

Chareunsky, Andrea K.; Macquarie University

andrea.chareunsky@mq.edu.au

Authors: Andrea K. Chareunsky, PhD

Department of Economics, Macquarie University (Australia)

Title: Darkening skies over shared waters – a hydropower coalition network game of Mekong River players



Transboundary water sharing negotiations are especially fertile ground for the application of game theoretic models. In this paper we look in particular at investment in the renewable energy sector in Southeast Asia, for the construction of hydroelectric dams with economic, social and environmental impacts on multiple transboundary stakeholders. Negotiations across national boundaries on hydropower development have been particularly fraught in developing countries, often resulting in suboptimal outcomes. We therefore seek to model the negotiation process, in order to explore means of achieving more equitable, sustainable outcomes for water stakeholders.

We propose a sequential two stage network game. Game play involves coalition formation within networks of agents, with a sub-game played over water sharing objectives, trading with partial agreement equilibria. Our games structure assumes that agents share objectives, and so have incentives to form coalitions prior to each round of negotiation. These agents play a sequence of 2x2 non-zero sum negotiation games. Players form strategic coalitions through network paths, in order to maximise their utility by optimising their objectives in sets of pairwise negotiations. In other words, agents who share objectives over this shared water space play a coalition game, with resulting partial equilibria at the end of each sub-game negotiation. We infer the ‘shared objectives’ from the ‘topics’ selected by the “Hydropower Sustainability Assessment Protocol” (HSAP) initiated by the World Bank in 2010. The 20 specific HSAP topics are used as yardsticks against basic sustainability objectives across economic, financial, technical, environmental and social indicators. These topics and the characteristics of the stakeholders form the basis of our inference of shared objectives, which give players the incentive to continue to form coalitions.

Using Lao hydropower development, around the Mekong, as an example of the process of negotiating shares of a large body of water, the paper analyses the influence of stakeholder engagement, and the intra-network contagion effects on the outcomes of such negotiations. While particularly relevant to the question of environmental, economic and social sustainability of water management projects, the model constructed here can be generalised, to be a means of analysing any infrastructural development process that has transboundary implications