Integrating Environmental Impacts into Water Allocation Models of the Mekong River Basin

Future Research Directions

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The Mekong River flows through 6 countries, is 4,800km long, has a catchment area of 795,000km², a flow rate of 15,000 m³/second and approximately 75 million people depend on its resources for food production (Ringler 2001). Rapid development in the Mekong River Basin is leading to growing competition for Mekong River waters for agricultural, industrial, domestic and ecosystem services uses. A balanced set of water allocation policies is needed to ensure a healthy riverine environment is maintained while those living in the Basin can enjoy the benefits of economic development. The aim of this workshop was to explore how environmental impacts can be integrated into water allocation models of the Mekong River to provide information key to the development of water allocation policy. More specifically, the workshop aimed to bring together researchers working on environmental management issues in the Mekong River Basin, to explore possible synergies in environmental water policy research in the region, to discuss current research on valuing environmental demands in a river basin context, and to identify priorities for environmental water policy research in ACIAR's partner countries that make up the region.

The workshop was held on 15 December 2003 at the University of Economics, Ho Chi Minh City, Vietnam. Attendees included Dr Tran Vo Hung Son of the University of Economics and six of his colleagues (Mr Pham Khan Nam, Mr Nguyen Huu Dung, Mr Truong Dang Thuy, Mr Phung Thanh Binh, Mr Vo Duc Hoang Vu and Mr Nguyen Huu Loc), Prof Jeff Bennett (The Australian National University), Dr Elizabeth Petersen (Advanced Choice Economics Pty Ltd), Dr Ray Trewin (ACIAR), Dr Claudia Ringler (International Food Policy Research Institute), Dr Robyn Johnston and Ms Petrina Rowcroft (Mekong River Commission), Mr Danilo Israel (WorldFish

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Center), Dr Tang Duc Thang and Ms Trinh Thi Long (Southern Institute for Water Researches Research), Ms Hermi Fransisco (Economy and Environment Program for South East Asia), Dr Tran Ngoc Kham (Tay Nguyen University) and several members of the Vietnamese Provincial Departments of Natural Resources and the Environment.

The workshop program can be broadly categorised into four parts. The first part included an introduction and overview of the research problem through the welcoming addresses of Dr Tran Vo Hung Son and Professor Jeff Bennett, and the presentation of the overview paper by Dr Elizabeth Petersen entitled 'Valuing environmental water demands in the Mekong River Basin'. The second part of the workshop consisted of presentations on the various hydrological, economic and environmental models that have been developed for the Mekong River Basin. Dr Claudia Ringler of the International Food Policy Research Institute presented a paper she co-authored with Ximing Cai entitled 'Addressing environmental water values in an integrated economic-hydrological river basin modeling framework'. The paper incorporates environmental water values for fisheries and wetlands into an economichydrological model to analyse different water-using strategies and their implications for individual riparian countries. Dr Robyn Johnston and Ms Petrina Rowcroft presented the activities and approaches of the Mekong River Commission to integrating environmental values into resource allocation models in the lower Mekong River Basin in a paper they co-wrote with Kent G. Hortle and Charlotte McAllister entitled 'Integrating environmental values into resource allocation - MRC's approach in the Lower Mekong Basin'.

The third part of the workshop aimed at exploring the various resources and opportunities available for addressing the gaps in current research outcomes and activities. These resources and opportunities include the environmental economics capacity of the University of Economics, Ho Chi Minh City (as highlighted in a presentation by Mr Pham Khanh Nam), synergies with economic analysis being conducted in Australia (as demonstrated by Professor Bennett's paper entitled 'Integrating Science and Economics in Australian River Management'), research directions of the Southern Institute of Water Resources Research (as shown by Ms Trinh Thi Long's paper 'Impacts of Flow Regimes on Environmental Conditions in the Mekong Delta of Vietnam') and related work being conducted by the WorldFish
Center (as discussed by Mr Danilo Israel in his paper entitled 'Aquatic resources valuation and policies for poverty elimination in the Lower Mekong Basin: Review of the project and economic valuation methods').

The final part of the workshop involved the presentation of the key issues in water resource management as perceived by the representatives from the Provincial Departments of Natural Resources and the Environment in Vietnam. This information provided valuable information to the subsequent group discussion led by Professor Bennett.

The papers presented at the workshop and the workshop program can be downloaded from the project's website: http://apseg.anu.edu.au/staff/jb_intimpr.php. All papers are presented in English. The papers by Dr Petersen, Prof Bennett and Ms Long are also available in Vietnamese.

The remainder of this report will draw largely from the group discussion using the following subheadings: What are the important gaps in knowledge that is needed to develop water allocation policy in the Mekong River Basin? What are the modelling opportunities for addressing knowledge deficiencies? What is the scope of the benefits likely to arise from potential research projects? What are the capacities of the research organisations to generate data and conduct the modelling?

**What are the important gaps in knowledge that is needed to develop water allocation policy in the Mekong River Basin?**

The general finding from the workshop is that there are broad gaps in current knowledge on both the biophysical and value aspect of policy choices regarding water management options in the Mekong River Basin. From a biophysical science perspective, there is very little qualitative or quantitative data on the impacts of changes in flow rates through the basin on aspects of river health that are relevant to people. Many of the impacts occur in localised areas or in specific periods or seasons adding to the complexity of the problem. From an economic perspective, there is even less information available on how Mekong River Basin communities value riverine environmental attributes, with few studies that have been done in a similar socio-
economic context that may inform the debate. The group discussion focussed on what
the workshop participants considered to be the most important gaps in the data in
terms of key information needed to derive a balanced set of water allocation policies
for the Mekong River Basin.

One of the most prevalent issues raised by representatives of the provincial
departments (namely the provinces of An Giang, Can Tho, Long An and Dong Thap)
was the ad hoc development of dykes throughout the delta. These dykes are flood
diversion structures designed to protect agricultural land or villages. However, the
dykes have alienated some parts of the floodplain, and increased flooding in others.
Alienated areas are not available for fish spawning, do not receive a supply of
nutrients from floods and do not provide other environmental services such as water
quality improvements. Some provincial representatives argued for the cessation of
dyke construction, whilst others argued that development should be planned with
consideration of the entire floodplain. A potential project was discussed that could
analyse the biophysical and economic impacts of a large number of small,
uncontrolled dyke developments on the floodplain's ecology and economy. Dr
Johnston indicated that the Mekong River Commission's Floodplain Mitigation
Program would be especially interested in a floodplain management project and that
existing hydrological models of the River would be a useful starting point for the
examination of the impacts.

Further research related to Dr Ringler's economic-hydrological river basin model was
raised as another area of specific research potential. The model results are sensitive to
a number of key relationships, but these relationships would need to be estimated
empirically to make them more useful for basin water management. In particular, the
relationships between water availability across time and space, and benefits from
fisheries and wetland uses need further research. Additional validation would also
enhance the functional forms relating domestic and industrial and irrigation water
uses with water flows and revenues. Quantification and validation of these
relationships would require significant time and financial resources. However, once
validated, the model results could provide important information to policy-makers
seeking to improve the allocation of water between competing uses.
During the group discussion, Professor Bennett raised the possibility of modifying Dr Ringler's model to separate the biophysical relationships from the economic relationships. For example, the relationship between fisheries revenue and water availability could be disaggregated to first model the biophysical relationship between water availability and fish production, and subsequently the relationship between fish production and fishery revenue. By separating the scientific relationships from the economic relationships, the data availability and deficiencies can be more clearly identified and specified.

**What are the modelling opportunities for addressing knowledge deficiencies?**

Two of the models presented during the workshop could be utilized for further research. Dr Ringler's model provides a basin-wide economic-hydrological model which allows for the broad analysis of different water allocation strategies in terms of their biophysical and economic impact on domestic, industrial and environmental water uses. However, relationships in the model require empirical estimation, refinement and validation before the model can be used as a tool for policy making. The Mekong River Commission has a hydrological model that covers the Lower Mekong Basin. This model contains superior flow data compared with Dr Ringler's model; however, it does not contain an economic component. In addition to the series of hydrologic models currently available at the Mekong River Commission, experts in the Basin Development Plan Unit are working on a simplified economic modeling framework compared to Dr. Ringler’s model. This model is based on an Excel spreadsheet, but will make use of the data from Mekong River Commission's river flow models.

There is significant opportunity to expand the representation of environmental water uses in these models. Again, both biophysical information and value data are lacking. Studies of cause-effect relationship between alternative water management regimes and ecosystem services that are important to people are required. Non-market valuation studies of the values provided by these ecosystem services are also necessary to complete the models. These values could be fed into Dr Ringler's and/or the Mekong River Commission's models. If these data supplements could be
integrated into these models, they would provide powerful instruments to inform the Mekong River Basin water allocation debate.

**What is the scope of the benefits likely to arise from potential research projects?**

The potential scope for a project on integrating biophysical research with studies of the value of ecosystem services in the Mekong River Basin is great. To take a broad perspective, future research could focus on the basin as a whole. Dr Ringler's model could be further quantified, validated and updated with recent Mekong River Commission flow data. Alternatively, the Commission's resource allocation model could be used as a base. The biophysical relationships between flows and environmental attributes could then be explored, and economic values for these changes in environmental attributes derived from non-market valuation studies. The model would necessarily be an aggregated and schematic depiction of the Mekong River Basin. A model with such breadth of coverage would be an important instrument for analysing the social, economic and environmental impacts of different allocation strategies and would therefore be of strong policy relevance. To take a narrower perspective, future research could focus on one subregion (for example, a Vietnamese province or the Tonle Sap region in Cambodia) within the Mekong River Basin with the goal of collecting and analysing in more detail scientific and economic data for that subregion. Such a study would allow a more thorough study of the problem and would be extremely useful for that localised area, but may have less policy relevance outside that area unless the study subregion was selected because of its representative characteristics.

Another approach would be a compromise between the macro and micro approaches detailed above. One subregion could be selected that is small enough to allow the collection and analysis of accurate and reliable data, but large enough for its social, economic and biophysical characteristics to be sufficiently broad ranging that the research findings would be significant to a broad range of environments, and would allow benefit transfer of data to other subregions. If the selected subregion spanned more than one country (such as the floodplains bordering Cambodia and Vietnam), the project would be of relevance to the Mekong River Commission, whose mandate is to consider transboundary issues in the Mekong. Moreover, the different levels of
economic development of the floodplain on either side of the Cambodia/Vietnam border may provide opportunities for the generation and comparison of ecosystem services values held by different communities. To simplify the study further, the scope of the project could be confined to one environmental attribute (such as wetland quality). The scope could be subsequently broadened to include other attributes if resources permitted.

**What are the capacities of the research organisations to generate data and conduct the modelling?**

The workshop brought together researchers from a number of institutions with a broad range of research capacities. The Mekong River Commission has a strong water modelling capacity coupled with an interest in environmental analysis. The Commission is in the process of building its capacity to undertake economic analysis. Representatives of other regional organisations demonstrated strong capacity in environmental economics; including the International Food Policy Research Institute, the WorldFish Center and the Economics University, Ho Chi Minh City. Members of the Environmental Economics Unit of the Economics University are developing experience in non-market valuation and would benefit from the collaboration afforded by a collaborative research project of the type suggested here. The Southern Institute of Water Resources Research has developed expertise in biophysical analysis of environmental problems in the Vietnamese section of the Mekong River Delta and would also be capable of acting as a collaborative research partner.

**Conclusions**

The environmental quality of the Mekong River Basin is still good relative to other global river systems (MRC 2003). However, the impacts of economic development are now starting to be observed. This workshop highlighted the potential for environmental degradation in the Basin due to changes in Mekong River flows. Important gaps in scientific and economic knowledge of these environmental impacts were identified, and possible modelling opportunities that could integrate biophysical, social and economic aspects of different water management strategies in the Mekong River Basin were discussed.
In funding this workshop, ACIAR has demonstrated an interest in funding research in this field. A first step towards the inception of a research project to take up the issues raised in the workshop was suggested by Dr Ray Trewin, ACIAR Agricultural Development Policy Program Manager. His suggestion was to lobby for the potential research topics to be included as country priorities in the upcoming ACIAR Vietnamese consultations. This would allow ACIAR to begin the process of bringing together on a formal basis, the potential research partners so that a proposal could be developed.

Workshop participant, Ms Hermi Fransisco of the Economy and Environment Program for South East Asia (a project established by the International Development Research Centre of Canada), indicated that they could contribute to funding students to pursue this line of research, and so, could be a collaborator in an ACIAR project.

The support of the Mekong River Commission would be a key component of any research proposal in this field. The current focus of the Commission on the development of integrated socio-economic-biophysical models of the Basin indicates that the areas of research potential demonstrated through the course of the workshop are opportune for the Commission. Consistent with the Commission’s mandate, developing research projects that involve interactions across the borders of the nations constituting the Basin – particularly Vietnam Cambodia and Thailand – would also be an appropriate way forward.

The key outcomes of the workshop were the development of a sound research focus and the demonstration of a strong research capacity amongst organisations in the region. Together, these provide a useful base for policy relevant environmental research to inform the Mekong River water allocation debate.
Reference


Project website