions with ECSIR for finalisation.

9.3.2 HYDROLOGY & SEDIMENT

The hydrology and sediment additional study was selected because: (i) it is ***feasible*** given the data and time constraints, (ii) it relates to a ***priority concern*** of the majority of stakeholders who have been consulted, (iii) it integrates and ***consolidates*** sectoral and thematic analysis of the SEA, and (iv) it is ***necessary*** to fill identified critical gaps in the evidence base for the SEA.

The hydrology and sediment additional study aims to explore in greater detail the tributary sources of mainstream flow, and undertake a modeling study of the implications of changes to the hydrological regime on targeted LMB users. The detailed concept and TOR for the Hydrology additional study is attached in Volume 4. It has four main components:

1. **Assessment of the trends induced by the tributary dams on the hydrological regime of the Mekong River:** explore the contribution of flow and sediment from Mekong tributaries and the implications of the tributary dams on the flow and sediment flux of the Mekong mainstream
2. **Modelling study of peaking power operation and flow pulsing for Floodplain hydropower:** simulate the operation of a mainstream dam under continuous and peaking operations and quantify the extent of downstream water level fluctuations from flow regulation at a daily time-step.
3. **Water abstraction and demand balance and technical implications for the Agriculture, irrigation and hydropower sectors:** explore the implications of daily flow fluctuations for small, medium and large scale agriculture downstream of a mainstream dam
4. **Review of the Climate Change implications for the Mekong hydrological regime**

9.3.3 ECONOMICS & DISTRIBUTIONAL ANALYSIS

The economics additional study was selected because: (i) it is ***feasible*** given the data and time constraints, (ii) it relates to a ***priority concern*** of the majority of stakeholders who have been consulted, (iii) it integrates and ***consolidates*** sectoral and thematic analysis of the SEA, and (iv) it is ***necessary*** to fill identified critical gaps in the evidence base for the SEA.

The economics additional study aims to support the core economics study in three areas:

(i) Develop a critical overview of broader energy-economics and macro-economic trends and issues relating to mainstream hydropower development in the LMB in the region overall and the four countries;
(ii) Develop an overview of basic economic indicators relating to the mainstream dams; and,
(iii) Assess the sectoral economic impacts of mainstream hydropower development on key development sectors or economic sectors including forestry, navigation/transport, and tourism.

The economics additional study has three main components:

1. **Energy economics and macroeconomic trends:** review of existing macro-economic and development programs at the sectoral, national, and provincial levels;
2. **Economic Evaluation of mainstream hydropower:** develop a clearer picture of the economic and cost-benefit case for these (or a subset of these) 1212 projects;
3. **Impact on sectoral development:** link the opportunities and risks associated with main stream hydropower development back to sectoral and macro-level TRENDS and planning targets as indicated by government planning documents.

9.4 PHASING OF THE ADDITIONAL STUDIES

The three additional studies are at different levels of progress as summarized in Table 5.

The timing and content of the Yunnan additional studies is yet to be finalized and depends on a negotiation process. *It is possible that the study will not be agreed and completed in time to be integrated into the SEA baseline and opportunities/risks assessment.*

The hydrology and sediment study will be completed and presented as part of the Regional Baseline Workshop in Phnom Penh. The Economics and distributional analysis study relies on sectoral analysis in the opportunities and risks assessment and therefore will be completed and presented as part of the Regional Opportunities & Risks Workshop in Bangkok.

Table 7: Phasing for the additional studies

ADDITIONAL STUDY	CURRENT STATUS	ESTIMATED START DATE	ESTIMATED DATE OF COMPLETION
Hydrology & Sediment	Proposal submitted with Inception Report	Nov 2009	End January 2010
Economics & Distributional Analysis	Proposal submitted with Inception Report	Nov 2009	April 2010
Yunnan Cascade	Under discussion and design	To be finalised	To be finalised
Overview of electricity demand and supply alternatives	Under discussion	To be finalised	To be finalised

10 THE FOUNDATION OF EXISTING INFORMATION AND ANALYSIS FOR THE SEA

SEAs are a strategic tool designed to support existing plans and planning processes. Typically this means that SEAs do not generate existing studies or research of their own, but rely on the wealth of information existing within government and civil society. The SEA then analyses and presents the body of knowledge in a form which is useful for decision makers and planning processes.

This SEA is not starting from scratch. There exists a large body of information within the MRC structure amassed over the history of it programs, as well as within government and research institutions. During the scoping period the SEA team has been assessing the level of information available from these sources and Table 6 summarises some of the most important against strategic themes identified by LMB countries. The SEA team will use this information as the foundation for the SEA, gathering additional information as required during the baseline assessment.

Table 8 MRC data, documentation & services

Key sector or theme to be addressed by the SEA	MRC program or other source
Integrated basin flow management (IBFM) study at five different representative sections of the Mekong mainstream (2006) (environmental flows study covering): ▪ hydrology, ▪ river morphology, ▪ biodiversity, ▪ livelihoods and ▪ economics	MRC Environment program

Fisheries database, analysis and studies - eg ▪ Larval study to determine breeding sites ▪ Expert panel on impacts of dams on fish ▪ Study fish passes ▪ Fish consumption and markets ▪ Role of deep pools for fisheries productivity	MRC Fisheries Program
Fisheries: Modelling of fish migration	ICEM and World Fish
Hydrology and sediment: MRC Decision Support data base from hydrological models showing ▪ Impacts of changes in flow from dams and infrastructure ▪ Modelling of the Mekong Delta ▪ Modelling of impacts of the China dams ▪ Modelling of Tonle Sap for nutrient and sediment	BDP and IKMP WUP-Fin
Mapping and analysis of deep pool processes	MRC/IKMP
Hydropower projects: database relating to the 1212 proposed projects and tributaries: ▪ engineering design papers, ▪ specifications and ▪ up to date and verified GIS location information for the dam, reservoirs and related infrastructure	ISH/BDP
Hydropower projects: Lao PDR Optimisation Study raw data, analysis and reports	Lao PDR Government
EIA of hydro projects: All feasibility study reports, EIA reports, IEA reports, Environmental Management reports for the 1212 projects	Lao and Cambodia Governments and Developers
Social issues and resettlement: ▪ The SIM community survey information ▪ SEA team district fields assessments ▪ Vulnerability analysis data, analysis and reports	 MRC EP ICEM
GIS analysis: GIS dataset for the basin and GIS mapping and analysis support services ▪ Natural systems ▪ Economic systems ▪ Demographics ▪ Impact assessment	IKMP ICEM
Climate change ▪ CSIRO review of climate change and hydrological models ▪ CSIRO/MRC application of climate change models to the BDP scenarios ▪ Modelling of the Mekong Delta and Tonle Sap	CSIRO MRC EP/CSIRO University of Helsinki
Assessment of downstream effects of Yunnan province dams ▪ Sub-contracted study ▪ Study of hydrological effects of Yunnan dams	China Hydropower Institute Yunnan Environment Protection Bureau CNR
Economics ▪ Macro-economic context ▪ Economics relating to the projects ▪ Valuation	ADB National Governments ICEM district/provincial assessments
Energy	

▪ Regional power demand analysis ▪ Power trade	ADB ADB power trade RETA

11 SEA COMMUNICATIONS, CONSULTATION AND CAPACITY BUILDING PLAN

Effective communications and consultation are the backbone of the SEA process. The SEA results need to be taken up and implemented by the LMB countries. The only way that will happen is if the four governments and other stakeholders are adequately engaged in the process, view it as credible and objective, and feel that have had a hand in shaping the results.

11.1 OVERVIEW

The CCC Plan has four main components: (i) stakeholder identification, (ii) opportunities for stakeholder participation, (iii) communications options for the SEA and its outputs and, (iv) capacity building. An executive summary and full plan are attached as Volume 5.

The CCC Plan identifies the LMB stakeholders who are involved and potentially affected by the proposed mainstream dams. It sets out the methods of communication and consultation which will ensure that the SEA is an open, technically sound, inclusive and credible assessment of the opportunities and risks of mainstream hydropower.

The guiding principles of the CCC are:

(i) The need for the SEA to remain transparent and objective
(ii) The need for fast, effective interactions with a complex stakeholder base
(iii) The intention to improve accessibility of information relating to mainstream hydropower
(iv) The intention of being responsive and sensitive to a wide variety of viewpoints and information
(v) Ensuring the SEA purpose and objectives are clear, well communicated and understood

11.2 STAKEHOLDER IDENTIFICATION

LMB stakeholders have been identified as follows:

A. Government and Developer Stakeholders:

(i) *Hydropower oversight agencies*: the line agencies responsible for policies, regulation and management of hydropower development;
(ii) *Development sectors affected by hydropower*: no formal role in hydropower planning but whose sector may be affected;
(iii) *Developers*: Enterprises involved in the formulation, planning, financing, delivery, management and maintenance of hydropower operations;

B. Non-Government Stakeholders:

(i) *Directly affected communities*;

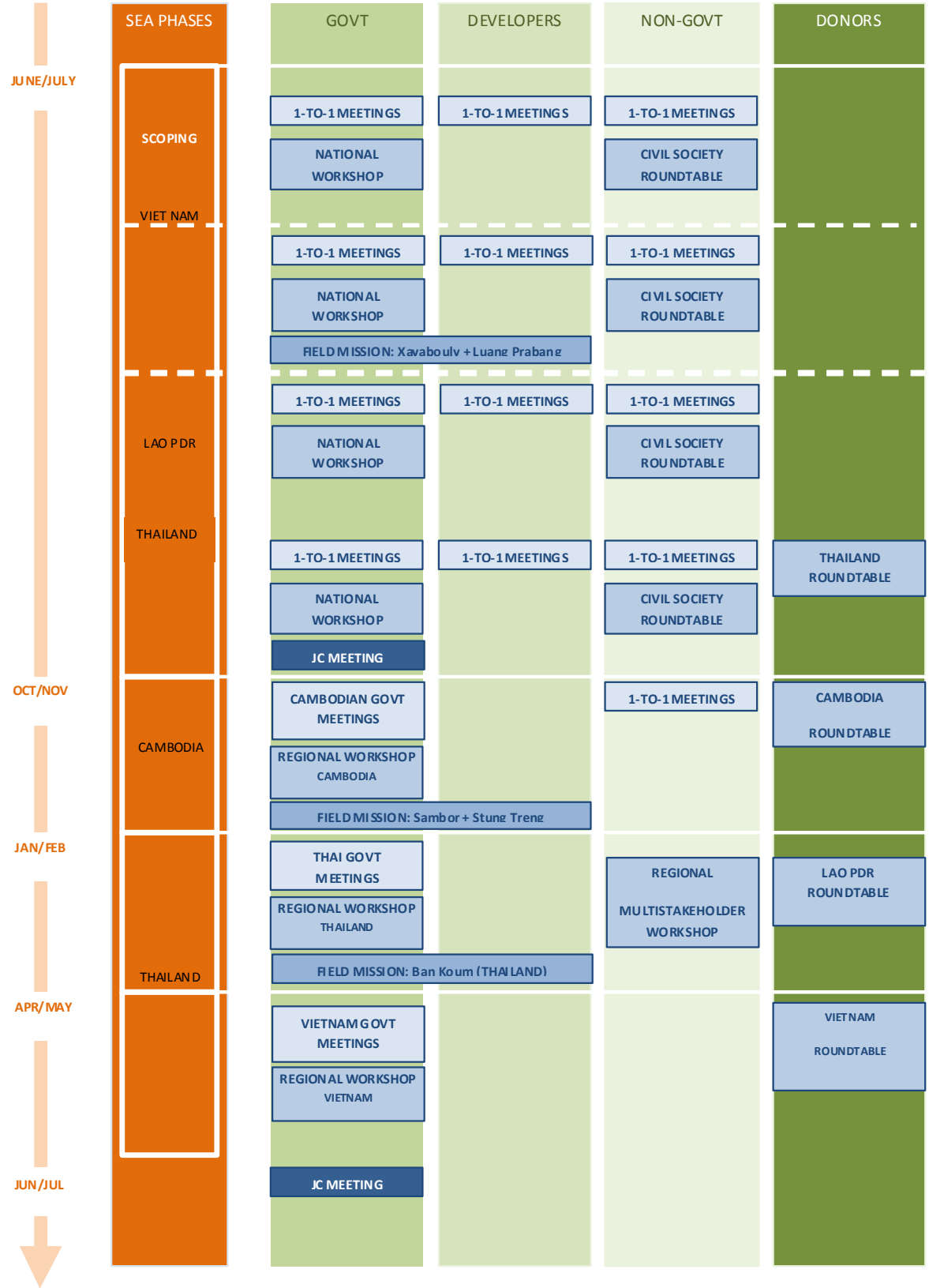
(ii) *Indirectly affected communities*; and
(iii) *Special interest groups* (advocacy NGO's, civil society interested in hydropower issues, academics and research institutions, and international development partners).

11.3 OPPORTUNITIES FOR STAKEHOLDER PARTICIPATION

There are five main types of consultation events in the SEA: (i) one to one round table meetings with government line agencies, NGOs and MRC programmes, (ii) national government workshops, (iii) CSO workshops, (iv) Donor round tables and one to one meetings, (v) developer meetings, (vi) field missions involving government and developers, and (vii) regional workshops of government and other stakeholders.

The scoping phase has involved six of the seven types of consultation (Section 5). The remaining three phases of the SEA (ie baseline, opportunities and risks assessment and avoidance, enhancement and mitigation) will see a shift in emphasis towards regional level consultation and facilitation of transboundary discussion between the four LMB countries and other stakeholders. Figure 12 provides an overview of the staging for the remaining consultations.

Figure 12 Key consultative events at each stage of the SEA



11.4 COMMUNICATIONS OPTIONS

The SEA identified three main media to facilitate communications:

1. MRC SEA website
2. Visual Media
3. Printed media

Table 6 lists the forms and uses of each type of communication.

Table 9 Communications media and their uses in the SEA

WEBSITE
Function: Facilitates most communications between the SEA and stakeholders Including:
Uses: (i) SEA Timeline (ii) SEA FAQs (iii) SEA Key Issues Blog (iv) Details of "The Hydropower Plan" (v) Multi-stakeholder workshop comments & responses (vi) Formal written public submissions
VISUAL MEDIA
Function: (i) Improve understanding of the strategic development concerns related to mainstream hydropower; (ii) Facilitate stakeholder input from the widest range of identified stakeholders as possible.
Uses: (i) The Hydropower Plan "Flyover" (ii) Filed Mission Photo Stories (iii) Community Video (iv) Archiving of existing video
PRINTED MEDIA
Function: (i) Officially release important outcomes of the SEA; (ii) Respond to debate specifically related to the SEA;
Uses: (i) Press Releases (ii) Press Conference (iii) Press Interviews (iv) Regular reports for distribution and comment at each main stage of the SEA (v) Final SEA Report

11.5 CAPACITY BUILDING

There is a strong element of capacity building in the SEA methodology. This reflects both the newness of SEA to some MRC member states and the limited global experience with transboundary SEAs on shared rivers. Capacity building efforts will emphasise on-the-job learning through the consultative process and interaction with the National Mekong Committees and line agencies in

each LMB country and more formal sessions as part of each regional and national workshop. Government line agency representatives are the priority target for capacity building.

11.6 OUTCOMES OF THE SCOPING PHASE CONSULTATIONS

The SEA on mainstream hydropower has begun with a lengthy scoping phase of 8 months, emphasing extensive consultation and discussions within each LMB country. This first phase duration reflects the priority given by the MRC and Member States for the SEA to use the scoping activities to establish a firm foundation of ownership, credibility and partnerships within each country as a basis for moving through each of the phases to follow – each requiring information, inputs and support from the governments and other stakeholders.

The scoping phase consultations have had three tangible benefits for the SEA and core government stakeholders:

(i) **Capacity building**: the SEA has involved some 400 stakeholders in the MRC Member States (government and CSO) in discussions on SEA as a development planning tool, international experiences in its use in transboundary situations, and in how best to apply it in the Mekong region.
(ii) **"Ground truthing" of the SEA scope:** consultations with a wide selection of LMB stakeholder has allowed the SEAs scope and methodology to be firmly embedded in the regional context, focussed on the key strategic issues identified by stakeholders the working within institutional and planning contexts of the LMB countries.
(iii) **Partnering:** consultations with core government line agencies and CSO groups have established important partnerships and opportunities for collaboration. These partnerships will extend the SEAs resources and influence in decision making

The scoping phase has also led to the following substantive outcomes for the SEA:

(i) **Methods:** The adoption of trend anlaysis as the main assessment tool and of two main BDP scenarios – with and without the LMB mainstream hydro project proposals – as the focus of risks and opportunities assessment.
(ii) **Scope:** The SEA scope has been defined to focus on agriculture, fisheries, hydrology/sediment flows and power security, with four other themes also identified for priority assessment.
(iii) **Phasing and timing:** The SEA will have four phases – scoping, baseline assessment, risk/opportunities assessment and mitigation/enhancement. The scoping phase has run from February to October with the baseline assessment phase commencing November.
(iv) **Integration with MRCS programs:** MRC programs have been involved in preparation of scope and methods theme papers including guidance on integration approaches. An SEA coordination working group has been established and theme working groups proposed. A special relationship has been forged between the BDP scenario assessment and SEA teams to define common and consistent methods and approaches and to share information.

12 BASELINE ASSESSMENT APPROACH

The key strategic themes and issues defined in the scoping phase provide the framework for gathering the baseline information at regional, national and local levels on past trends and current status. The baseline assessment phase runs from November 2009 to January 2010.

The design of the baseline assessment took place as part of the scoping phase and involved four steps:

1. Preparation of *theme papers* through consultation with MRC programs
2. Preparation of a *baseline assessment guidance* through intensive consultation, review and revision within the SEA team
3. Preparation of a *baseline GIS analysis and products table*
4. Preparation of a *baseline assessment operational plan* for each country

The theme papers identify information requirements and sources for each step of the SEA (Volume 4). Much of the required information is available through secondary sources such as MRC programs or ADB technical assistance projects (Section 10). Where there are gaps in information from secondary sources, the SEA team will need to gather it from stakeholders – especially government line agencies from national to local levels in each LMB country. Alternatively, where the information does not exist, additional studies may be required (Section 9).

The theme papers helped shape the *baseline assessment guidance* (Annex 3). It is a detailed listing for the national teams to use when in the field and when making contact with national and local government agencies as follow up to the line agency meetings during the scoping phase. The guidance focuses the SEA team on the information requirements of strategic importance. Past SEA's have had difficulties focusing at this stage on the most important information needs – and ended up gathering too much data of the kind normally associated with environmental impact assessments of specific projects. The baseline assessment guidance covers:

THEME ACTIVITIES	REGIONAL DATA / INFORMATION REQUIRED	DATA / INFORMATION FOR COLLECTION BY THE NATIONAL TEAM	BASELINE ASSESSMENT OUTPUTS OF NATIONAL TEAMS
Activities to be completed by the SEA under each theme – extracted directly from the theme papers	Information already collected, or readily available online, from the MRC, ADB or other non-government institutions	National, provincial and district information that the SEA national teams need to collect and assess for the baseline	Baseline outputs required of the SEA national teams. What text they should write, translate, which data& maps to compile and analyse

The baseline assessment includes gathering information for each strategic theme and issue. It will involve detailed profiling of selected Mekong districts in each country and the preparation of district case studies.

The baseline guidance was analysed to identify the GIS analysis and products which would be required to complete the assessment (Annex 4). Finally, the SEA team is in the process of preparing a detailed operational plan for each country extracting from the guidance what is relevant and identifying the many logistical arrangements needed – including authorizations and formal requests to government agencies. Field missions will commence through November 2009. The baseline assessment will lead to the preparation of a baseline report to be circulated to stakeholders and discussed and refined at a regional workshop in Phnom Penh, Cambodia.

The SEA will use, wherever possible, existing information available from the MRC and national governments. However, there are some cases in which the SEA team will need additional information at the provincial and district level. Given the time and resource limitations, the SEA team has undertaken a selection process to target additional data collection efforts and focus only on the areas of strategic priority. This was done by first selecting a short list of case study mainstream dams, and then by selecting a short-list of target districts likely to be most affected by the opportunities and risks presented by mainstream projects.

The relevance of this process varies between theme papers. Each theme paper will address the with and without mainstream dam scenarios, however, there is flexibility in the SEA approach to allow each them paper to decide on which project or combination of projects they will assess within the full spectrum. The social systems theme requires the most detailed data collection schedule. A full description of the selection process is presented in the social systems theme paper (Volume 4).

Selection of the case study dams

The 12 mainstream dams were reviewed against the following selection criteria:

(i) **Transboundary implications:** representative of dams with both transboundary and national impacts
(ii) **Location in the LMB:** situated at different locations along the LMB
(iii) **Status of the projects:** dams whose locations are known and fixed
(iv) **Existing information:** dams where assessments and studies have already been undertaken and where information is available to the SEA team

Based on this assessment, the SEA team selected the following six dams as case studies:

1. Pak Beng
2. Xayaburi
3. Pak Lay
4. Lat Sua
5. Don Sahong
6. Sambor

Sampling of these dams for more in-depth analysis does not mean that issues, concerns and feedback on all 12 proposed dams may not be integrated into the SEA's overall findings and conclusions.

Selection of the target districts

Target districts from the 6 representative mainstream dams were selected on the basis of a preliminary survey of key socio-economic indicators, including:

(i) Access to health, electricity, water supply and other infrastructure
(ii) Incidence of poverty
(iii) Number of villages
(iv) Location of the district in relation to dam activities and scheduling (affected by downstream, construction or head pond)

Based on this review process a total of 14 target districts have been identified (presented in Table 10). In Lao PDR, at least 1 affected district was selected for each affected province & two for Champassack and Xayaboury (which have the largest number of potentially affected districts of the 12 dams). Districts were chosen to balance between GoL designated poorest districts and non-poor districts, and districts with proportionately less access to basic infrastructure (e.g. water supply, electricity, primary schools). Lastly, wherever possible, districts affected by more than one of the three impact areas (construction/head pond/downstream) were also prioritized.

In Cambodia and Thailand a smaller number of districts border the Mekong mainstream; 2 will be sampled in Thailand, and 3 in Cambodia, while, one district will be sampled in Vietnam to explore the scale of downstream impacts.

Table 10 Target Districts for SEA socio-economic data collection

COUNTRY	PROVINCE	TARGET DISTRICT
Lao PDR	Oudomxay	Pakbeng
	Xayaboury	Xayaboury
		Pak Lay
	Bokeo	Paktha
	Luang Prabang	Nan
	Vientiane	Met
	Champassack	Pakse
		Khong
Thailand	Chiang Rai	Chiang Khong
	Udon Ratchathani	Khong Chiam
Cambodia	Stung Treng	Stung Treng
	Kratie	Sambor
		Kratie
Vietnam	Dong Thap	*

** To be decided during the baseline assessment*

13 SCHEDULE OF ACTIVITIES AND NEXT STEPS

The scoping phase ends formally on 30 October and with the submission of this inception report (although there remains an outstanding CSO consultation in Thailand - 03 November 2009). The baseline assessment has been designed and will commence as of 1 November 2009 and run through to end January 2010 with a regional workshop.

The revised phases of the SEA are outlined in Table 7. Table 8 highlights an indicative schedule of the key remaining consultation activities.

Table 11 Timing of the four phases of the SEA

SEA phase	**Main activities**
Scoping phase **February – October 2009**	• National consultations • Definition of scope of the SEA • Refinement of methods
Baseline assessment	• Analysis of past trends and current situation in the key

November 2009 – January 2010	development issue • Identification of government policies, plans and targets for the key issues
Risk and opportunities assessment **January – March 2010**	• Analysis of future trends in these issues: (i) Without the hydropower development – important as the basis for assessing the affects of hydropower (ii) With the hydropower development – identification of opportunities and risks according to a number of development scenarios • Assessing the combined/cumulative effects on future trends in the key issues
Avoidance, enhancement & mitigation **March – July 2010**	• Identifying avoidance, enhancement and mitigation measures – for example (i) Measures to address the opportunities and risks of greatest concern (ii) Improved institutional arrangements and management procedures (iii) Project specific recommendations (e.g. timing and sequencing; project design and appraisal) (iv) Future studies and monitoring

Table 12 SEA Schedule of consultative Events

DATE		MEETING	LOCATION	SEA STAGE
		NATIONAL CONSULTATIONS		
	Viet Nam	***Scoping Phase*** ***JUNE – SEPT***		SCOPING What are the key development issues for the Mekong River?
JUNE	29-30	VN Government line agency meetings	Ha Noi	
JULY	02	VN National Workshop		
	03	VN Civil Society meeting		
	Lao PDR			
JULY	06-07	LAO Government line agency meetings	Vientiane	
	08-09	LAO National Workshop		
	09	LAO Civil Society meeting		
	10-11	LAO Field Mission: Xayaburi, Luang Prabang	Luang Prabang	
	Cambodia			
JULY	14-15	KH Government line agency meetings	Phnom Penh	
	16-17	KH National Workshop		
	17	KH Civil Society meeting		
AUG	03	VN Civil Society meeting	Ha Noi	
	Thailand			
AUG	14	THAI National Workshop	Bangkok	
SEP/OCT	29-01	THAI Government line agency meetings	Bangkok	
NOV	03	THAI Civil Society meeting	Bangkok	
		REGIONAL CONSULTATIONS		
	Cambodia	***Baseline Assessment Phase*** ***OCT - DEC***		SCOPING What are the key development issues for the Mekong River?
JAN	21,25	Follow Up: KH Government line agency meetings	Phnom	

			Penh	
	22-23	Cambodian Field Mission: Stung Treng, Sambor	Sambor	
	27-28	Regional Baseline Assessment Workshop	Phnom Penh	
	Thailand	***Impacts Assessment Phase JAN - APR***		IMPACTS ASSESSMENT What are the future trends for these issues, with & without mainstream hydropower?
APR	19-20	Follow up: THAI Govt. Line agency meetings		
	22-23	Regional Impacts Assessment Workshop	Bangkok	
	24-25	Thai Field Mission: Ban Koum	Ban Koum	
	Lao PDR			
APR	27-28	Follow up: LAO Govt line agency meetings	Vientiane	
	30	Regional Multistakeholder Workshop	TBD	
MAY	01-02	Lao Field Mission: TBD	TBD	
	Viet Nam	***Avoidance, Enhancement & Mitigation Assessment Phase MAR - JUN***		MITIGATION What measures will be useful in enhancing the benefits and avoiding or mitigating the negative effects of mainstream hydropower?
JUN	18, 21-22	Follow up: Vietnam Government line agency meetings	Hanoi/Ho Chi Minh	
	24-25	Regional Mitigation Workshop	Can Tho	

14 CONCLUSIONS

The SEA was launched by MRC to supplement, guide and inform the appraisals of many hydropower projects proposed for reaches of the mainstream Mekong River in Lao PDR and Cambodia. The SEA is working on a pilot basis as part of the MRC Prior Notification and Consultation Procedures. It will lead to recommendations to the MRC Joint Committee concerning the opportunities and risks as well as contribution of hydropower to regional development.

Mainstream projects – the focus of the SEA: the SEA team is asked to "Provide an understanding of the implications of mainstream hydropower development to the extent necessary to permit formulation of specific policy-level recommendations on whether and how hydropower projects on the Mekong mainstream should best be pursued" (MRC SEA TOR).

Excellent support from NMCs and MRC ISH: The SEA process has moved forward with strong support of the National Mekong Committees and the MRC Initiative for Sustainable Hydropower Team. The first phase, which focused on scoping of the assessment, ran for 8 months. The intention behind that extended inception phase was to ensure LMB countries had an early opportunity to become familiar with the SEA and to help shape its focus and methods. That initial engagement has been achieved.

SEA team resources – careful marshalling required: The challenge now is to maintain the momentum and keep the stakeholders – especially the relevant government line agencies – interested and involved for the remaining and most important stage of the assessment. The lengthy

start up scoping phase has drawn heavily on the SEA team resources and great care will need to be taken to ration the remaining inputs evenly over the next three assessment phases.

Progressively sharpening the focus of the SEA: From now on, the main concern of the SEA team will be on keeping a sharp strategic focus to the assessment. The broad discussion on many issues has moved forward and now the SEA must continue to hone down the focus to address only the issues of greatest concern –ie the BIG strategic concerns – relating to the proposed mainstream developments. This is not all easy, given the diversity of views and interests involved – but it appears that fisheries, hydrology and sediment and local livelihoods are emerging as priorities accompanied by power security. This highlighting of BIG concerns will be finalized towards the end of the baseline assessment phase.

The downstream effects of the Yunnan dams – a gap in the baseline? A final point concerning the baseline assessment – In every country concerns have been raised about the downstream effects of the Yunnan mainstream hydropower projects. A good deal of effort and good has gone into the discussions between MRC and China – on both sides – concerning possible arrangements for a study of downstream effects on the LMB countries in close collaboration with and through the Chinese technical agencies and authorities. Yet, given the sensitivities and complexities in launching that study, there is a real risk that it will not be implemented in time to be of use to the SEA. It is essential that a "plan B" be defined so that the resources available can be applied to drawing together the best information and expert opinions available as part of the SEA baseline. This plan B might involve the SEA team preparing a background discussion paper and then convening an expert group to consider and agree on a set of informed expert judgments on the key issues – in a similar fashion to the expert meeting of fish Migration convened by MRC in 2008.

ANNEX 1: TREND ANALYSIS GUIDE AND TEMPLATE

In this template, "hydropower plan" refers to the 12 proposed mainstream hydropower projects in Lao PDR and Cambodia. The template is partially completed for a hypothetical theme – "biodiversity" – to guide and illustrate the approach the SEA team will take to its completion.

Themes and issues

Theme	*Key issue (relevant to hydropower)*
Biodiversity, including fauna and flora	• Condition and extent of natural areas of international importance • Habitat fragmentation

For analysis of each theme, the following template will be followed

Past trends and current situation	
Theme:	**Terrestrial biodiversity**
Issues:	Condition and extent of valuable natural areas, habitat fragmentation, species

Please describe:

- An overall context of the theme addressed (i.e. original / natural potentials & constrains , etc. - basic facts such as volumes, acreage, etc. accompanied by a short commentary on their importance – international, national, provincial, local)
- List issues that you have chosen to focus on within this theme and justify (in 1-5 sentences for each issues) why each issues is important – wherever possible, relate it to official documents also recognize the these issues as important
- Commentary on information sources and uncertainties – if you found that some critical pieces of information are missing or may be contradictory, incomplete or otherwise doubtful, state it clearly (and politely)
- Past trend (with regard to this overall context – what is its dynamic & the geographic scope and whether the trend whether it reaches any critical bottom-lines or turning points, etc.).
- Factors that cause the trend (drivers) or that limit the trend (counter-trends). When doing so, you may wish to cross-refer to any other relevant past trends as outlined by other members of the SEA team.
- The key problems and/or the key geographic areas of specific concern (of national, provincial and local importance), problems

E.g.

In 1990, the region had extensive population of XX1 critically endangered species (out of which XX2 species are endemic) and of XX3 endangered species (out of which XX4 species are endemic). Further, the region hosts a small population of XX5 species which are not protected but they play a significant role in the lifestyles of the local ethnic groups.

Valuable natural ecosystems in areas (see attached map) accounted for ZZZ ha (25% of the territory of the province) in 1995. They were connected by bio-corridors KVD and HWD which played an important role for migration of XX5 critically endangered or endangered species. The Biodiversity Conservation Action Plan of the region (elaborated in 1994 by SWA but not yet awaiting formal approval by the national government) has suggested to ensure that at least 15%

of the territory becomes protected to halt biodiversity decline.

Until 2006, 9% of territory of the province has received various degrees of protection. ZZZ1 ha in location XYZ that hosts species …. has been declared as national park which is also classified as habitat of international importance (see ministerial meeting XSW and resolution by KWC). ZZZ3 ha in location UBF serves as a breeding ground for species GDE has been declared protected area, etc.. Areas GBH 1-3 have been proposed as special use forests.

At the same time, ZZZ2 ha (5% of valuable important ecosystems found in the province) have been irreversibly damaged by conversion of these natural ecosystems to mining and agriculture. The remaining valuable ecosystems that are endangered by forestry practices FFF. As overall degradation of the ecosystems regards, it should be noted the status of existing protected areas does not entirely prevent degradation of already protected ecosystems (e.g. forestry practices GHJ cause impacts YUZ in locations DRT).

The bio-corridor KVD has been irreversibly damaged by road developments in AA1. Migration of critically endangered species XX6 has stopped with the fragmentation of this bio-corridor, however some migration reportedly takes place through the bio-corridor HDW. The bio-corridor HDW thus serves as the only migration route for species XX7 and plays the key role the viability of these populations of these migratory species in the province, and in Vietnam generally.

+ Supplemented by any graphic aids to illustrate the trend - graphs, maps, pictures or boxes with "local stories" that provide representative examples the trend.

Summary of (i)current status of theme and (ii) government policies and targets for the theme (no more than 10 sentences with thorough references)

	Future trends without the LMB mainstream hydropower development
Theme:	**Terrestrial biodiversity**
Issues:	Condition and extent of valuable natural areas, habitat fragmentation

Please outline:

- Future drivers of the trend and counter-trends
  - Key drivers: Socio-economic-environmental drivers and/or any officially established policy objectives and plans/strategies elaborated for this issue (e.g. natural areas will be influenced by Biodiversity Protection Strategy, etc.)
  - Factors which positively or negatively influence these trends: Socio-economic-environmental constrains and/or other development policy objectives and plans/strategies that will act as counter-trends (e.g. natural areas will be affected by trends in forestry, road development trends, urban development trends, etc.). You can get this information from the analysis of the future trends elaborated by other members of the SEA team
- Expected overall future trend – its dynamics and geographic scope
- The key problems and/or geographic areas that will become of specific concern which would normally arise from this trend
- Likelihood of the trend and key uncertainties

E.g.
Natural ecosystems that could be declared protected areas are likely to decrease by approximately 5% in the next 6 years, mainly because of recently adopted Forestry Policy and approved future projects for aquaculture (DHR, HWT) and tourism (LKT, HWT, CZD). Etc.

No plans for rehabilitation of bio-corridors exist…….

+ supplemented by graphic aids to illustrate the trend – graphs or maps

Future trends with the LMB mainstream hydropower development	
Theme:	**Terrestrial biodiversity**
Issues:	Condition and extent of valuable natural areas, habitat fragmentation, etc.

Summary of the past and future trends without LMB mainstream hydro projects

Please write a short summary of past and future trends without HPP (5-10 sentences that remind the reader of the past trends, current situation and future trends without LMB mainstream hydropower development – this will serve as input into the executive summary of the SEA)

E.g.

- Valuable natural ecosystems that could be declared as protected amount for 25% of the territory. Until now 9% of these ecosystems have been declared protected areas but the most important bio-corridors that connect them have been damaged.
- These areas will decrease by approximately 5% in the next 6 years, mainly because of recently adopted Forestry Policy and approved future projects for wind-farming, aquaculture and tourism. No plans for rehabilitation of bio-corridors exist.

Expected direct effects of the proposed LMB mainstream hydro projects on the future trend in this theme/issues

Components of the HP plan	Likely expected opportunities or risks caused by this component	Proposed mitigation and enhancement measures
Mention which component: individual projects, cluster of projects or the overall plan.	Explain in detail: • Character of impact (what exactly causes this impact or assumptions that form the basis for this forecast) • Probability and key uncertainties • Geographic scale -directly and indirectly affected territories - geographic areas that will become of specific concern • Duration and reversibility • The key concerns associated with this impact All these statements need to be substantiated by detailed calculations, examples, references to international and national literature and supplemented by graphic aids (maps, graphs) to	

	illustrate the impact.	
Project	The construction will most probably cause fragmentation of ecosystem AXT that forms an integral part of the only remaining regional bio-corridor. This impact can be either short-term or permanent depending on the effectiveness of mitigation.	This loss of bio-corridor can be compensated by restoration of damaged ecosystems AXT after the construction.

Possible indirect links with other future trends which create other risks and opportunities

Relevant future trends with the HP plan from other themes	Likely expected opportunities or risks	Proposed mitigation and enhancement measures
Road developments	• Read information on the relevant future trends with the HP plan (elaborated by other members of the team) and outline their key impacts on the specific issue you address in this table using the same approach to analysis as the one outlined above …	…

Expected future cumulative/synergistic effects of the LMB mainstream hydro projects on the trends for the theme/issue

Please summarize the worst-case scenario & the best-case scenario for the future evolution of this trend if all direct and indirect impacts of relevant components of the LMB mainstream hydro projects on the trend would happen. When dosing so, please make sure that you judge these impacts on the basis of future trends without HP plan (e.g. some important ecosystems or development opportunities may be lost as result of development trends without the HP plan or some ecosystems or development opportunities may become even more important since they will provide the only remaining assets in the study area).

Worst-case scenario

E.g.

If the LMB mainstream hydro projects proceeds as planned, 250 ha of natural ecosystems in location CDR, etc will be lost and 4 bio-corridors DWS, etc. of international importance will be permanently damaged. This trend will most likely lead to extinction of species FRD, GWS, etc.

Best-case scenario

E.g.

If all recommended changes to HP plan are adopted, only 50 ha of natural ecosystems in location DRT, etc. will be lost and only 2 important bio-corridors will be temporarily damaged. This damage - which will occur in any case - can be compensated by establishment of new protected areas in XXX. Species FRD, GWS will remain critically endangered and greater attention needs to be give to their protection.

Proposed mitigation and enhancement measures for this theme/issue
Please bring all recommendations on mitigation/measures into comprehensive overview that clusters the proposed mitigation measures into those that relate to: LMB interventions – eg: • initiation of planning processes that address program-wise issues • improved institutional arrangements • improved monitoring, etc. National interventions – e.g: • initiation of planning processes that address program-wise issues • improved institutional arrangements • improved monitoring, etc. Inter-sectoral interventions in the river-basin – e.g: • initiation of planning processes that address program-wise issues • improved institutional arrangements • improved monitoring, etc. Interventions specific to this hydropower plan – issue pertaining to all projects e.g.: • initiation of planning processes that address program-wise issues • improved institutional arrangements • improved monitoring, etc. • which projects may go ahead, be modified or be stopped, • optimal sequencing of projects, Project-level recommendations - e.g. • detailed issues to be addressed in the detailed project planning, EIAs and EMPs

ANNEX 2: DEVELOPMENT SCENARIOS IN THE LOWER MEKONG BASIN

Background paper prepared by the team for MRC SEA on mainstream hydropower
May 2009

I. SOURCES:

WorldBank scenarios:

• Podger G., Beecham R., Blackmore D., Perry C., Stein R. 2004. Modelled observations on development scenarios in the Lower Mekong Basin. Mekong Regional Water Resources Assistance Strategy, WorldBank, Vientiane, Lao PDR. 142 pp.
p. ii, Table 5.4, p. 22; Table 5.7, p. 25; Table 5.12, p. 30; Table 5.14, p. 32; Table 5.17, p. 36.

Nam Theun 2 scenarios

• NORPLAN and EcoLao 2004. Cumulative impact analysis and Nam Theun 2 contributions. Final report for the Government of Lao PDR and the Asian Development Bank, Manila, Philippines. 476 pp.
p. 21-23, Tables 3 to 6, p. 9, Table 3 and p. 21-23, Tables 3 to 6; p. 9, Table 3 and p. 21-24, Tables 3 to 7

BDP 1 scenarios

• MRC (Mekong River Commission) 2005c. Basin Development Plan scenarios for strategic planning. Mekong River Commission, Vientiane, Lao PDR. 148 pp.
p. 53, Table 7.6 and p. 54-55

Built Structures scenarios

• Koponen J., Tes S. and Mykkanen J. 2007 Influence of built structures on Tonle Sap hydrology and related parameters. Report of the project "Technical Assistance to the Kingdom of Cambodia for the study of the influence of built structures on the fisheries of the Tonle Sap". Environmental Impact Assessment Center of Finland Ltd and WorldFish Center. 65 pp.
P 23-23 + Koponen and Tes Soparith (pers. com.)

BDP 2 scenarios.

• Thanapon Piman 2008. Approach and process to formulate and assess basin-wide development scenarios. Presentation on 24-25 July 2008 at Chiang Mai University, Chiang Mai, Thailand. [online: http://www.mpowernet.org/download_pubdoc.php?doc=4323]

• BDP (Basin Development Plan) 2008. Modelling of flow changes in the Mekong mainstream for a range of water resources development scenarios. Presentation at the Regional multi-stakeholders consultation on MRC's hydropower programme. 25-27 September 2008, Vientiane, Lao PDR.
• Thanapon Piman 2008.Results of Fast-Tracked Basin-Wide Water Resources Development Scenarios. Mekong River Commission, Basin Development Plan, Phase 2, Internal Technical Note. 103 pp.

II. OVERVIEW OF DAMS CONSIDERED IN THE 23 SCENARIOS REVIEWED

Country	Project	MW	Mainstream	Completion	In operation in 2000	In operation in 2009	In construction in 2009
China	Dachaosan	1350	x	2003		x	
China	Ganlanba	150	x	2013			
China	Gonguoqiao	750	x	2008		x	
China	Jinghong	1500	x	2010			
China	Manwan	1500	x	1995	x	x	
China	Mengsong	600	x	2025			
China	Nuozhadu	5850	x	2017			
China	Xiaowan	4200	x	2013/2012			
Laos	Houayho	150	x	1999	x	x	
Laos	Mekong at Don sahong	360	x	2015			
Laos	Mekong at Luangprabang	1410	x	2014			
Laos	Mekong at Pakbeng	1230	x	2018			
Laos	Mekong at Paklay	1320	x	2015			
Laos	Mekong at Sanakham	570	x	2016			
Laos	Mekong at Xayabuly	1260	x	2015			
Laos	Nam Bak 2B	126		2018			
Laos	Nam Kong 1	150		2015			
Laos	Nam Kong 3	35		2016			
Laos	Nam Leuk	60		2000	x	x	
Laos	Nam Lik	100		2009		x	
Laos	Nam Lik 2	100		2010			
Laos	Nam Mang 3	40		2004			

Country	Project	MW	Mainstream	Completion	In operation in 2000	In operation in 2009	In construction in 2009
Laos	Nam Ngiep 1	260		2015			
Laos	Nam Ngum (1)	155		1971	x	x	
Laos	Nam Ngum 2	615		2013			x
Laos	Nam Ngum 2B	183		2012			
Laos	Nam Ngum 3	440		2014			
Laos	Nam Ngum 3E	580		2012			
Laos	Nam Ngum 4A	55		2015			
Laos	Nam Ngum 5	120		2012			x
Laos	Nam Ou 2	90		2014			
Laos	Nam Song	60		1996	x	x	
Laos	Nam Tha 1	168		2013			
Laos	Nam Theun 1	523		2015			
Laos	Nam Theun 2	1070		2010			x
Laos	Nam Theun 3	236		2016			
Laos	Pa Mong	4800					
Laos	Thakek	360					
Laos	Theun-Hinboun	210		1998	x	x	
Laos	Theun-Hinboun ext.	280		2010			
Laos	Theun-Hinboun NG8						
Laos	Xe Kong 3d	91.1		2012			
Laos	Xe Kong 3up	144.6		2012			
Laos	Xe Kong 4	485		2015			
Laos	Xe Kong 5	300		2017			
Laos	Xe Xou	59		2020			
Laos	Xekaman 1	322		2014			
Laos	Xekaman 3	250		2010			x
Laos	Xekaman2	53					
Laos	Xepian-Xenamnoy	390		2010			
Laos	Xepon	75		2008		x	
Laos	Xeset 2	76		2010			x
Lao-Thailand	Mekong at Ban Kum	2000	x				

Country	Project	MW	Mainstream	Completion	In operation in 2000	In operation in 2009	In construction in 2009
Lao-Thailand	Mekong at Pakchom	1079	x				
Thailand	Chulabhorn	40		1971	x	x	
Thailand	Huai Luang			1984	x	x	
Thailand	Lam Phra	0.85		1976	x	x	
Thailand	Lam Takhong	500		2002		x	
Thailand	Nam Oon	0.4		1973	x	x	
Thailand	Nam Pao	1.3		1971	x	x	
Thailand	Nam Pung	6		1965	x	x	
Thailand	Pak Mun	136		1997	x	x	
Thailand	Sirindhorn	36		1968	x	x	
Thailand	Ubol Ratana	25		1966	x	x	
Cambodia	Lower Se San 2	420		2017			
Cambodia	Lower Sre Pok 2	222		2017			
Cambodia	Mekong at Sambor	2600	x	2016			
Cambodia	Mekong at Stung Treng	980	x	2016/2020			
Vietnam	Ban Tou Srah	86		2008		x	x
Vietnam	Buon Kuop	280		2008		x	x
Vietnam	Duc Xuyen	58		2025			
Vietnam	Plei Krong	120		2008		x	x
Vietnam	Se San 3	273		2006		x	x
Vietnam	Se San 3A	96		2006		x	x
Vietnam	Se San 4	360		2009		x	x
Vietnam	Se San 4A	255		2008		x	
Vietnam	Sre Pok 3	300		2012			x
Vietnam	Sre Pok 4	100		2009		x	
Vietnam	Upper Kontum	220		2025			
Vietnam	Yali	720		2000		x	

II. SCENARIOS

WorldBank scenarios

Baseline scenario: Situation in 2000. Six dams overall, but Manwan in China (1500 MW, mainstream) and 9 Thai dams all completed before 2000 and totalling at least 245 MW (Chulabhorn, Huai Luang, Lam Phra, Nam Oon, Nam Pao, Nam Pung, Pak Mun, Sirindhorn, Ubol Ratana) are not included.
Chinese dams scenario: 10 dams overall, including 4 mainstream dams in China. Corresponds to Baseline scenario + 4 Chinese dams.
Low development scenario: 15 dams overall, including 3 mainstream dams in China (Nuozhadu -5850 MW, construction started in 2006- is excluded). Corresponds to baseline dams and baseline agricultural productivity + population growth.
Embankments scenario: 15 dams overall. Corresponds to Low Development scenario + embankments for 130,000 ha of agriculture in Cambodian floodplains.
Agriculture scenario:15 dams overall. Corresponds to Low Development scenario + domestic and industrial water demands + intra- and inter-basin transfers + increases in irrigation diversions. High development scenario: 25 dams overall, including 4 mainstream dams in China and Sambor in Cambodia. Corresponds to Low Development scenario + 10 dams.

WB dams

Country	Project name	MW	Completº	Main stream	Baseline.	Chinese dams	Low dev.	Embank ments	Agri culture	High dev.
Cambodia	Mekong at Sambor	2600	2016	x						x
Cambodia	Lower Se San 2	420	2017							x
Cambodia	Lower Sre Pok 2	222	2017							x
China	Dachaosan	1350	2003	x		x	x	x	x	x
China	Manwan	1500	1995	x	no	x	x	x	x	x
China	Nuozhadu	5850	2017	x		x	no	no	no	x
China	Xiaowan	4200	2013/2012	x		x	x	x	x	x
Laos	Houayho	150	1999		x	x	x	x	x	x
Laos	Nam Leuk	60	2000		x	x	x	x	x	x
Laos	Nam Ngum (1)	155	1971		x	x	x	x	x	x
Laos	Nam Ngum 2	615	2013				x	x	x	x
Laos	Nam Ngum 3	440	2014				x	x	x	x
Laos	Nam Ou 2	90	2014							x
Laos	Nam Song	60	1996		x	x	x	x	x	x

Laos	Nam Tha 1	168	2013							x
Laos	Nam Theun 2	1070	2010				x	x	x	x
Laos	Nam Theun 1	523	2015							x
Laos	Nam Ngiep 1	260	2015				x	x	x	x
Laos	Theun-Hinboun	210	1998		x	x	x	x	x	x
Laos	Xe Kong 4	485	2015							x
Laos	Xekaman 1	322	2014							x
Vietnam	Plei Krong	120	2008				x	x	x	x
Vietnam	Se San 3	273	2006				x	x	x	x
Vietnam	Se San 4	360	2009							x
Vietnam	Yali	720	2000		x	x	x	x	x	x

Nam Theun 2 cumulative impact analysis scenarios

Baseline: Situation in 2003 unlike the other scenarios having 2000 as a reference. 15 dams overall. All Thai dams anterior to 2003 are included, but Pak Mun (1997) and Theun Hinboun (1998) are excluded since they are run-of-the-river dams.
2010 scenario: 20 dams overall, including 3 mainstream dams in China. Corresponds to Baseline scenario + 1 dam in China and 4 in Laos. Pak Mun (1997), Theun Hinboun (1998) and Xeset 2 (2010) are excluded (run-of-the-river dams).
2025 scenario: 42 dams overall, including 8 mainstream dams in China but no other mainstream dam in downstream countries. Corresponds to Baseline scenario + 27 new dams + irrigation (+100% increase in surface area in Laos, +10% in Thailand, +100% in Cambodia and +5% in Vietnam) + urban development, industry, social development, etc. Pak Mun (1997), Theun Hinboun (1998) and Xeset 2 (2010) remain excluded. Sambor and Stung Treng (2016, mainstream) are not part of the scenario either.

NT2 dams

Country	Project Name	MW	Completº	In constructº in 2009	In operatº in 2000	In operatº in 2009	Main stream	Base line	2010	2025
Cambodia	Lower Se San 2	420	2017							x
Cambodia	Lower Sre Pok 2	222	2017							x
China	Dachaosan	1350	2003			x	x	x	x	x
China	Gonguoqiao	750	2008			x	x			x

China	Jinghong	1500	2010				x			x
China	Manwan	1500	1995		x	x	x	x	x	x
China	Nuozhadu	5850	2017				x			x
China	Xiaowan	4200	2013 /2012				x		x	x
China	Mengsong	600	2025				x			x
China	Ganlanba	150	2013				x			x
Laos	Houayho	150	1999		x	x		x	x	x
Laos	Nam Bak 2B	126	2018							x
Laos	Nam Kong 3	35	2016							x
Laos	Nam Leuk	60	2000		x	x		x	x	x
Laos	Nam Lik	100	2009			x			x	x
Laos	Nam Ngum (1)	155	1971		x	x		x	x	x
Laos	Nam Ngum 2B	183	2012							x
Laos	Nam Ngum 3E	580	2012							x
Laos	Nam Ngum 4A	55	2015							x
Laos	Nam Ngum 5	120	2012	x						x
Laos	Nam Theun 2	1070	2010	x					x	x
Laos	Theun-Hinboun ext.	280	2010						x	x
Laos	Xe Kong 5	300	2017							x
Laos	Xekaman 1	322	2014							x
Laos	Xekaman 3	250	2010	x						x
Laos	Xepon	75	2008			x			x	x
Laos	Xe Xou	59	2020							x
Thailand	Chulabhorn	40	1971		x	x		x	x	x
Thailand	Huai Luang		1984		x	x		x	x	x
Thailand	Lam Phra	0.85	1976		x	x		x	x	x
Thailand	Lam Takhong	500	2002			x		x	x	x
Thailand	Nam Oon	0.4	1973		x	x		x	x	x
Thailand	Nam Pao	1.3	1971		x	x		x	x	x
Thailand	Nam Pung	6	1965		x	x		x	x	x
Thailand	Sirindhorn	36	1968		x	x		x	x	x
Thailand	Ubol Ratana	25	1966		x	x		x	x	x

Vietnam	Ban Tou Srah	86	2008	x		x				x
Vietnam	Duc Xuyen	58	2025							x
Vietnam	Plei Krong	120	2008	x		x				x
Vietnam	Se San 4	360	2009	x		x				x
Vietnam	Upper Kontum	220	2025							x
Vietnam	Yali	720	2000			x		x	x	x

Built structures scenarios

Baseline scenario: 6 dams overall. Situation in 2000, including 1 Chinese dam (Manwan) and 5 LMB dams. 9 Thai dams all completed before 2000 and totalling at least 245 MW are not included.

Intensive basin development scenario: 13 dams overall, including 3 mainstream dams in China. Corresponds to Baseline scenario + 2 mainstream Chinese dams + 4 Lao dams + 1 dam in Cambodia.

Extreme basin development scenario: 20 dams overall, including 10 mainstream dams basinwide. Corresponds to Intensive basin development scenario + 7 mainstream dams (Luang Prabang, Pa Mong and Xayaburi in Laos, Thakek and Ban Koum in Laos/Thailand, Stung Treng and Sambor in Cambodia).

Country	Project Name	MW	Com pletº	In constructº in 2009	In operatº in 2000	In operaº in 2009	Main stream	Baselin e	Intensiv e dev	Extrem e dev
Cambodia	Sambor	260 0	2016				x			x
Cambodia	Stung Treng	980	2016/ 2020				x			x
Cambodia	Lower Sre Pok 2	222	2017						x	x
China	Manwan	150 0	1995		x	x	x	x	x	x
China	Nuozhadu	585 0	2017				x		x	x
China	Xiaowan	420 0	2013/ 2012				x		x	x

Laos	Houayho	150	1999		x	x		x	x	x
Laos	Luangprabang	1410	2014				x			x
Laos	Xayabuly	1260	2015				x			x
Laos	Nam Leuk	60	2000		x	x		x	x	x
Laos	Nam Ngum (1)	155	1971		x	x		x	x	x
Laos	Nam Theun 3	236	2016						x	x
Laos	Pa Mong	4800					x			x
Laos	Thakek	360					x			x
Laos	Theun-Hinboun	210	1998		x	x		x	x	x
Laos	Xe Kong 5	300	2017						x	x
Laos	Xekaman 1	322	2014						x	x
Laos	Xekaman 3	250	2010	x					x	x
Laos-Thailand	Ban Kum	2000					x			x
Vietnam	Yali	720	2000			x		x	x	x

BDP 1 scenarios

Baseline scenario: Situation in principle in 2000 but restricted to LMB dams only; Manwan dam (1500 MW, mainstream, completed in 1995) is excluded and 9 Thai dams all completed before 2000 and totalling at least 245 MW are not included either. 5 dams overall, no mainstream dam.
Chinese dams scenario: 9 dams overall, including 4 mainstream dams (in China). Corresponds to Baseline scenario + 4 Chinese dams.
Low development scenario: 14 dams overall, including 4 mainstream dams (in China). Corresponds to Baseline scenario + 3 Chinese dams (but not Nuozhadu, 5850 MW, whose construction has already started) + 6 LMB dams + Irrigation (+12%) + 1 inter-basin water diversion + industrial and urban water withdrawals (+92%). This scenario is different from the WorldBank "Low development" scenario (here Sesan 4 is present, while Nam Ngiep 1 and Sesan 3 are not).

Irrigation scenario: 14 dams overall, including 3 mainstream dams in China (but not Nuozhadu, 5850 MW). Corresponds to Low development + 40% irrigated land + 2 inter-basin diversions + 51% domestic and industrial water abstraction.
High development scenario: 21 dams overall, including 4 mainstream dams in China. Corresponds to the Irrigation scenario + Nuozhadu in China; + 6 dams in the LMB.
There is no LMB mainstream dam in any of the BDP1 scenarios.

Country	Project name	MW	Comple-tion	In construcº in 2009	In operatº in 2000	In operatº in 2009	Main strea m	BDP1 Baseline	Chinese dams	Low dev	Irrigatio n	High dev
Cambodi a	Lower Se San 2	420	2017									x
Cambodi a	Lower Sre Pok 2	222	2017									x
China	Dachaosan	1350	2003			x	x		x	x	x	x
China	Manwan	1500	1995		x	x	x	exclude d	x	x	x	x
China	Nuozhadu	5850	2017				x		x	excluded	exclude d	x
China	Xiaowan	4200	2013/ 2012				x		x	x	x	x
Laos	Houayho	150	1999		x	x		x	x	x	x	x
Laos	Nam Lik	100	2009			x		x	x	x	x	x
Laos	Nam Ngum (1)	155	1971		x	x		x	x	x	x	x
Laos	Nam Ngum 2	615	2013	x						x	x	x
Laos	Nam Ngum 3	440	2014							x	x	x
Laos	Nam Theun 2	1070	2010	x						x	x	x
Laos	Nam Theun 3	236	2016									x
Laos	Theun-Hinboun	210	1998		x	x		x	x	x	x	x
Laos	Xe Kong 5	300	2017									x
Laos	Xekaman 1	322	2014									x
Laos	Xekaman 3	250	2010	x								x
Vietnam	Plei Krong	120	2008	x		x				x	x	x

Vietnam	Se San 4	360	2009	x		x				x	x	x
Vietnam	Upper Kontum	220	2025							x	x	x
Vietnam	Yali	720	2000			x		x	x	x	x	x

BDP 2 scenarios

Baseline scenario: Situation in principle in 2000. 1212 dams overall, all in the LMB. Manwan in China (1500 MW, mainstream, completed in 1995) is not included. In Thailand 5 dams completed before 2000 are included, but 5 very small Thai dams (Huai Luang Lam Phra, Nam Oon, Nam Pao, also existing in 2000) are not. This scenario also includes 74,000 km^2 or irrigated land. This baseline is thus different from BDP 1 and WorldBank baselines, and ignores Manwan, a big mainstream dam existing in 2000.
Upper Mekong dams scenario: 17 dams overall. Corresponds to Baseline scenario + 5 mainstream dams in construction or committed in China (Dachaosan, Gonguoqiao, Jinghong, Manwan, Xiaowan) + Nuozhadu
Definite future scenario: 35 dams overall. Corresponds to Upper Mekong scenario (1212 LMB dams existing before 2000 and 6 mainstream Chinese dams in construction or committed)+ 18 dams existing or under construction in 2009. It is not clear to what extent this scenario includes irrigation development, inter-basin water diversions and industrial and urban water withdrawals.
LMB mainstream dams scenario: 45 dams overall. Corresponds to Definite Future scenario+ 10 mainstream dams planned. In fact in this scenario only 16 dams are actual mainstream dams; the scenario, despite its name, also includes 29 tributary dams.
LMB tributaries dams scenario: 45 dams overall (but not the same as in the Mainstream dams scenario). Corresponds to the Definite Future scenario + 10 dams planned on tributaries, but none of the 10 dams planned on the mainstream.
LMB 20-year scenario: 55 dams overall. Corresponds to Definite future scenario + 10 dams planned on the mainstream + 10 dams planned on tributaries + irrigation (baseline + 8,150 km^2 only) + water supply projects.

Country	Project Name	MW	Completion	In constructº in 2009	In operatº in 2000	In operatº in 2009	Mainstream	Baseline	Upper Mekong dams	Definite future	LMB mainstream dams	LMB tributaries	20-year
Cambodia	Sambor	2600	2016				x				x		x
Cambodia	Stung Treng	980	2016/2020				x				x		x
China	Dachaosan	1350	2003			x	x		x	x	x	x	x
China	Gonguoqiao	750	2008			x	x		x	x	x	x	x

Country	Project Name	MW	Completion	In constructº in 2009	In operatº in 2000	In operatº in 2009	Mainstream	Baseline	Upper Mekong dams	Definite future	LMB mainstream dams	LMB tributaries	20-year
China	Jinghong	1500	2010				x		x	x	x	x	x
China	Manwan	1500	1995		x	x	x	excluded	x	x	x	x	x
China	Nuozhadu	5850	2017				x		x	x	x	x	x
China	Xiaowan	4200	2013/2012				x		x	x	x	x	x
Laos	Houayho	150	1999		x	x		x	x	x	x	x	x
Laos	Don sahong	360	2015				x				x		x
Laos	Luangprabang	1410	2014				x				x		x
Laos	Pakbeng	1230	2018				x				x		x
Laos	Paklay	1320	2015				x				x		x
Laos	Sanakham	570	2016				x				x		x
Laos	Xayabuly	1260	2015				x				x		x
Laos	Nam Kong 1	150	2015									x	x
Laos	Nam Leuk	60	2000		x	x		x	x	x	x	x	x
Laos	Nam Lik 2	100	2010							x	x	x	x
Laos	Nam Mang 3	40	2004							x	x	x	x
Laos	Nam Ngum (1)	155	1971		x	x		x	x	x	x	x	x
Laos	Nam Ngum 2	615	2013	x						x	x	x	x
Laos	Nam Ngum 3	440	2014									x	x
Laos	Nam Ngum 5	120	2012	x						x	x	x	x
Laos	Nam Song	60	1996		x	x		x	x	x	x	x	x
Laos	Nam Tha 1	168	2013									x	x
Laos	Nam Theun 2	1070	2010	x						x	x	x	x
Laos	Nam Theun	523	2015									x	x

Country	Project Name	MW	Completion	In constructº in 2009	In operatº in 2000	In operatº in 2009	Mainstream	Baseline	Upper Mekong dams	Definite future	LMB mainstream dams	LMB tributaries	20-year
	1												
Laos	Nam Ngiep 1	260	2015									x	x
Laos	T. Hinboun	210	1998		x	x		x	x	x	x	x	x
Laos	T. Hinboun ext	280	2010									x	x
Laos	T. Hinboun NG8											x	x
Laos	Xe Kong 3d	91.1	2012									x	x
Laos	Xe Kong 3up	144.6	2012									x	x
Laos	Xekaman 1	322	2014							x	x	x	x
Laos	Xekaman 3	250	2010	x						x	x	x	x
Laos	Xekaman 2	53								x	x	x	x
Laos	Xepian-Xenamnoy	390	2010									x	x
Laos	Xeset 2	76	2010	x						x	x	x	x
Lao-Thailand	Ban Kum	2000					x				x		x
Lao-Thailand	Pakchom	1079					x				x		x
Thailand	Chulabhorn	40	1971		x	x		x	x	x	x	x	x
Thailand	Nam Pung	6	1965		x	x		x	x	x	x	x	x
Thailand	Pak Mun	136	1997		x	x		x	x	x	x	x	x
Thailand	Sirindhorn	36	1968		x	x		x	x	x	x	x	x
Thailand	Ubol Ratana	25	1966		x	x		x	x	x	x	x	x
Vietnam	Buon Kuop	280	2008	x		x				x	x	x	x
Vietnam	Ban Tou Srah	86	2008	x		x				x	x	x	x
Vietnam	Plei Krong	120	2008	x		x				x	x	x	x

Country	Project Name	MW	Completion	In constructº in 2009	In operatº in 2000	In operatº in 2009	Mainstream	Baseline	Upper Mekong dams	Definite future	LMB mainstream dams	LMB tributaries	20-year
Vietnam	Se San 3	273	2006	x		x				x	x	x	x
Vietnam	Se San 3A	96	2006	x		x				x	x	x	x
Vietnam	Se San 4	360	2009	x		x				x	x	x	x
Vietnam	Se San 4A	255	2008			x				x	x	x	x
Vietnam	Sre Pok 3	300	2012	x						x	x	x	x
Vietnam	Sre Pok 4	100	2009			x				x	x	x	x
Vietnam	Yali	720	2000			x		x	x	x	x	x	x

NOTES

1) Additional mainstream Chinese dams

Several other mainstream dams are considered or committed in China, and are not mentioned in any of the 23 scenarios reviewed:

Dam name	Country	River	Installed capacity (MW)	Status as of Jan. 2009	Completion date	Note
Ganlanba	China	Mainstream	150	Committed / Priority	2013	Present only in NT2 2025 scenario
Huangdeng	China	Mainstream	1,860	Potential		Not present in any scenario
Jiabi	China	Mainstream	430	Potential		Not present in any scenario
Liutongjiang	China	Mainstream	550	Potential	2010	Not present in any scenario
Mengsong	China	Mainstream	600	Committed / Priority		Present only in NT2 2025 scenario
Tiemenkan	China	Mainstream	1,780	Potential		Not present in any scenario
Tuoba	China	Mainstream	1,640	Potential		Not present in any scenario
Wunonglong	China	Mainstream	800	Potential		Not present in any scenario

2) Current baseline situation (2009)

The scenario closest to the current situation at the time of the SEA study is the BDP2 Definite future scenario, where all dams are in operation or in construction. However:

- it should be confirmed whether 5 very small Thai dams (Huai Luang Lam Phra, Nam Oon, Nam Pao, existing in 2000) should indeed be ignored as per the scenario, although they do exist.
- the status Gonguoqiao in China, included in the Definite future scenario, needs to be checked

Dam name	Country	Sub-Basin	River	Installed capacity (MW)	Energy Production (GW)	GW-Value 2	Status as of Jan. 2009	Completion date
Gonguoqiao	China	Mekong	Mainstream	750	4670	4060	Committed / Priority?	2008?

3) Future situation

The scenario closest to the situation in 20 years from now is the LMB 20-year scenario, which integrates most of recent development plans. However in this scenario the total number of mainstream dams considered is 16, not 12 (China: Dachaosan, Gonguoqiao, Jinghong, Manwan, Nuozhadu, Xiaowan; Laos/Thailand: Ban Kum, Don Sahong, Luangprabang, Pakbeng, Pakchom, Paklay, Sanakham, Xayabuly; Cambodia: Sambor, Stung Treng). If all plans for mainstream dams are considered, 8 additional mainstream dams in China can be added (Ganlanba, Huangdeng, Jiabi, Liutongjiang, Mengsong, Tiemenkan, Tuoba, Wunonglong).

4) New BDP2 scenarios

Recently BDP2 has produced 3 new scenarios (2 about Climate Change, 1 about a 50 years perspective) but details about these scenarios were not available at the time of writing.

ANNEX 3: GUIDANCE FOR BASELINE ASSESSMENT

Key:

PROVINCIAL: provinces in the 4 LMB countries which the Mekong River flows through or borders.

SECTORAL: key development sectors of the LMB – fisheries, forestry/NTFPs, agriculture/irrigation, water supply, mining, industry, power consumption & power production, tourism, transportation

No	THEME ACTIVITIES	REGIONAL DATA / INFORMATION REQUIRED	DATA / INFORMATION FOR COLLECTION BY THE NATIONAL TEAM	BASELINE ASSESSMENT OUTPUTS OF NATIONAL TEAMS
	These are the activities for the SEA under each theme – extracted directly from the theme papers	*This is information we have already collected, or can get online, from the MRC, ADB or other non-government institutions*	*This is the national, provincial and district information that the SEA national teams need to collect and assess for the baseline*	*These are the outputs that each theme paper requires of the SEA national teams. What text they should write, translate, which data& maps to compile and analyse*
A. ECONOMICS				
1	REVIEW OF EXISTING MACRO-ECONOMIC & DEVELOPMENT PROGRAMS AT SECTORAL, NATIONAL & PROVINCIAL LEVELS 1. Overview of the past, present, and forecasted macro-economic projections and identifying the key contributors to these projected growth forecasts	• ADB and World Bank key data on macro-economic trends, including sectoral breakdown (industry, agriculture and services) • Macro-economic development forecasts (regional, national, and provincial) • Data on possible sectoral impacts from the other economic analysis collected in the SEA. •	A. National and provincial socio-economic development plans (ie for provinces bordering the Mekong River) B. National Power Development Plans C. Most recent planning strategy papers for the following sectors : o Fisheries, o Forestry/NTFPs, o Agriculture/irrigation, water supply, o Mining, o Industry o Power consumption &	1. Short overview of the past, present, and forecasted national macro-economic projections to 2025 if possible, otherwise those from the most recent planning documents possible. Identification of the key sectors driving growth (e.g. manufacturing, mining, refining , agriculture, tourism etc). and identifying the key drivers for those trends and contributors to the projected growth forecasts 2. Short overview of the past, present, and forecasted national macro-economic projections for Mekong provinces and identifying the key drivers for those

	2. Description of the past, present, and forecasted energy demand at the regional and national levels, as well as a review of the existing energy supply development plans; and 3. Macro economic conditions – develop an overview of current macro economic conditions and past trends in the four countries. 4. Identification of macro-economic drivers of these trends		power production, o Tourism, o Transportation	trends and the key contributors to the projected growth forecasts 3. Short description of (i) the past, present, and forecasted energy demand at the national level, and (ii) of the existing energy supply development plans. 4. Short description of (i) the past, present, and forecasted energy demand at the Mekong provincial level, and (ii) of the existing energy supply development plans. 5. Short description of key socio-economic targets in most recent national sectoral plans (sectors as listed opposite) and socio economic development plans. These should include value-added and/or output figures in monetary terms, output per unit (e.g. yield per hectare, ICOR etc) employment figures, income other output data (in appropriate units) and strategic focus (e.g. growth of aquaculture in fisheries sector, expansion of different sorts of agriculture). Performance/target measures will differ between sectors. 6. Prepare a strengths, weaknesses, opportunities and threats (SWOT) matrix based on each of sectoral plans.
2	ECONOMIC EVALUATION OF MAINSTREAM HYDROPOWER DAMS • Preliminary cost-	• MRCS Hydropower Data base prepared by IKMP(already have this data)	• No additional data collection identified at this stage	• No national team input required

	benefit analysis	• (Developer's data sheets – not part of baseline)		
3	IMPACT ON SECTORAL DEVELOPMENT Assessment of current conditions and recent trends in economic sectors, causal factors driving these trends (including policy), contribution to national and regional economies, and assessment of the strategic importance of the sector. Assessment of risks and uncertainties	• MRCS Hydropower Data base prepared by IKMP • Results of sectoral analysis on likely output, value added employment and income impact of Outputs from other SEA theme papers	• National Government Plans & national sector targets for 2025 and 2050 (see A1). • Available economic data on the recent historical performance of the sectors (show past trends if possible); • Current status and future plans for the development of inland navigation and waterways (masterplans, GIS maps)	• Short description of current conditions and recent trends in economic sectors with existing or potential uses of the Mekong River, and factors driving these trends • Provide details of the economic/development/livelihood contribution of those sectors with existing or potential uses of the Mekong River
4	DISTRIBUTIONAL IMPACTS Assessment of current patterns of distribution between groups and spatially	•	• National and provincial level poverty incidence over last 10 years. • National and provincial household Income over last 10 years • Spatially disaggregated poverty incidence current and 10 years previously Spatially disaggregated average household income current and 10 years previously National targets for (and giving full source reference): i. Poverty reduction ii. MDGs (Millennium Development Goals) iii. Nutrition iv. Income	• Short summary of changes in poverty from the most recent socio economic development plan, also targets adopted in various government documents including poverty reduction strategy and in reference to the MDGs. • Short account of different poverty metrics (ie. Where is the poverty threshold) for each country, and whether it has changed over time. **GIS outputs:** • Creation of poverty maps of the LMB, including poverty incidence, poverty density for both time periods. Map for different time periods should have the same key. • Creation of income maps for the LMB

			v. ???	
5	MITIGATION & ENHANCEMENT MEASURES Qualitative study to explore: (i) Benefit sharing mechanisms; (ii) Structural adjustment programmes for affected sectors; and, (iii) Compensatory payments and schemes.	• illustrative quantitative examples and international comparisons. To be defined in discussion by SEA team in conjunction with the MRC working groups (i.e. ISH and BDP specialists)	• No additional data collection identified at this stage	• No national team input required
6	ALTERNATIVE GENERATION OPTIONS (i) Mainstream dams; (ii) Tributary dams; and, (iii) Thermal (coal fired) generation. • overview of current macro economic conditions and past trends in the four countries. • Identification of macro-economic drivers of these trend • Assessment of current conditions and recent trends in	• Existing MRC BDP cost-benefit case analysis, from MRC hydropower database and other sources to be defined by energy and economic specialists	• No additional data collection identified at this stage	• No national team input required

	economic sectors, causal factors driving these trends (including policy), • Contribution to national and regional economies, and assessment of the strategic importance of the sector. • Assessment of risks and uncertainties			
7	PROJECTIONS & POLICY PLANNING • Sectoral development projections (based on government planning documents), examination of the likely future composition of: economic structure, structural change and the geographical distribution of sectoral activities (at national and sub-national level). • Relating these to sectoral planning documents and	•	1. Data and or maps for the following key socio-economic indicators. Scale: data should be at provincial level, except for the case studies districts[7]: i. Small area poverty incidence data/maps for LMB current and 1999; ii. Small area population density data/maps of the LMB current and 1999; and iii. Small area average household income data/maps of the LMB current and 1999	• Collate data in tables for GIS specialist to make the following GIS outputs: **GIS products:** 1. Small area poverty incidence maps for LMB current and 1999; 2. Small area population density maps of the LMB current and 1999; and 3. Small area average household income maps of the LMB current and 1999

[7] Case studies districts are defined in the social systems section of the matrix. They include 8 districts in Lao PDR, 2 in Thailand, and 7 in Cambodia

	targets. Identification of economic sectors of developing strategic importance (scale and contribution to national/regional economies). Assessment of risks and uncertainties			
B	**ENERGY**			
1	POWER POLICY REVIEW: Describe and assess power policy and plans in the four countries, especially Laos and Cambodia and regional approaches including the power trade arrangements	• Background information from ADB GMS Energy Report • Backgound information on RPTCC (Regional Power Trade Coordination Committee) under ADB •	• Check for local power policy with focus on import and export regulations • Cross border trade agreement – check if it is the same as RPTCC now?	• Short analysis of power export policies and plans for Laos and Cambodia • Short analysis for power import policies and plans for Vietnam and Thailand • Summary of regional power trade policies under RPTCC , but also comment on willingness to cooperate in power plannning
2	BASELINE DEMAND AND FORECASTS: Describes and assesses historic power demand and official forecasts and the main drivers • Compare LMB per capita energy consumption & GDP with global case studies (USA, Europe, Japan, India, China) • Produce graphs of national power demand for LMB	• GDP and Energy consumption data - ADB, World Bank and CIA fact book, International Energy Agency (IEA) for GIS output 1, comparing kWh/capita to GDP/capita • Historic electricity demand data • Revision PDP 2007 Thailand • ICEM Team has PDP VI from Vietnam, • For Thailand and Vietnam, annual peak load diagrams at present daily and annual, and where available for the	• National Power Development Plans (to extract forecasted demand as well as planned power generation capacity and imports) • Thai Alternative Power Plan • National Energy Plan Thailand • Revision 2 of Thai Power Development (from EGAT) Plan from 2007, just in Thai. Excerpt needed for Thai version, mainly changes in figures compared to Revision 1 • For Vietnam, check status or information available from PDP VII (EVN, Institute of Energy) • Annual reports from relevant electricity authorities to show past	• Short description of the historic power demand trends and official forecasts and the main drivers for those trends. The trend should be given as figures in Gwh per year from 1990 until 2008. • For Thailand list basic changes between PDP 2007 Rev 1 and PDP 2007 Rev 2, especially in generation capacity (see EPPO website) **GIS outputs** ▪ chart of countries power consumption per capita and GDP for year 2008 if available (see Annex A in Energy theme paper for example) ▪ graph showing past and present

	countries with explanations •	big cities in these countries from recent years (for examples see Annex A of the Energy Theme paper). If the same is available for the big cities (Bangkok, Hanoi, Ho Chi Minh City). •	(15-20 years) peak electricity demand in GWh and MW: i. EdL (Laos), ii. EGAT or EPPO (Thailand), iii. EAC (Cambodia) and iv. EVN (Vietnam) • daily peak power consumption (in GWh and MW) in Bangkok, Hanoi, Ho-Chi-Minh City	electricity demand in GWh and MW by country and total for the region as well as a chart showing the split between rural and urban (as well as sectoral (such as residential, industrial etc)) demand at present if possible also in the past 15-20 years ▪ 3graphs showing official peak electricity demand forecasts in GWh and MW by country and for the region until 2025 and extrapolated demand forecasts until 2045. These data will be split into rural and urban demand and if possible into sectoral growth
3	ALTERNATIVE DEMAND: • Describe and assesses alternative demand forecasts and their origin • Understand alternative demand forecast scenarios	• "Building a sustainable Energy Future for the GMS" by ADB (2009) will be the main source of analysis for this component ▪ Input given through MRC website from other stakeholders, if applicable •	• No additional data collection identified at this stage	• No national team input required
4	BASELINE SUPPLY AND FORECASTS: Describes and assesses power supply and summarises generation assets in the past and present and describes planned power stations in the four LMB countries • total installed capacity (+ planned new capacity, -	▪ Regional Power Trade Coordination Committee (RPTCC) proceedings under ADB ▪ Annual reports of electricity utilities in the countries • ADB Interconnection maps (ADB RPTCC – Regional Power Trade Coordination Committees) • list the planned commercial operation dates for	• National Power Development Plans (see above) • Generation Expansion plans (can be part of PDPs) that lists the planned power stations in each country, best case with commercial operation date, installed capacity (MW), generation capacity (GWh) • Lists of existing power stations with locations and installed capacity for each country (source: Annual Reports of ESCOs?)	• Short description of power supply situation and summaries of generation assets (name of power station, installed capacity, output [GWh], commercial operation date) in the past and present • Describe planned power stations until 2025. List power stations planned and provide the following details: (i) total installed capacity (+ planned new capacity, - retired capacity) (ii) separate installed capacity into generation types (iii) supply and demand curve and balances

	retired capacity) • separate installed capacity into generation types • supply and demand curve and balances	mainstream dams	• Find data shpwing the retired capacity in each country (for Thailand it is part of the PDP) • Data on transmission lines between countries , capacity of transmission in kV and length in km, connection between substations and power stations • Data on planned transmission lines (interconnections). Country plans and also ADB plan •	GIS outputs: (i) graph showing the accumulated installed generation capacity (deducting the retired capacity each year) by country and the region until 2020/25 in MW (ii) percentage figures of how much power would be produced in the years up to 2020-25 by mainstream dams in GWh and which percentage of installed capacity will be from mainstream dams in MW GIS products: (iii) graph comparing the planned power capacity with the future demand scenarios from the earlier chapter (e.g. see Annex C of Energy theme paper) (iv) map showing existing transmission lines between the countries (v) maps showing proposed options future transmission lines between the countries
5	SUPPLY WITHOUT MAINSTREAM DAMS: • Assesses how much electricity needs to be replaced if mainstream dams are not built and • explores the alternative generation options • potential for thermal generation from regional	• Draw on the results of the above four chapters of energy paper ▪ MRC hydropower database ▪ ADB GMS Energy Study for energy resource potential ▪ List of mainstream dams with expected generated output in GWh ▪	▪ data on thermal energy resource	Describe: ▪ Options which might exist to replace the planned GWh from mainstream dams (for example, looking at tributaries) ▪ thermal energy generation potential in GWh (calculate this into number of power stations or installed capacity) Describe the potential and plans for renewable energy in meeting power demand

	resources • explore the theoretical potential from other renewable energies			
6	POWER POLICY IN THE LMB COUTNRIES & REGIONAL APPROACHES There are three important aspects to be explored in this section: 1. Policies of the exporters (Cambodia and Lao PDR) 2. Policies of the importers (Thailand and Vietnam) 3. The regional framework for cross border power trade. • Review relevant policies in Laos and Cambodia with regard to IPPs, PPAs, power generation in general etc. • Review ADB's approach for integration of the energy markets in the Greater Mekong Subregion and the task and plans of the	▪ ADB GMS Energy Study ▪ Websites of EVN, EGAT, EPPO, EAC, Poweringprogress, EdL ▪ ADB "Building a Sustainable Energy Future" ▪ ADB's RPTCC website and proceeding reports ▪ GMS inter-government agreement on regional power trade in the greater Mekong sub-region signed in 2002 •	• Regulator in Vietnam (ERAV) and Thailand (check EPPO website)	• Description of national policies for power generation, power import and export • For Vietnam and Thailand, description of market regulation and impact on power generation. What is the aim of regulating the markets? Are there existing studies estimating impacts on prices etc? Will it result in less or more import of power?

	RPTCC (Regional Power Trade Coordination Committee) under ADB			
C	**AQUATIC SYSTEMS**			
1	Past and Current aquatic ecology of the Mekong River	• IBFM zones (IBFM reports no 3 and 5). • MRC 1998 State of the fisheries report, • MRC 2005 Hydrology of the Mekong Basin, • MWBP 2004. L.W.2.10.05 Mekong_Biodiversity_Survey_Oct2004.pdf • MWBP 2003. L.W.1.10.05 Mekong_Biodiversity_Survey_Aug2003.pdf • ADB Atlas of the Environment, • Flood reports 2006 and 2007 • *Lagler,* K.F., 1976. Fisheries and integrated *Mekong r*iver basin development. The University of Michigan, School of natural resources. pp. 363. • Bezuijen et al. 2008	• Maps of aquatic zones between Kratie and Stung Treng (from WWF) – already collected • Estimates of quantities of Mekong weed collected and sold in each province, including seasonality of collection	• Short statement about collection and sale of Mekong weed, seasonality and abundance GIS products: • Estimates of areas of in channel inundation (permanent dry season channel, wet season channel)

		Biological surveys of the Mekong River between Kratie-Stung Treng. WWF • Timmins et al 2006 Biodiversity surveys between Stung Treng – Khone Falls: MWBP. • IUCN 2008 – Integrating people in Conservation Planning Stung Treng Ramsar Site • MRC Digitised hydrographic maps of the Mekong River channel interpreted according to aquatic ecosystems, with some ground truthing where possible		
2	Review of ecosystem services identified by the Millenium Ecosystem Assessment (see page 40 for table)	•	• No additional data collection identified at this stage	• No national team input required
3	Exploration of the impacts on aquatic habitats, biodiversity and ecosystems services based upon the Hydrological signatures of the basin without mainstream Mekong Dams	• Hydrology theme paper outputs	• No additional data collection identified at this stage	• No national team input required

D	FISHERIES			
1	BASELINE: 1. status of the Mekong Fisheries 2. factors driving fish production	• MRC 1998 State of the fisheries report • Sverdrup-Jensen 2002 Fisheries in the Lower Mekong Basin: status and perspectives. • Baran et al. 2007 Values of inland fisheries in the Mekong Basin • Hortle 2007. Consumption and the yield of fish and other aquatic animals from the Lower Mekong Basin. • Annual reports of the MRC Fisheries Programme • Baran et al. 2003 BayFish: a model of environmental factors driving fish production in the Lower Mekong Basin. •	• Official statistics, for each riparian country, of capture fisheries and inland aquaculture, ideally from 1995 up to 2008. Lumpsum data (number of tonnes by country) are available from the FAO until 2007, but what is needed is: 1) statistics by province (Mekong + Tonle Sap provinces in particular) and ii) statistics by species. Any unofficial statistics (e.g. from research projects) are also welcome. Distinguish river fish catches from reservoir fish catches if possible. In absence of statistics by species, identification from reports, for each country, of the ten to twenty main commercial species. Output = Excel file (example will be provided). Priority: high • If possible, statistics on number of jobs in the fisheries sector, in particular for inland fisheries and inland aquaculture sector in the Mekong provinces of the 4 riparian countries (+Tonle Sap provinces). Distinguish river fish catches from reservoir fish catches if possible. Output = Excel file. Priority: low • Official or unofficial (project-based) statistics of sales (local market and export) of fish products (capture	• Brief analysis report from each country describing the statistics gathered (histograms, description for each country of the trend in the past ten years). Describe if possible the main drivers for these trends. Output: Excel file with comments. Priority: medium • Reports from each country describing : 1) national (inland) fisheries policies and plans; 2) national (inland) aquaculture policies and plans; 3) future targets for freshwater fisheries and aquaculture sectors. These reports should summarize in particular documents in national languages. Example: analysis of the Cambodian Strategic Planning Framework for Fisheries 2009-2018. Priority: low • Brief report, for each country, quantifying the respective contribution of subsistence and of commercial fisheries. Existing studies and instructions will be detailed; the focus should be on an update of existing information by recent publications and reports in national languages. Output: 1-2-pages reports. Priority: medium. • Specifications and figure of each mainstream dam proposed, including fish passes if any. Priority: high • GIS output F1: For each mainstream dam reservoir, table file of 1) reservoir total surface area, 2) total volume of water; 3)

			and aquaculture), by species, from 1995 to 2008, in particular for Mekong and Tonle Sap provinces. Output = Excel file; example will be provided. Priority: low	volume of water between surface and -2m; 4) volume of water between surface and -5m (these layers correspond to areas of biological productivity). Priority: high • GIS output F2: table files, for each country, of population in communes bordering the Mekong (if possible 10 tables per country, with 5 stripes on each bank: 0 to 10 km from the Mekong, 12 to 20 km, 21 to 30 km, 31 to 40, 41 to 50 km away from the Mekong). Tonle Sap Lake should be included. Detailed instructions will be provided separately. Priority: medium.
2	Fish migration analysis	• Poulsen et al. 2002. Fish migrations of the Lower Mekong River Basin • Baran 2006 Fish migration triggers in the Lower Mekong Basin • BFM zones (IBFM reports no 3 and 5). • (Another 30 mentioned)	• No contribution expected from national teams for this section	• GIS output F3: For each mainstream dam, table file of 1) basin surface area (catchment) upstream each dam; 2) length of river network (mainstream + tributaries) upstream each dam. Priority: high
3	1. Key Fish species guilds 2. species composition for specific river stretches	• Welcomme et al. 2006. Fish environmental guilds as a tool for assessment of ecological condition of rivers. • IUCN Red list • WorldFish species lists • MRC study "Fish	• No contribution expected from national teams for this section	• GIS output 4: Compilation of the 537 fish species distribution layers available in the MRC Mekong Fish Database (.aep files) and identification of the number of species by river. Output file: a) Excel file of number of species by river and b) map of the basin showing the number of species by sub-basin. Files and detailed

		migrations and spawning habits in the Mekong mainstream: a survey using local knowledge",		instructions will be provided separately. Priority: high
4	Fisheries in 10 & 30 years without mainstream hydropower	• Outputs from the hydrology paper; • information about changes in aquatic habitats to be provided by the Aquatic ecology component • changes predicted by the BDP2 scenarios	• No contribution expected from national teams for this section	• No contribution expected from national teams for this section
5	Economic value of fish catches	• Data from the MRC monitoring program	• Official or unofficial (project-based) statistics of market prices by fish species from 1995 to 2008, in particular for markets in Mekong provinces. MRC Fisheries Programme has such records, national offices of statistics must also have that on a monthly basis. Output = Excel file. Priority: medium • Gathering of all economic studies on the inland fisheries and aquaculture sectors available in Laos, Thailand and Vietnam. Output: set of reports gathered. Priority: medium	•
E	**HYDROLOGY & SEDIMENT**			
1	Past and Current hydrology of the Mekong River	• MRC Hydrology & IBFM reports • MRC Digitised hydrographic	• Flood regime (depth, timing, ad duration) from flood studies and provincial/regional master plans,	• 1-2 paragraph description on flooding and drought in Mekong River provinces as well as other hydrological characteristics

		maps of the Mekong River channel • MRC flow data from gauging stations • Annual discharge trends for the Mekong River • FMMP reports	as well as other hydrological characteristics relevant for each country (e.g. saline intrusion, acid sulphate soils, groundwater connectivity) as defined by the hydrology team • Reports on bank erosion	relevant for each country (e.g. saline intrusion, acid sulphate soils, groundwater connectivity), covering: i. Depth, ii. Timing, iii. Duration iv. incidence • 1 paragraph summary on the extent and trends of erosion of the Mekong channel in each of the four countries
2	Assessment of the trends induced by the tributary dams on the hydrological regime of the Mekong River	• GoL Powering progress database • MRC hydropower database • MRC multivariate analysis of Mekong tributaries • Helsinki University (TKK) basin-wide sediment trapping study & other sediment publications • MRC Mekong flow data • Mekong Hydrology and Flood status reports	• Catchment topographic maps for Mekong Tributaries (for major Mekong tributaries) • Sediment and flow studies on the i. Chi-Mun reservoirs of Thailand ii. Nam Theun & Nam Ngum reservoirs of Lao PDR iii. Sesan, Sekong reservoirs of Vietnam	• Literature review & 1page summary description of the changes to tributary hydrology and sediment transport for existing dams in each of: i.Chi& Mun river basins, ii.Nam Theun & Nam Ngum river basin, iii. Sesan (Yali project) & Sekong (Huoay Ho project) riverbasins – LAO, TH, VN • 1-2 page evaluation of the performance and lessons learnt from the reservoirs in the Chi-Mun river basins in Thailand • Review the GoL database and national power development plans to list tributary projects based on the year of completion – where information on timing is not available, discuss with ministry of energy to clarify project timing – LAO, VN, KH For each tributary dam existing or expected to be completed before 2030: • Write a 1-2 paragraphs describing the (i) the approval status, (ii) rated capacity, (iii) type of dam construction and (iv) target market (include any plan drawings showing

				operating water level, dam height, and location of turbines, spillway and flushing gates) • Write a 2-3paragraphs describing the general hydrological conditions of the catchment – (i) catchment area, (ii) location in the LMB, (iii) land use cover, (iv) location of gauging stations, (v) monthly rainfall regime (with table or graph), (vi) soil type. • collect daily & hourly flow data – to plot stream hydrographs, where summary analysis of the seasonal tributary flow contribution is not available • where available, provide a table showing the monthly/ seasonal variation in sediment concentrations (Total Suspended Solids mg/L) at the gauging stations in each of the catchments • provide digitized topographical maps of each of the catchments
3	Assessment of the trends induced by the China Dams on the hydrological regime of the Lower Mekong River Basin (LMB)	• a recently completed study by Peter Adamson *The impacts of the China Dams on the hydrology of the Lower Mekong Basin (2009)*, • (The Optimization study undertaken by CNR, • Chinese SEA of China dams • any other information the MRC receives from the Chinese Authorities regarding the existing and proposed Chinese dams .	• No additional data collection identified at this stage	• No national team input required

4	Review of the eleven mainstream hydropower projects proposed for the LMB and nomination of the probable, feasible mainstream hydropower projects	• CNR 2009 Optimization Study, • Acres-Mekong Secretariat 1994 *Mekong mainstream run-of-river hydropower*, • all available IEEs, EIAs, pre-feasibility and feasibility studies. • developer questionnaires	• If needed, follow-up meetings with government and developers to obtain additional information as defined by the hydrology team. •	•
5	Exploration of the Hydrological signatures of the basin without LMB mainstream Mekong Dams	• Based on E1-E4	• No additional data collection identified at this stage	• No national team output required
6	1. Review of hydrological documents (additional study) 2. Assessment of the influence of climate change on baseline trends in river flow (of mainstream and identified significant tributaries)	• MRC, 2009, *An assessment of the hydrology at proposed dam sites on the mainstream of the Mekong upstream of Vientiane* • Recent MRC EP modelling study of climate change and BDP scenarios • Adamson, 2009, *The impacts of the China Dams on the hydrology of the Lower Mekong Basin* • CNR, 2009 Optimization study • Helsinki University (TKK) basin-wide sediment trapping study & other sediment publications	• No additional data collection identified at this stage	

		• Reports on the impacts of climate change to the Mekong Basin (MRC, donor agencies, research institutes)		
7	MODELLING STUDY	• Developer questionnaires • Gauging station flow data (daily and hourly) • Sediment and flow studies on the tonle sap-delta system (WUP-FIN, MRC) •	• No additional data collection identified at this stage	• No national team input required
8	WATER BALANCE AND IMPLICATIONS OFR AGRICULTURE	• Location of small and large pump stations on the Mekong mainstream • MRC BDP Irrigation database • Mekong provinces agriculture and irrigation master plans • Gauging station flow data •	• Irrigation and agricultural master plans/development plans for Mekong provinces (those provinces which border the Mekong river, or through which the Mekong flows) • IWRM Management reports or National Water resource management plans • Water abstraction and projected abstraction for Mekong Provinces in Cambodia	• 1 page national summary of the current IWRM/water resource management plan and future targets • 1 page national summary for irrigation/agriculture sector describing current & future 2025: (i) water use quantities i.e. agriculture water demand (ii) abstraction methods, (iii) water users & types of crops, (iv) irrigated areas, (v) quantity and types of infrastructure (kms of canals/preks, no of pumphouses) - KH, VN, LAO, TH GIS products: • Tables, graphs and maps for points (i) – (v) in the point above
F	**TERRESTRIAL SYSTEMS**			
1	1. Past and Current terrestrial ecology of the Mekong mainstream	• WWF ecoregions of the Greater Mekong • Reports and data from the	• national land use databases and maps • national agriculture policies and	• Short paper to describe the terrestrial biodiversity of value in the provinces adjoining the Mekong River including

	catchment • Biodiversity assessment to describe ecosystem types based on the 4 main WWF ecoregions and zones for the study • 9 biodiversity landscapes from GMS initiative • 6 Mekong river ecological zones 2. trends and effects in agro-ecological systems • Assessment of land uses and mapping • Effects on flood plain	GMS Biodiversity corridors initiative • six ecological zones associated with the mainstream Mekong River (Map 3) ▪ ICEM 2003 Protected Areas and Development, Lower Mekong River Region – National and regional reports ▪ MWBP 2004. L.W.2.10.05 Mekong_Biodiversity_Survey_Oct2004.pdf ▪ MWBP 2003. L.W.1.10.05 Mekong_Biodiversity_Survey_Aug2003.pdf ▪ ADB Atlas of the Environment, ▪ ADB – GMS Biodiversity Conservation Corridors Initiative publications ▪ Daconto, G. 2001. Siphandone wetlands. CESVI ▪ Timmins et al 2006 Biodiversity surveys between Stung Treng – Khone Falls: MWBP. ▪ Singh, S. 2007 An assessment of wildlife trade in Stung Treng and Attapeu Provinces. MWBP/TRAFFIC ▪ IUCN 2008 – Integrating	master plans • national forestry policies and master plans • Lao PDR district land certificates for littoral zones - we are looking for information on river bank gardens on the mainstream and tributaries that will be inundated – so in each reservoir we will need an estimate of the total area of riverbank gardens listed in land certificates likely to be lost • Relevant park management plans for parks within 50km of the Mekong River	listing the protected areas in place. Summarise information in PA management plans on threats and status of biodiversity. • Short paper to describe the agricultural and forestry policies and plans for the Mekong Provinces especially as they might affect uses or impacts on the Mekong River and its tributaries. Include description of the extent and nature of river bank gardens along the Mekong mainstream – statistics if available.

		people in Conservation Planning Stung Treng Ramsar Site ▪ Bezuijen et al. 2008 Biological surveys of the Mekong River between Kratie-Stung Treng. WWF • all available IEEs, EIAs, pre-feasibility and feasibility studies.		
2	EXISTING TRENDS AND PRESSURES ON TERRESTRIAL SYSTEMS	•	• No additional data collection identified at this stage	• No national team input required
G	**SOCIAL SYSTEMS**		***No field surveys of communities, but need to obtain secondary data from national, provincial and district levels***	
1	Situation Analysis under the 3 Social Themes 1. Poverty ethnic groups livelihoods, 2. Health & nutrition, 3. Resettlement, migration, pop growth, trafficking, urban development	• Secondary data for sub-topics under the 3 Social Themes from Published socio-economic research on sub-topics available from other sources, e.g. EIAs for selected dams, sector planning documents, focused case studies on LMB livelihoods, etc.)	• There are three levels of focus for the social assessment: i. *NATIONAL*: covers four LMB nations ii. *PROVINCIAL:* covers Mekong Provinces including 24 districts in Lao PDR, 7 in Cambodia, 2 in Thailand iii. *CASE STUDY DISTRICT:* a set of case studies selecting minimum of 1 district in	• Formats for national outputs are clearly defined in the appendices to the social systems theme paper. These data sheets are comprehensive and one set of data sheets should be completed for *<u>each</u> case study district* (17 in total). • National teams will: i. Complete the data sheets ii. Organise the collected data into data tables using headings decided apon in discussion with the Social Livelihoods Specialist and Project Coordinator

			each Mekong Province[8]. Giving a total of 8 districts in Lao PDR, 7 in Cambodia and 2 in Thailand	
2	Sampling Framework, for 6 selected dams: 1. Pak Beng 2. Xayaburi 3. Pak Lay 4. Lat Sua 5. Don Sahong 6. Sambor	• number of districts falling into different impact zones. •	• Also the social system assessment will consider communities based on their location in relation to the 12 proposed projects: **a.** First affected locations: districts where the dam construction site will be located (including contractors' camps, spoil pits, quarries, etc.) as well as associated infrastructure facilities (including access roads), causing land acquisition and/or resettlement **b.** Second affected locations: districts where headponds/reservoirs will extend **c.** Third affected locations: downstream districts affected by operational impacts • Secondary data for sub-topics under the 3 Social themes from Provincial	• as above

[8] Criteria is based on a preliminary survey of socio-economic indicators (poverty levels, access to infrastructure, economic base, number of villages) and location in relation to the 12 proposed projects, with criteria defined in the social assessment theme paper and summarized in Section 13 of this Inception Report

			and district authorities; sector planning documents, NGO case studies on LMB livelihoods.	
3	FORESTRY AND AGRICULTURAL LAND ALLOCATION	•	DATA SOURCES A. PAFO B. Provincial Department of Planning & Investment or Office of Statistics C. Provincial Land Offices DATA REQUIRED 1. Maps of province and districts, showing topography and natural features 2. Overview and section maps showing soil characteristics 3. Forest inventory – areas and volumes by forest type 4. Land administration maps, land use maps, cadastral surveys, soil maps, and others (if available)	• as above
4	DEMOGRAPHY & POPULATION STATISTICS, POVERTY		DATA SOURCES A. Provincial Department of Planning & Investment or Office of Statistics B. Women's Union DATA REQUIRED • 1. Provincial GDP • 2. Total provincial population • 3. Total families (not households) in province	• as above

			• 4. Total number of poor families per province • 5. Ethnic groups in the province, and percentage of ethnic groups in relation to overall provincial population	
5	HEALTH & NUTRITION		• 1. Number and location of hospitals in the province • 2. Number and location of health centres in the province • 3. Number of heath personnel in the province • 4. Incidence of wasting & stunting in the province (if data available) • 5. Main reported diseases in the province and % of reported cases • 6. Main causes of death and % by cause per annum • 7. Percentage child mortality cases per annum • 8. Main health activities and priorities in the province	• as above
6	LAND USE AND PRODUCTION SYSTEMS		• 1. Provincial land use and concessions in the province (including total land area given to concessions) • 2. Provincial strategies towards agriculture, reduction of slash and burn, various farming practices – maps and statistics • 3. Market prices of key cash crops over the past 3 years and their	• as above

			seasonal variations	
7	OTHER PROGRAMMES OR DOCUMENTS		• . Information on other Projects and Programmes being implemented in the Province	• To be explored during provincial field visits
H	CLIMATE CHANGE			
	• Exploration of impacts of climate change on Mekong hydrology (glacial melt, rainfall patterns, sea level rise)	• CSIRO, MRC and SEA START climate change studies and modeling in the basin • MRC Environment Program regional review of adaptation status in LMB • SEAs and EIAs of hydropower in the region and elsewhere which have considered climate change	• NAPAs and equivalent National climate change adaptation action plans for all four countries •	• No national team input required

ANNEX 4: GIS ANALYSIS AND OTHER GRAPHICS PRODUCTS REQUIRED FOR THE SEA

No	Coverage	Source of information	GIS maps	Other GIS/graphical products
	Aquatic & Terrestrial			
A1	For each dam and reservoir from Pak Beng to Don Sahong	• FSL height above sea level • Location of dam • MRC channel hydrographic maps • Deep pool maps	Map to show inundation of: • Existing dry season channel, • Existing locations of deep pools • Existing wet season channel • Out of channel inundation • Areas of important productive wetland (to be indentified later)	Estimates of: • Dry season channel inundated • Wet season channel inundated • Outside of channel inundation • Areas of deep pools inundated • Other areas such as reedbeds, sandbars??
A2	For Stung Treng dam	• As above, but using digitized info from IUCN		
A3	For Sambor dam	• As above but using digitized info from WWF		
A4	For each dam + 50 km downstream	• Location of dam • MRC channel hydrographic maps • Deep pool maps	Map to show locations of dams and downstream river morphology, deep pools, dry & wet season channels, sandbars rocky outcrops, floodplains	Estimates of deep pools and other aquatic habitats downstream of each dam
A5	For each dam and reservoir, (extend to say 100 m above FSL)	• FSL height above sea level • Location of dam • Land use maps	Map to show inundation of existing land use • Land use outside of channel • Forest cover outside	Estimates of areas of: • Agricultural land inundated • Types of forest inundated
A6	Catchment within 50 km of each dam and reservoir	• FSL height above sea level • Location of dam • Land use maps • Forest cover • Protected areas	Maps with contour lines (100m) showing land use and forest cover and protected areas	
A7	Catchment within 50 km of each dam and reservoir	• FSL height above sea level • Location of dam • Political boundaries, • Settlements	Maps showing dams and reservoirs, with political boundaries, main settlements, roads, bridges, ferries, existing transmission lines	• Identification of villages and towns within reservoir area. • Identification of political boundaries crossed/shared –

		• Major infrastructure		national, provincial, district • Estimates of lengths of road or bridges inundated • Identification of ferries impacted – increase in width of river/reservoir to be crossed
A8	Consolidated catchment maps for: • cascade of 5+1 dams to Vientiane • Lat Sua and Ban Kum, • Don Sahong, Stung Treng and Sambor	•	Consolidated catchment maps showing: • land use & • Settlements and Infrastructure	
A9		•		
	Economics & Social			
S1	• For LMB region	•	• LMB poverty maps (current & 1999) showing: (i) poverty incidence, (ii) poverty density for both time periods. Map for different time periods should have the same key •	•
S2	• For LMB region	• Average household income	• LMB income maps (current and 1999)	•
S3	• For LMB region	• Population data	• Small area population density maps of the LMB current and 1999	•
S4	• For LMB region	•	• Selection of maps and tables for selected indictors[9] comparing the following sectors across LMB nations: (i) Fisheries, (ii) Forestry/NTFPs, (iii) Agriculture/irrigation, water	•

[9] Indicators/parameters will be defined by the social and economic teams, together with further detailed instruction on this output

			supply, (iv) Mining, (v) Industry (vi) Power consumption & power production, (vii) Tourism, (viii) Transportation •	
S5	• For LMB region	•	• Selection of maps and tables for regional trade, current and 2025 between LMB nations: (i) electricity (ii) agricultural produce (iii) fisheries and aquaculture (iv) industrial goods	•
S6	• For national	•	Selection of maps and tables for selected socio-economic indicators and parameters from the list in S9	•
S7	• For national	•	• Map showing significant national or regional development corridors with changes to land use marked, based on: (i) Most up-to-date govt. planning strategies (ii) ADB GMS corridors (iii) MRC BDP 2	•
S8	• For Mekong Provinces	•	•	Selection of charts and tables summarizing data collection from provinces, including • A selection from the list in S9
S9	• For target districts	•	•	Selection of charts and tables summarizing data collection in target districts, including • Total village land area & land use breakdown • Village types (urban, peri-urban,

				development corridor) • Population distribution/densities • Selection of population profiles (age, employment, urban, rural, ethnicity, nationality) • Comparison of official poverty threshold and poverty incidence • Trends in resettlement (total numbers, affected districts and receiving districts) • Location and number of infrastructure & facilities[10] • Incidence of disease (including water-borne, STDs) and proportion of population affected • Proportion & location of population with less than 6months food security per year • Main crop species &crop calendar
S10	For each dam and reservoir	• FSL height above sea level • Location of dam • MRC channel hydrographic maps • Administrative boundaries • Data from S8 & S9	• Map to show inundation in relation to a selection of the parameters analysed in S8 & S9	•
	•	•	•	•
	Energy			
E1	• For each LMB country (Lao PDR, Thailand, Cambodia, Vietnam)	• Per capita power consumption • Per capita GDP	•	• chart of countries power consumption per capita and GDP for year 2008 if available (see Annex A in Energy theme paper for example) •
E2	For both	• Electricity demand,		Electricity demand 1990-present:

[10] Markets, electricity connections, all-weather road access, schools, hospitals, health clinics, ferry crossings, clean water supply, sewage & sanitation services

	• LMB region • National	national, sectoral, urban and rural • Electricity forecasts, national, sectoral, urban and rural	▪	▪ graph showing past and present electricity demand in GWh and MW by country and total for the region ▪ chart showing the split between rural and urban demand ▪ chart showing sectoral demand (such as residential, industrial etc) Electricity Demand forecasts 2025, 2045: ▪ 3graphs showing official peak electricity demand forecasts in GWh and MW by country and for the region including: o rural demand o urban demand and o (if possible) sectoral growth o National and regional totals •
E3	For both • LMB region • National	(iv) total installed capacity (+ planned new capacity, - retired capacity) (v) separate installed capacity into generation types (vi) supply and demand curve and balances •	(vi)	Installed Generation Capacity (vii) graph showing the accumulated installed generation capacity (deducting the retired capacity each year) by country and the region until 2020/25 in MW Planned power capacity & future energy demand (viii) graph comparing the planned power capacity with the future demand scenarios from the earlier chapter (e.g. see Annex C of Energy theme paper) Percentage figures of how much power would be produced in the years up to

				2020-25 by mainstream dams in GWh and which percentage of installed capacity will be from mainstream dams in MW •
E4	•	• transmission line locations	Transmission network • map showing existing transmission lines between the countries • maps showing proposed options future transmission lines between the countries	•
	Fisheries			
F1	• Provincial and national	• Lumpsum data (number of tonnes by country) are available from the FAO until 2007, • Species list (river and reservoir) • Provincial inland fisheries and aquaculture yields	• Maps showing migration routes of main species (based on WF modelling results)	Fisheries and inland aquaculture statistical report 1995-2008 - histograms, tables, charts • statistics by province (Mekong + Tonle Sap provinces in particular) and • statistics by species. Any unofficial statistics (e.g. from research projects) are also welcome. • Distinguish river fish catches from reservoir fish catches if possible. (ix) In absence of statistics by species, identification from reports, for each country, of the ten to twenty main commercial species.)
F2	• Mekong provinces of the 4 riparian countries (+Tonle Sap provinces)	• Inland fisheries employment • Inland aquaculture employment • Wild fisheries employment • Reservoir fisheries employment	•	Jobs in the fisheries sector 1995-2008 statistical report - histograms, tables, charts • number of jobs in the fisheries sector: (i) inland fisheries and, (ii) inland aquaculture sector in the. • Distinguish river fish catches from reservoir fish catches if possible
F3	• Mekong and Tonle Sap	• Market sales figures	(x)	Revenue of the fisheries sector 1995-

	provinces	• Export figures • Subsistence fish yields/catch • Commercial fish yields catch		2008 statistical report - histograms, tables, charts (xi) Official or project-based local market and export sales of fish products (capture and aquaculture), by species • respective contribution of subsistence and of commercial fisheries
F4	• For each mainstream project	• Location of dam • Plan drawing of dam infrastructure – including fish passage layout • River channel and surrounding ground elevation • MRC hydrographic map •	Fish Passage Maps • Maps showing fish ladders fish passage or ladders for each mainstream dam proposed, • Maps showing natural fish passage over Khone Falls (Hu sahong channel)	•
F5	• For each mainstream project	• Location of dam • Plan drawing of dam infrastructure • River channel and surrounding ground elevation • Reservoir inundation areas	Mainstream Dam reservoir maps showing • Dam structure • Inundated area • Water depth •	For each mainstream dam reservoir, table file of layers in the water profile corresponding to areas of biological productivity (i) reservoir total surface area, (ii) total volume of water; (iii) volume of water between surface and -2m; (iv) volume of water between surface and -5m. •
F6	• For each country	• Location of dam • River channel • Administrative & national boundaries	Riverine Population maps showing: • 5 spatial 'strips[11], • Population summary tables for	Table files, for each country, of : • Population in communes bordering the Mekong.

[11] Strip is based on the distance from the river channel (i.e. 10, 20, 30, 40, & 50km)

			districts and for countries	if possible 10 tables per country or at least covering the target districts), with 5 strips on each bank: (i) 0 to 10 km from the Mekong, (ii) 12 to 20 km, (iii) 21 to 30 km, (iv) 31 to 40, (v) 41 to 50 km away from the Mekong). (vi) Tonle Sap Lake should be included. Eric will provide detailed instructions for what he has in mind here.
F7	• For each mainstream project	•	•	• For each mainstream dam, table file of (i) basin surface area (catchment) upstream each dam; (ii) Length of river network (mainstream + tributaries) upstream each dam.
F8	• For LMB basin	•	(i) map of the basin showing the number of species by sub-basin.	Species Distributional analysis • Compilation of the 537 fish species distribution layers available in the MRC Mekong Fish Database (.aep files) and identification of the number of species by river. Output file: (ii) Excel file of number of species by river and Files and detailed instructions will be provided separately.
	Hydrology & Sediment			

H1	• LMB region	• Dam site location • General land cover (eg forest, slash and burn, agriculture, urban, wetland) • MRC and Chinese authority sediment transport data • Topographical maps with stream network	Sediment transport Map showing: • Mainstream dam site location • General land use cover • Subcatchments of the Mekong based on MRC divisions[12] • Sediment load of river at monitoring stations	• Catchment area for tributaries joining the Mekong mainstream • Proportion of catchment areas in broad land use categories • Where possible sediment load (wet and dry season averages) at each dam site or nearest monitoring station • Sediment contribution from UMB and from main tributaries
H2	• LMB region	• Dam site location • Topographical maps with stream networks	Catchment Groupings of the Mekong • Subcatchments of the Mekong based on MRC divisions[4] • Mean annual runoff (mm) •	•
H3	• LMB region	• SE Developer profiles • MRC navigation survey of channel bottom	Updated longitudinal profile of the Mekong River, showing: • Bottom elevation • Dam walls • FSL and operating water levels	• Average gradient for reaches between dams • Distance of dam structures from: (i) Deep pools (ii) In channel rocky outcropping (iii) In-channel islands (perennial & seasonal) (iv) Confluence with major tributaries (upstream only)
H4	• For LMB	• IBFM report	Maps showing key hydrological characteristics of the LMB, contextualised in the IBFM 5 flow zones	• Existing dry and wet season variability in hydrological characteristics: (i) Depth of deep pools (ii) Sediment transport totals

[12]For example tributaries grouped into: China-Chiang Sean, Chiang Saen-Luang Prabang, Luang Prabang – Chiang Khan, Chiang Khan – Vientiane . A full list and instructions will be provided separately

				(iii) Saline intrusion (iv) Max & min groundwater contours in areas of surface-groundwater connectivity (v) Volume and flow pathways of overland flow in the delta (Cambodia-Vietnam border area)
H5	• National level	•	National Water Balance map showing • Annual tributary discharge into Mekong • Estimates of annual abstraction totals for each major water user • Areas of intensive agriculture • Areas of land concessions and agro-forestry	•
H6	• LMB region	•	Location and inundation areas of dams proposed for 2030 (i) Mainstream (ii) tributaries	• reservoir volumes •
H7	•	•	• Maps and charts exploring trends induced by Chinese dams to be finalised subsequent to discussions with Chinese authorities	•
H8	• For each mainstream dam	•	• Same as A1 and A2	•
H9	• For LMB	•	• H4 with climate change	•
H10	• For the following mainstream dams: (i) One from the northern cascade (ii) One from Pak-Chom- Don Sahong (iii) Sambor	•	Maps showing operations of mainstream projects, including: • Inundation areas for seasonal max and min inundation areas, under two operating modes: (i) Continuous operation (ii) Peaking operation	•
H12	• For the Sambor dam site + downstream into the delta	•	• Map showing location and distance of gauging stations	Graphs and tables analysing • Water levels at gauging stations

			downstream of Sambor	down stream of sambor with: (i) Existing flow regime (ii) Sambor peaking operation (iii) sambor continuous
H12	• For the Sambor dam site + downstream into the delta	• MRC Irrigation database	Downstream irrigation users • Location and number of (current and future[13] irrigation works affected by a significant[14] change in water levels including: (i) Pumphouses (small, med, large) (ii) Canals/preks (small, med, large)	Table showing • Length of canals affected for each size group • Number of pump stations for each size group
H13	• For the following mainstream dams: (i) One from the northern cascade (ii) One from Pak-Chom- Don Sahong	• MRC Irrigation database	Downstream irrigation users • Location and number of (current and future irrigation works affected by a significant change in water levels including: (i) Pumphouses (small, med, large) (ii) Canals/preks (small, med, large)	•

[13] Use the same time slice as the MRC irrigation database

[14] Significant will be defined by earlier analysis in the hydrology study

ANNEX 5: EXAMPLE OF ORIENTATION QUESTIONS FOR NATIONAL LINE AGENCY MEETINGS

LINE AGENCY	THEME ADDRESSED
Department of Electricity	ENERGY: 1. What is the projected energy demand for Thailand in the next 20 – 30 years? 2. What is the current and future projected importance of hydropower in meeting this demand? 3. What proportion of power generated in Thailand will be exported 4. How will Thailand ensure that it will have a market for the power – how are market rates determined? 5. What power trade agreements exist or are planned involving hydropower development in (i) Mekong tributaries and (ii) mainstream Mekong 6. Has the national EIA/SEA regulations been applied to power trade agreements 7. What existing and planned hydropower projects are on the Thailand tributaries to the Mekong River? 8. What are the potential mainstream effects of those projects (and what studies are underway or are planned under national EIA regulations to assess those effects) 9. What are the main policy documents relating to power trade
EGAT	HYDROPOWER & ENERGY TRADE AGREEMENTS: 1. What are EGAT priority energy sources for the next 20years 2. What proportion of power generated will be imported to Thaialnd 3. How will Thailand ensure that it will have a market for the power – how are market rates determined? 4. What power trade agreements exist or are planned involving hydropower development in (i) Mekong tributaries and (ii) mainstream Mekong 5. What is the typical cycle and time frame for negotiating PPAs 6. Have the national EIA/SEA regulations been applied to power trade agreements 7. What existing and planned hydropower projects are on the Thailand tributaries to the Mekong River 8. What are the potential mainstream effects of those projects (and what studies are underway or are planned under national EIA regulations to assess those effects) 9. What are the main policy documents relating to power trade

Royal Department of Irrigation	Agriculture & Irrigation: 1. What are the main priorities and targets for irrigation and agriculture development in the Mekong River Provinces? 2. What is the extent and importance of irrigation to the Mekong River provinces 3. How does the current irrigation and agricultural regime manage the high variability in Mekong river flow? 4. How sensitive is the current irrigation and agricultural regime to drought or dry years 5. What are the status and trends in water demand in the Mekong River Provinces 6. What are the main sources of water for irrigation and are they affected by upstream/downstream influences 7. Who are the main users of water and are any affected by upstream/downstream influence 8. What is the current status and trends/targets for irrigation in the Mekong River Provinces – what are the main challenges facing irrigation – will those challenges be affected by upstream/downstream 9. Is management and sharing of Mekong River Provinces water resources affected by upstream/downstream influences – eg sharing between provinces, managing flood waters 10. Is there sectoral competition for water between irrigation and other water users 11. What is the history of dams and water supply infrastructure in the Mekong provinces – and how important are these dams to irrigation 12. What are the main challenges in managing dams for irrigation supply 13. What are the official projections/plans for dams in the Mekong provinces – and which government plans define these targets
Department of Navigation and Maritime	Transport & Navigation 1. What is the nature and extent of water transport in the Mekong River Provinces 2. What is the current extent and future plans for the navigation/transport infrastructure in the Mekong River Provinces 3. How important is navigation on the Mekong river to the economy of Thailand and the three Mekong provinces 4. What is the predicted future importance of navigation to the Thai and Mekong province economies 5. How sensitive are Thailand's navigation plans to regional cooperation 6. Will water transport and infrastructure be influenced by upstream/downstream effects – in what ways –

	positive and negative 7. What are the connections and challenges between Thailand's inland and coastal shipping 8. What are the biggest challenges for improved road and shipping networks
National Economic and Social Development Board (NESDB)	Poverty & livelihoods 1. What are the current status and trends for poverty in the Mekong River provinces 2. What are the main causes of poverty and which groups are most affected 3. Is poverty in the Mekong River provinces affected by upstream/downstream influences on the Mekong river – if so in what ways 4. What are the connections between poor and rural livelihoods and the Mekong River 5. Are those livelihoods affected by upstream/downstream influences 6. What are the biggest challenges facing poverty reduction for the Mekong provinces 7. What level of priority does poverty reduction in the Mekong provinces have for the national government, and what targets/guidelines have been set 8. What are the official targets for poverty reduction in the Mekong provinces – and which government plans define these targets Migration & urban development 1. What are the past and current trends in migration to and from the Mekong River provinces? 2. Where are migrants going to or coming from? 3. Will migration trends be affected by upstream/downstream influences or water availability 4. What are the trends in urbanization? Will growing urban centres be affected by upstream/downstream influences or water availability 5. What are the official targets for migration and populations in the Mekong River provinces – and what government plan sets these out. Tourism 1. What are the current status and trends in tourism to the Mekong provinces

	2. What are the main causes of growth in the tourism sector 3. Which geographic areas are important tourism zones 4. What important sites of cultural heritage are there along the Mekong River 5. What are the future economic projections of tourism (to 2020, 2050) for the Mekong provinces Industry 1. How important is industry and secondary sector economic activity to the Mekong provinces 2. Where are the major industrial zones in the Mekong provinces 3. What type of industry is prioritized for the Mekong provinces 4. What are the official targets for industrial growth in the Mekong River provinces – and which government plans define these target
Department of Fisheries	Aquatic Biodiversity & Fisheries 1. Provide a breakdown of the Mekong fisheries sector (eg fresh water capture fisheries, aquaculture) 2. What is the status and trends in fisheries (capture and aquaculture) in the Mekong over the past 10 years? 3. What are the key influences affecting trends in fisheries? 4. What contribution do fisheries make to the Thailand economy (capture and aquaculture) 5. What contribution do Mekong fisheries make to the provincial economies of Chi, Mun and Kong provinces 6. Are Mekong fisheries affected by upstream/downstream influences – in what ways? Are some species affected more than others (eg migratory species) 7. What is the status and trends in the Mekong wetlands and aquatic systems 8. Which Mekong protected areas might be affected by upstream/downstream influences 9. Which measures, guidelines or policies are in place to protect aquatic habitats and spawning grounds in Mekong provinces 10. What are the main plans, policies and targets relating to Mekong fisheries production 11. What are the main pollution problems and water quality issues affecting fisheries and aquatic systems in the Mekong
Office of Natural Resources and Environment Policy Planning	Terrestrial Ecology, Forestry and aquatic systems 1. What are the past trends and current trends in forest cover in Mekong River Provinces in Thailand?

(ONEPP)	2. Where are the major pockets of remaining forest and wetlands, and what significance do they play for biodiversity and local communities 3. Are those areas affected by upstream/downstream influences 4. What are the past and current trends in terrestrial biodiversity in the Mekong River Provinces 5. How important are remaining aquatic habitats to fisheries in the Mekong provinces and in the Mekong river 6. Are those trends affected by upstream/downstream influences 7. What are the main drivers of land use change in the Mekong River Provinces 8. Are those drivers influenced by upstream/downstream factors 9. What are the official targets for conservation of terrestrial systems in the Mekong River provinces – and which government plans define these Water Supply Infrastructure 1. What has been the impact (positive and negative) of dams on the natural resources of the Mekong provinces 2. Which official policies and plans cover the planning, construction and maintenance of dams 3. What are the official polices for environmental assessments for new infrastructure in the Mekong Provinces 4. What are the official targets for conservation of terrestrial systems in the Mekong River provinces – and which government plans define these
Public Health Department	Health & nutrition 1. What are the main health and nutrition challenges facing the Mekong province communities 2. Are any of those challenges affected by upstream/downstream influences 3. What is the status of water-related diseases in the Mekong provinces and how are these affected by upstream/downstream influences? 4. What are the main sources of nutrition in the Mekong provinces and how might they be affected by upstream/downstream influences? 5. What is the incidence of malnutrition, diarrhea and other diet-related diseases? 6. What is the distribution of health infrastructure in the Mekong provinces 7. What are the official targets for nutrition, water related disease and access to amenities for the Mekong River

	provinces – and which government plans define these targets
Department of Labour	Employment 1. What are the current status and trends for employment in the Mekong River provinces 2. What are the main causes of unemployment and which groups are most affected 3. What are the connections between poor and rural livelihoods and the Mekong River 4. Are those livelihoods affected by upstream/downstream influences 5. What are the biggest challenges facing job creation for the Mekong provinces 6. What level of priority does unemployment in the Mekong provinces have for the national government, and what targets/guidelines have been set 7. What are the official targets for employment in the Mekong provinces – and which government plans define these targets