

Title: “A multi-criteria decision analysis approach to transboundary water resource management in the Mekong River Basin”

Extended abstract

Water has no national and administrative boundary. Water sharing across nations in the shared river basin to meet national development goals continues to generate upstream-downstream disputes, with negative environmental consequences, such as the degradation of ecosystem and the shortage of water supply for biodiversity. The Mekong River is one of the significant transboundary rivers globally. The Lower Mekong River basin (LMB) covers the lower part of the Mekong River basin (MRB) within the territories of four countries, including Laos, Thailand, Cambodia and Vietnam. The LMB, with a total population of around 65 million people, serves as a lifeline for the basin's inhabitants and economic development of all four lower countries by bringing enormous benefits from, such as water supply, hydropower generation, irrigation and navigation. Due to numerous pressures ranging from high population growth to industrial, agricultural and intensive hydropower development, the MRB, particularly the LMB, has been facing significant challenges concerning its biodiversity and ecosystem. In addition, managing and resolving water-related issues among countries with different levels of development and interests while preserving and maintaining the gains from the river have been posing significant challenges to the LMB members, which require practical cooperation. As each LMB's riparian nations is still seeking ways to foster its national development, there is a strong demand for maximize the benefits from utilizing the Mekong water and its resources. Yet, the actual impacts of water development in the Mekong River remain unclear, and the decision on the most sustainable development scenario is difficult to make. A crucial part of many challenges facing water managers in the Mekong region is the necessity to deal with numerous economic, social and ecological impacts, represented in different metrics. Building a consensus among stakeholders, who express serious concerns about the outcome of any management plan or policy in the water planning and managing process is essential for reaching a successful decision. In the Mekong region, water resources are at the core of development. The decisions made regarding sharing and managing water for food and energy, ecosystem preservation, and livelihoods supporting will have significant impacts on the region's future development.

In 2017, the Mekong River Commission (MRC), an intergovernmental organisation founded in 1995 for the purpose of comprehensive cooperation among LMB countries, established the Council Study, which analysed the impacts of water development scenarios concerning the environmental, social and economic aspects of the LMB. The use of water scenarios in the Mekong region might enhance the accountability of member states involved in water resource management by encouraging them to be more explicit about their major suppositions about the benefits, risks and causal connections. Therefore, the MRC should develop a more appropriate evaluation system to provide the member states with persuasive evidence of the coexistence of the economic benefits and the negative impacts that each water development scenario can bring out. More importantly, a comprehensive evaluation of water

development in the LMB can create strong incentives for member countries to strengthen their cooperation on water-related issues to foster the long-term sustainable development of the river basin and maintain the long-lasting benefit of utilising the Mekong water for all parties. Therefore, the dissertation proposes a new approach to analyzing, assessing water resource development scenarios characterized by sustainability indicators and to assisting in developing a suitable water policy in LMB according to the best cooperation scenario. The findings provide recommendations for the MRC and the LMB countries to improve their policy concerning benefit-sharing scheme, water planning, water policy making and risk mitigation strategies.

The dissertation consists of five chapters. Chapter 1 introduces the research area and outlines the background and rationale for the present study. It briefly reviews transboundary river management in international and Mekong's context and outlines the current difficulties faced by Mekong countries regarding sharing and utilizing water resources in the LMB. The literature on transboundary management of the LMB is analyzed before identifying research gaps. The chapter subsequently describes research objectives and outlines research designs.

Chapter 2 presents an overview of the MRC by describing the development history, the structure and the main roles of the MRC in managing water resources in the LMB. The key challenges to the MRC are also addressed and the functions and limitations of institutional capacity of the MRC are summarized.

Chapter 3 explores the evolution of water cooperation among Mekong countries to examine the impact of riparian countries' attitudes towards cooperation on the evaluation of different development scenarios. By applying the Analytic Hierarchy Process model, this chapter develops a framework to integrate the evolution of water cooperation into the process of evaluating water development in a transboundary river context. The preferences of riparian countries on each water development scenario regarding their perspectives towards cooperation, instead of solely implementing general economic assessment.

Chapter 4 examines the nature of risks to ecosystem and human beings in the LMB and implements a comparative analysis between international river worldwide and the Mekong region. This chapter subsequently presents the assessment of different water development scenarios and ranks the scenarios in priority order based on the existing and potential risks by using a multi-criteria decision analysis (MCDA) model.

Chapter 5 initially summarizes the findings interpreted in the context of previous research. The main results are subsequently appraised and explanations are suggested for particular outcomes in the data. Prior to concluding, the chapter addresses the strengths and limitations of the study and proposes areas for future research. This chapter ends by offering recommendations and practical implications of the study.