

HYDROPOWER DEVELOPMENT IN THE CONTEXT OF INTEGRATED WATER RESOURCES MANAGEMENT IN THE LOWER MEKONG BASIN

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Abstract

Principles of Integrated Water Resources Management (IWRM) underpin the 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin. For an international river basin, such as the Mekong, integration needs to occur at a range of different levels - across sectors, across administrative boundaries, and among different stakeholder groups including government, private sector and civil society.

The Lower Mekong Basin is currently seeing an intensity of private sector-led hydropower initiatives that will bring significant development opportunities to the region, but will also involve risks. Foreign exchange revenues will enable governments to invest in major development programmes in line with their national strategic goals. At the same time, far reaching effects on the water resources of the basin will be experienced leading to substantial changes in water flows, water quality, sediment flows and related natural resources such as fisheries. Driving these financial flows is the recognition that hydropower is a major source of renewable energy and can provide an attractive response to global concerns over high oil and gas prices and concerns over climate change.

Formal procedures among member countries of the Mekong River Commission (MRC) for notification of tributary hydropower projects and prior consultation for proposed mainstream projects will be facilitated on a case-by-case basis by the MRC Secretariat under the 1995 Mekong Agreement. To place these within a more holistic and integrated framework for assessment, MRC is working on a number of important initiatives, including analyzing the consequences of a range of future development scenarios under the Basin Development Plan Programme; a proposed Strategic Environmental Assessment of the mainstream dams in the Lower Mekong Basin; studies on fish migration; and pilot testing of sustainability assessments for hydropower projects in a major sub-basin of the Mekong.

Keywords: Mekong River Basin, Integrated Water Resources Management, Hydropower Development, Strategic Environment Assessment

1. The 1995 Mekong Agreement embraces principles of Integrated Water Resources Management

Principles of Integrated Water Resources Management (IWRM) underpin the 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin signed by the four countries of the Lower Mekong Basin – Cambodia, Lao PDR, Thailand and Viet Nam. The Mekong Commission (MRC) was established under the Agreement and subsequently Myanmar and the Peoples Republic of China became Dialogue Partners. From the outset there was a recognition of the need for coordination in sustainable development across a range of sectors including irrigation, hydropower, navigation and others to optimize multiple uses for the benefit of all riparians and avoid any harmful effects (Article 1). The concept of cooperation and coordination is further linked to the principle of sustainable and equitable

development (e.g. Articles 2 and 5). The maintenance of certain flow regimes important for fisheries productivity and other environmental considerations such as salinity control is set out together with a need for developing detailed management procedures (Articles 6 and 26). And the protection of water quantity and quality as well as the ecological balance of the river system is also clearly articulated (Article 7).

Responsibilities for delivering on these commitments are defined in the governance arrangements for the MRC through its Council, Joint Committee and Secretariat (Articles 18, 24 and 30) including responsibilities for addressing differences or disputes between member countries. In particular, procedures are established that require member countries to notify others of their plans and, in the case of projects on the mainstream of the Mekong, for them to enter into a process of 'prior consultation with a view to reaching an agreement' (Article 5).

Although not specifically articulated in the 1995 Agreement, MRC's work plans for its various programmes are increasingly incorporating a broader interpretation of stakeholder participation that goes beyond involvement of government agencies and includes representatives of civil society and the private sector. Recent examples of this are the regional consultations for the Basin Development Plan (BDP) Programme held in March 2008 and for MRC's emerging Hydropower Programme held in September 2008.

The Dublin Principles that emerged from an International Conference on Water and the Environment in 1992 were three years old when the Mekong Agreement was signed. The Agreement can therefore be considered as an early example of embodying such IWRM principles into an international agreement. It has inevitably taken over a decade to see how they will be translated into practice and still there is further work needed in some areas. It is important to recognize that institutional change of this nature will take many years to achieve and cannot be realized within the time horizons of individual project interventions.

The mid-1990s also saw a significant emphasis placed on social and environmental concerns of major infrastructure projects. The multilateral development banks introduced environment guidelines and involuntary resettlement policies. The importance of stakeholder participation was also gradually institutionalized through introduction of operational procedures. Now in 2008, it is easy to take such environmental and social policies for granted as a normal element of the planning system. However, the planning period for many of the major projects now being considered in the Mekong basin have a history that predates such policies by many years.

For an international river basin organization, such as MRC, integration needs to occur at a range of different levels. The most obvious is an integrated dialogue and planning framework that can influence planning systems in member countries. Some of the important elements here for MRC are developing a common understanding of development needs; of crafting a planning framework and set of procedures within which individual projects of a transboundary nature can be assessed; and establishing common systems for data collection and analysis in which member countries collectively have confidence. One example of such modeling capability is MRC's Decision Support Framework that underpins basin development planning by analyzing the consequences of various development scenarios.

Then there is the integration required across sectors – perhaps to promote multiple benefits from individual investments or to optimize water resource and land use against a set of previously defined objectives. An underlying concept is that resource use for single sector purpose activities should not compromise other uses. This inevitably involves trade-offs, but not necessarily losers. Equitable distribution of benefits is a fundamental principle that supports the view that gains in one area should not take place at the expense of others, but rather be used as a stimulus to identify options for mutual sharing of benefits.

Integration across administrative boundaries is a fundamental tenet of IWRM. At the level of the Lower Mekong Basin, the 1995 Mekong Agreement sets out a framework for cooperation and that significant efforts have gone into establishing effective institutional arrangements.

2. Hydropower development in the Lower Mekong Basin

Countries of the Mekong region continue to experience rapid economic growth. This is accompanied by a surge in electricity demand, for example in the order of 12-14% growth per year in Vietnam. Combined with a focus on renewable forms of energy to reduce global warming and the rising importance of regional trade and investment flows in the energy sector, this has stimulated a new era of hydropower development in the basin. In response to market demands, a broad range of developers are now investigating a large number of potential projects, some of which were identified as early as the 1960s. Many concession agreements are already at advanced stages of negotiation. Run-of-river projects for the Mekong mainstream are among them as these are now seen as more viable due to the expected increase in dry season flows that will result from dam projects being constructed in the Lancang-Mekong river in China, resulting in reservoir storage of more than 20 billion cubic metres. High oil and gas prices provide another driving force for hydropower development.

However, rivers are more than just flows of water with hydropower generation potential. Rivers are also resources for local communities who are dependent upon them to meet their daily livelihood needs through fisheries, water for domestic use and agriculture, and for water transport. Consequently, planning for hydropower development needs to evolve from a project-based engineering approach to a more holistic one—an approach incorporating river basin planning and integrating potential social and environmental issues across multiple projects and the entire river basin. Such a framework would help to optimize the benefits and minimize the costs. It would also bring stakeholders together to weigh opportunities and risks and form a consensus for sustainable and equitable development. Under the 1995 Mekong Agreement, MRC has a mandate to prepare this framework through its basin development planning process and other strategic assessment activities.

It is often said that the Mekong river has not yet been developed. From an engineering perspective and consideration of exploiting the vast energy potential of the river, this is indeed the case. There are currently relatively few dams and control structures. But that should not be interpreted to mean that the resources of the basin are not being extensively utilized. Irrigated agriculture, predominately rice production, is practiced on approximately 3.2 million ha of which 47% is in the Mekong Delta. In 2000, the total fisheries production consumed in the basin amounted to about 2.6 million tons of which some 90% is from capture fisheries. Natural fisheries in the LMB is valued at approximately \$2.5 billion annually. Recent years have also seen a dramatic increase in aquaculture, mostly in the Vietnamese Delta. Exports of fish from the Delta are estimated to be as high as 1.0 million tons per year.

These underlying developments in agriculture and fisheries contribute significantly to the character of the Mekong, but also to the broad distribution of benefits to a large sector of the rural population. For fisheries in particular, only minor investments in fishing gear are required to tap into this renewable resource. The key for the more macro-development projects in the future, such as hydropower and mining, will be to find ways that they can be undertaken in harmony with such traditional uses and that the development benefits and foreign exchange revenues earned by the countries are accompanied by a sharing of those benefits to the wider community.

In the next five to ten years, private sector-led development and investment in hydropower will reach levels not previously seen. The combined effects of the projects will lead to significant changes in water

flows and water quality, in the related natural resources such as fisheries, and in changes in land use as surrounding areas develop. The influx of private sector capital is already evident, for example, in Lao PDR, it already far exceeds official development assistance (ODA). Figures for 2007 estimate about US\$770 million of foreign direct investment (FDI) inflows, compared to net ODA inflow of \$364 million in the previous year. With studies for new projects reaching an advanced stage, continuing increases in FDI are expected in the future. Some slowdown as a result of the recent global credit crisis and high commodity prices may be expected, although the overall pattern of private sector-led development is now well established and expected to continue.

The Lower Mekong Basin has an estimated total hydropower generation potential of nearly 30,000 MW. In Lao PDR, approximately 60 memoranda of understanding (MOU) have been signed for tributary projects up to the year 2020. Proposals for up to eight mainstream run-of-river projects are also being considered at feasibility stage under MOUs or Project Development Agreements (PDAs). Two of these are located on the border with Thailand and would be joint projects. In Cambodia, a master plan is being completed that identifies 5,300 MW of promising capacity in 14 projects. Similar emphasis on hydropower development is occurring in Viet Nam following development of a National Hydropower Master Plan with 2,500 MW being planned for the next 12 years. Recent deregulation of the electricity industry there is seeing more involvement of semi-government and private sector entities.

The MRC Secretariat is currently analyzing the extent of hydrological changes expected to result from projects in both the Lower Mekong Basin and in China. Preliminary results suggest that dry season flows in northern Laos may increase by approximately 45% with the effect reducing further downstream to about 10% in the lower part of the basin. Some of these impacts will be positive for development in the LMB, particularly the increases in dry season flows. Others may influence the timing of fish migration and extent of feeding grounds and more study is required to determine the consequences. Further detailed modeling of these changes as well as those related to sediment transport and salinity intrusion are currently being studied by the BDP Programme in conjunction with specialists from MRC's member countries.

In response to the renewed emphasis on mainstream dam proposals, but also realizing that feasibility studies are still under preparation, the MRC Joint Committee at its meeting in April 2008 encouraged member countries to share preliminary information. This was seen as a precursor to formal notification and prior consultation under Article 5 of the 1995 Agreement. In June 2008 the Lao National Mekong Committee provided such information on eight potential run-of-river mainstream dams. Cambodia is similarly considering such information exchange.

The current proposals for mainstream projects date back to preliminary studies undertaken in 1994 by the Mekong Secretariat – a predecessor of the MRC Secretariat. This demonstrates the longevity of the planning process, which is inevitably affected by changing political and economic circumstances. At that stage, concerns over likely but non-quantified impacts on fish migration were raised and recommendations made for more detailed scientific studies to improve understanding. The mainstream projects did not proceed at that time partly due to the Asian financial crisis of the late 1990s and consequent reduction for energy in Thailand. Unfortunately neither did the necessary fisheries studies and current knowledge of migratory fish behaviour remains limited.

The mid-1990s was also a time when public sector investment supported by finance from multilateral development agencies was more prevalent than private sector finance. Although formulated in such a context, the procedures of the 1995 Mekong Agreement remain equally relevant to the new private-sector setting of today. In the intervening years, the foundation has to a large extent been laid within which the project proposals outlined above can be assessed. But knowledge of these procedures and requirements

and the capacity of the MRC to provide relevant scientific analysis and advice to project promoters remains relatively limited to water and environment ministries. More needs to be done to ensure that energy ministries and private developers are fully aware of the analytic capability of the MRC and the role it can play in providing an integrated basin-wide understanding of cumulative impacts and act as a source of advice on good practice. A regional multi-stakeholder consultation on MRC's Hydropower Programme held in September 2008 was an initial step forward to improve MRC's visibility in this area.

3. MRC's role to provide an integrated framework within which individual hydropower projects are assessed

The regional dimension of hydropower in the Mekong region is the driver behind many of the current projects with bilateral agreements being established for the export of electricity. MRC supports sustainable hydropower development that is implemented within the framework of the 1995 Mekong Agreement and is in the joint interests of its member states. It recognizes that there are both opportunities and risks that need to be addressed.

Private sector-led investments in the region have opened up tremendous opportunities for member countries and offer a scale of development and foreign exchange incomes that would not have been considered possible ten years ago. The question then is how to promote sustainability and incorporate best practice, including considerations of impacts that go beyond the immediate geographic area of a project's location.

A couple of key factors need to be borne in mind. First is the need to ensure a more open discussion of a project's parameters and the approach to sustainability assessment within the overall understanding of the basin's water resources. In doing so, it will be important for MRC to address any remaining concerns that line agencies and project promoters may have about its role and apprehensions that this may cause delay.

Second a realization that the optimal solution is unlikely to be established by taking a case-by-case approach to project development. Additional financing and resources may need to be mobilized to address some of the broader environmental management and social development issues that go beyond the remit of any one project. A range of financing opportunities may exist to improve performance from a sustainability perspective including complementary loan projects facilitated by international finance institutions, placing a levy on the revenues of commercial developers, making specific budget allocations at government level on the royalties received, and the possibility of introducing carbon financing.

The formal framework for assessing hydropower project proposals under the 1995 Mekong Agreement are the Procedures for Notification, Prior Consultation and Agreement (PNPCA). For tributary projects, these generally involve notification of other member states once feasibility level studies and environmental assessments have been undertaken. Other member countries can request clarifications and raise comments on the proposals. Many tributary hydropower projects have already been notified under the PNPCA. In the case of mainstream projects affecting dry season flows, there is a more stringent requirement that member countries enter into a process of 'prior consultation with a view to reaching agreement'. The first of such processes is expected to commence in early 2009.

One possible limitation for implementation of the PNPCA is the apparent 'case by case' approach to prior consultation – for example, the process of prior consultation for each mainstream dam proposal is initiated at a time prior to project implementation once the necessary level of feasibility and environmental studies have been undertaken. Theoretically, each project would then be viewed on a case by case basis. If this were the only extent of MRC involvement, indeed it could be considered as a limitation and a rather *ad hoc* assessment of a project's suitability within the terms of the Agreement.

However, the Mekong Agreement and the MRC Strategic Plan for 2006-2010 recognizes the importance of a more integrated assessment and requires the MRC, through the BDP Programme to undertake a cumulative impact assessment of various development scenarios including mainstream dams. More recently, the MRC Joint Committee has agreed that MRC will undertake an Strategic Environmental Assessment (SEA) for mainstream dams in Lower Basin as described below.

3.1 The objectives of MRC's Hydropower Programme

A preliminary draft of the MRC Hydropower Programme Document was discussed at the recent regional hydropower consultation and resulted in broad endorsement of a proactive role for MRC to establish the necessary cross-sectoral analytic framework within which new hydropower proposals can be assessed. Government agencies, developers, NGOs, researchers and other stakeholders considered MRC to be in a unique position to play this role.

The overall goal of the Hydropower Programme is:

To promote and facilitate regional cooperation among member countries and developers for the sustainable development of hydropower resources in the LMB, thereby realising mutual benefits, supporting economic growth, reducing poverty and minimizing negative impacts on the environment and people in the basin.

Four immediate objectives have been identified to reflect the manner in which MRC will meet this goal:

- Increased communication and cooperation between Member States, Dialogue Partners (China and Myanmar), project developers and financiers, and other stakeholders on hydropower development in the Basin;
- An expanded knowledge base (data and information) on existing, under construction, planned and proposed hydropower projects in the Mekong Basin made available for use by the MRC Secretariat (MRCS), the National Mekong Committees (NMCs) and other organizations involved in hydropower development;
- Support provided to line agencies of Member States, project developers, financiers and other stakeholders and decision-makers involved in regional hydropower planning; and
- Capacity built in MRCS, line agencies and project developers in the implementation of measures to achieve increased sustainability of hydropower projects constructed in the Basin.

In considering the policy and strategy issues involved, MRC has three broad entry levels:

- Regional and National-Level Power Sector Planning: for example regional power planning, regulatory systems, awareness raising of key opportunities and risks of hydropower development, capacity building for implementation.
- Hydropower Sub-sector Planning: for example, analyzing alternative boundary conditions and thresholds for sustainable development, cumulative impact assessments, linkages between hydropower planning and other sector planning, multi-purpose considerations
- Hydropower Project Planning/Preparation, Design and Operation: for example in establishing appropriate designs and operating rules for fisheries and sediment management, and promoting freedom of navigation.

Key principles considered in framing the detailed activities for the Hydropower Programme have included:

- Added value of MRC as a regional river basin organization, facilitating communication and interchange of opinions between Member States, Dialogue Partners, developers and other interested stakeholders;

- Need to be participatory and inclusive of all the stakeholder groups;
- Relevance to i) the agencies responsible for setting the policy framework and regulating project developments, and ii) other stakeholders, making available a body of knowledge and analysis to support decision-making for the joint interests of the member states;
- Consistency with the MRC Strategic Plan 2006-2010;
- Coordination and integration with other MRC Programmes;
- Articulation of the benefits of a basin-wide approach focusing on long-term sustainability of hydropower development in accordance with the procedures of the 1995 Mekong Agreement.

In recognition of the rapid pace of hydropower development in the basin, a multi-track approach is proposed for implementation of the Hydropower Programme. A set of fast track activities has been endorsed by the MRC Joint Committee to address urgent questions related to projects at an advanced stage of feasibility study. These 'Track 1' activities include undertaking a strategic environmental assessment (SEA) to provide the overall framework for analysis of proposed projects and will draw extensively on results from the cumulative assessment of various development scenarios being carried out by BDP and examination of key sector specific issues, such as improving understanding of the barrier effect of dams to fish migration and possible mitigation measures, and preparing standard specifications for navigation locks to ensure freedom of navigation. Long term influences of climate change on basin hydrology and development paths will be considered through BDPs modeling work.

The SEA will provide the frame of reference for discussions between member countries during the PNPCA process and for discussions with line agencies and developers. It will be complemented with a macro-economic regional analysis that examines the distribution of costs, benefits and impacts of mainstream dam projects and considers whether transfers of benefits from one project would be appropriate to facilitate the introduction of sustainability measures in other areas. It will also identify possible incentives for promoting sustainability, including financing mechanisms.

Track 2 activities comprise medium to longer term activities in support of strategic assessments and covering a range of activities including technical analysis related to the PNPCA process on specific projects; policy development, for example related to benefit sharing mechanisms for hydropower projects; capacity building initiatives for line agencies and developers; and the facilitation of dialogue among various stakeholder groups on regional hydropower development. Activities related to increasing cooperation with China in connection with the projects on the Lancang-Mekong River are currently being explored where the emphasis is placed on joint assessments of the operational regime of the existing and new projects.

3.2 Coordination with other MRC Programmes

The Hydropower Programme will play a coordinating role on hydropower issues with specialist inputs from other MRC Programmes. It covers three overarching areas; (i) encouraging dialogue between all parties, (ii) integrating basin planning and, (iii) assessing outcomes of potential hydropower developments. Interaction of the Programmes in these areas is illustrated in Figure 1 and some examples are elaborated below.

Activities of the Fisheries Programme will include follow-up to the first meeting of an expert group of engineers and ecologists on the barrier effects of dams to provide guidance to governments and developers on mitigation measures and appropriate fish passage design where appropriate. The scale of fisheries impacts will also be modeled and where possible valued for a range of different scenarios. Improving the understanding of fish migration patterns throughout the mainstream is the subject of ongoing research work including a major ichthyoplankton study at key sites in the Mekong mainstream.

Improving the productivity of mitigation measures such as reservoir fisheries is also a major focus of FP's work over the next couple of years.

Modeling of sediment impacts throughout the basin will be carried out by the MRC's Information and Knowledge Management Programme (IKMP) in coordination with BDP. Approaches to sediment monitoring and impact assessment were discussed at a recent regional meeting in Vientiane. Consideration of morphological changes will be important from a number of perspectives, including for the Mekong Delta, bank erosion, siltation of reservoirs and deep pools in the river that serve as refuges for fish in the dry season and operational rules for sediment flushing. IKMP is also working with BDP and HP to update and maintain a basin-wide database of hydropower projects, covering existing projects, those currently being implemented and those planned for the future.

In addition to the SEA, the MRC is helping to develop a sustainability assessment tool to be used in conjunction with strategic and project level impact assessments. A combined initiative of MRC, the Asian Development Bank and WWF International, the initiative on Environmental Considerations for Sustainable Hydropower Development (ECSHD) is linked to the Sustainability Assessment Protocol initiative of the International Hydropower Association. Further information on ECSHD is presented in a parallel paper presented at this Symposium (Bird et al, 2008).

Long term sustainability of watersheds is an important requirement for reservoir projects, particularly for the Governments that will take over operation of projects after the expiry of concession periods that are typically of about 25 years duration. Several community management approaches and financing mechanisms have been pilot tested and now need to be evaluated and replicated. MRC's cooperation with the German agency GTZ is planning to assess appropriate practice in this area during the next phase of its Watershed Management Programme.

Ensuring freedom of navigation is also a key principle embodied in Article 9 of the 1995 Agreement. MRC's Navigation Programme is preparing standard specifications for ship locks to be adopted throughout the mainstream in the LMB.

MRC's coordination role was strongly endorsed at the regional hydropower consultation by all stakeholders: government agencies, developers, NGOs, financing agencies. In particular it was clear that MRC needs not only to provide the integrated framework outlined above, but also to ensure that the results of its studies and analysis are made more widely available. Close engagement with developers of proposed projects is a key to this and a seminar for developers is currently being planned to brief them on the ongoing programme of work and the current status of analysis.

In parallel to providing the basin-wide framework focusing on water resources, environmental and social factors, MRC is also supporting the Government of Lao PDR to undertake power optimization studies for the proposed mainstream projects in the upper parts of the LMB. MRC will provide hydrological and modeling capacity to assist the Government optimize the system systems as a whole from a power output perspective rather than a project-by-project approach in which the output of individual projects would be considered in isolation. Based on the 1995 Mekong Agreement, there is a growing recognition that the optimization of the mainstream schemes does not exclusively refer to the power and energy outputs as a function of full supply and tail water levels, but also to the wider cumulative impacts and trans-boundary issues of importance to the other member countries.

4. Next steps

Current hydropower development plans in the Mekong Basin provide an opportunity for MRC and line agencies to demonstrate how a planning framework based on the principles of IWRM can be used to influence development of individual projects driven by the private sector. The ultimate test is to demonstrate this approach can add value and improve outcomes, taking into consideration the joint interests of member states and of the people of the Mekong Basin. Initial results from various sectors will be fed into the SEA over the coming months and made available to line agencies responsible for overall planning and to the developers. The complete SEA will be available in draft form towards the end of 2009.

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Figure 1: Thematic Areas of Collaboration of MRC Programmes to Support Decision Making on Hydropower Development

