Consilience: The Journal of Sustainable Development
Vol. 7, Iss. 1 (2012), Pp. 73-86

The Impact of Continued Mekong Basin Hydropower Development on Local Livelihoods

Scott William David Pearse-Smith
National Centre for Peace and Conflict Studies
University of Otago, New Zealand
scottps@gmail.com

Abstract

Hydropower development of the Mekong Basin is proceeding at an increasingly rapid pace. Hydropower has already affected the natural and social environments of the Mekong, and threatens to cause further devastation for local livelihoods as hydropower projects increase in size and number. This article builds upon scientific knowledge of the environmental effects of Mekong hydropower development to consider what impacts these environmental changes will have on local livelihoods. Attention is focused on how hydropower development will affect crucial renewable resources, and how this will affect the production of food and income for millions of the basin's inhabitants. This study contends that the food and economic security of the majority of the local population is inextricably intertwined with the integrity of the natural environment. Therefore, continued hydropower development will have a devastating impact on the livelihoods of millions of the basin's inhabitants. More sustainable alternatives are desperately required.

Author's Note

Scott Pearse-Smith holds an LLB from the University of Otago Faculty of Law, and is currently an MA candidate at the National Centre for Peace and Conflict Studies, University of Otago. This article draws on research and analysis from his thesis, *Hydro-development and Conflict: The Mekong Basin*. The author would like to thank the Graduate Research Committee for their support, by means of the University of Otago Postgraduate Publishing Bursary.

Keywords: Mekong, hydropower development, livelihoods, water resources, food security.

1. Introduction

Hydropower development of the Mekong Basin is proceeding at an increasingly rapid pace (Friend, Arthur & Keskinen, 2009). The relatively small-scale hydropower projects that have been developed to date provide some insight into the expanding environmental and social impacts that can be expected as hydropower projects increase in number and scale. An exploration of the impact of hydropower development on local livelihoods demands input from a broad spectrum of disciplines across both the natural and social sciences. Fortunately, a wealth of information has already been generated by the natural sciences on the environmental impacts of Mekong hydropower development.

The Mekong Basin is defined as "the land area surrounding all the streams and rivers that flow into the Mekong River" (MRC, 2011, para. 1). The Mekong River begins its 4800-kilometer journey on the Tibetan Plateau in China, travels southeast through six developing nations and eventually empties into the South China Sea (Adamson, Rutherford, Peel & Conlan, 2009).

The Mekong Basin can be usefully divided into two sub-basins: the Upper Mekong Basin and the Lower Mekong Basin. The Upper Mekong Basin refers to the area of the Mekong Basin that is within the national territories of China and Myanmar (Radosevich & Olson, 1999). This comprises about thirty percent of the area of the basin as a whole and has a population of about fifteen million. The Lower Mekong Basin, from the "Golden Triangle" south, represents the area of the Mekong Basin within the national territories of Lao PDR, Thailand, Cambodia, and Vietnam (Elhance, 1999). This accounts for the remaining seventy percent of the area of the Mekong Basin, and is home to about sixty million people (MRC, 2010a), 29.6 million of who live and work with fifteen kilometers of the Mekong River itself (ICEM, 2010a). This study is largely focused on the impact on the Lower Mekong Basin, which is "more important, both socio-economically and environmentally," than the Upper Basin (UNEP, 2006, p. 11).

In recent years, the Mekong Basin has undergone significant hydropower development (Friend et al., 2009). Pre-1990, most hydropower development in the Mekong was publically funded, but this new wave of development has generally been led by commercial partnerships between private sector developers and host governments (Hirsch, 2011). In the Lower Basin, there are currently twenty-five operational hydropower dams and an additional ninety-nine tributary hydropower projects at various stages of exploration (ICEM, 2010a; MRC, 2010a). As such, most Mekong tributaries have cascades of dams either already in place or planned for completion by 2030 (ICEM, 2010a). Although it considers dams throughout the basin, this piece focuses on two particularly well-publicized tributary dams as examples: the Pak Mun dam in north-eastern Thailand, and the Yali Falls dam in Vietnam.

To date, China is the only nation to have dammed the mainstream Mekong, and has so far constructed the first four dams in a planned cascade of up to eight hydroelectric projects. Of these, the Xiaowan dam will be the world's highest arch dam,[1] whose construction will mark the first time in the Mekong Basin's history that "a single development will influence the entire hydrological regime" of the basin (ICEM, 2010a, pp. 26-27). The final four mainstream dams in the Yunnan cascade are due to be completed by 2020 (ICEM, 2010a; MRC, 2010a).

In the Lower Mekong Basin, at least twelve potential mainstream hydropower developments are currently being considered by private sector developers (MRC, 2009a). Ten of these proposed projects are planned for Lao PDR, and the other two for Cambodia (ICEM, 2010a). Site preparation for the first of these projects, Xayaburi, is underway. The Lao government and its Thai developer are beginning preparatory earth works and resettlement plans for those whose land is needed for the dam's construction ("Xayaburi Dam Work Begins", 2011).

[1] At 292 metres high (ICEM, 2010a).

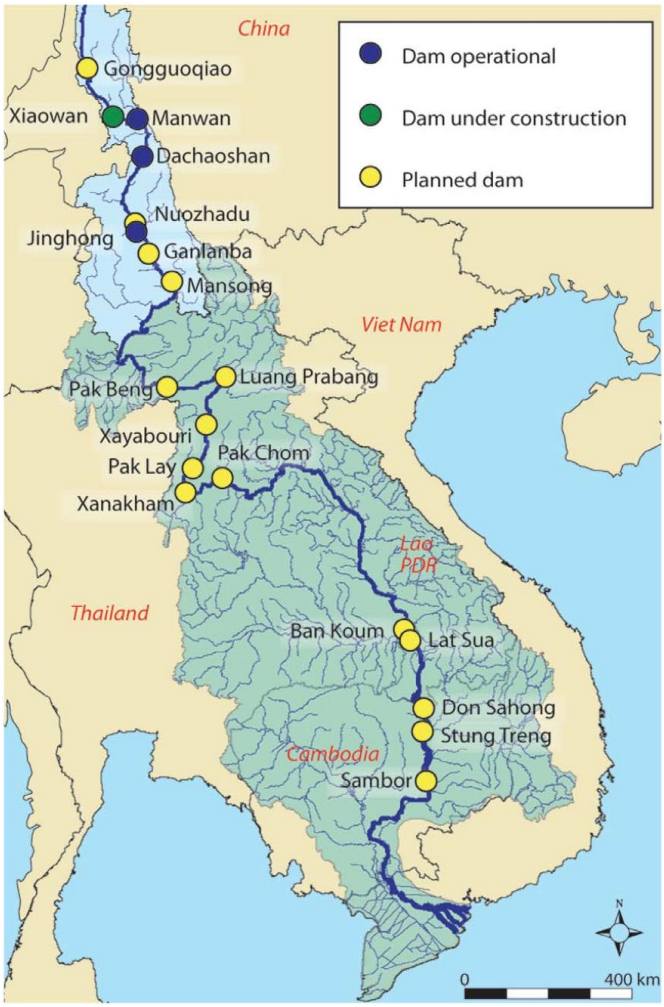

Figure 1: Map Showing Current and Proposed Mainstream Mekong Hydropower Dams (from Lee & Scurrah, 2009).

2. Hydropower Development as a Constraint on Agricultural and Capture-Fisheries Productivity

2.1 The Changing Environment of the Mekong Basin

The Mekong is "one of the few large river basins yet to be irreversibly modified by large-scale infrastructure" (Sarkkula, Keskinen, Koponen, Kummu, Richey & Varis, 2009, p. 227), and is the last remaining river to still flow freely through five nations. The Mekong's hydrological system has remained in dynamic equilibrium with the ecology and climate of the basin for thousands of years (ICEM, 2010a). Many of the basin's ecosystems are tailored to, and reliant on, the predictable seasonal fluctuation of the river (MRC, 2009b). Over the past fifteen years, however, hydropower development has begun to alter the hydrology of the basin (UNEP, 2006; ICEM, 2010a). The cumulative effects of hydropower dam construction on the mainstream and its tributaries are transforming the fundamental characteristics of the river regime with pervasive repercussions not only for natural systems, but also social systems and economies (ICEM, 2010a). The construction of four mainstream dams in the Upper Mekong has already affected the timing and scale of the Mekong's natural pulse,

as well as the many other natural features of the system that are tuned to it. Proposed future mainstream hydropower projects, including the remainder of the Yunnan Cascade and the Lower Basin mainstream hydropower projects, are all expected to further disrupt the Mekong's flow regime. While the hydropower development of tributaries does not have such a profound impact on the equilibrium of the Mekong ecosystem, it does have severe localized impacts, as seen in the cases of Pak Mun and Yali Falls (ICEM, 2010a). Further hydro-development of Mekong tributaries could be expected to create similarly destructive environmental changes.

The changing natural environment impacts the human environment in a number of ways. Most notably, the environmental change created by hydropower development will increasingly constrain the productivity of fishing and agriculture. The altered Mekong hydrology will degrade or diminish a number of the basin's natural resources, such as fish stocks, natural nutrients, agricultural land and forested land, all of which are crucial inputs to either agriculture or fishing. The vast majority of the Lower Basin's sixty million inhabitants rely on these resources for food and economic security.

2.2 The Impact of Hydropower Development on Capture-Fisheries

The Mekong fishery is the "world's largest freshwater fishery" (ICEM, 2010a, p. 95). However, a number of environmental changes created by hydropower development have recently reduced the supply of fish stocks in the Mekong Basin. People claim to have observed declining fish populations in the Mekong Basin since construction began on the Yunnan cascade (ICEM, 2010a). The impact of the proposed Lower Mekong Basin mainstream dams on fish stocks is predicted to be "dramatically destructive" (Sarkkula et al., 2009, p. 243). They will "fundamentally undermine the abundance, productivity and diversity of Mekong fish resources" (ICEM, 2010a, p. 16). Broadly speaking, hydropower development has two main impacts on fisheries; it creates a physical barrier to migration, and it degrades and destroys fish habitats (Sarkkula et al., 2009).

The productivity of Mekong fisheries has been declining for years, due largely to an increasing number of fishers[2] (UNEP, 2006). Now, with the added supply-side threat to fish stocks posed by hydropower development, the productivity of capture-fisheries will be even further reduced. Hydropower development can also hinder fishing productivity because local fishing techniques have been adapted to particular flow conditions and may respond poorly to changes in the river's regime (Wyatt & Baird, 2007). Further, as was witnessed downstream from the Yali Falls dam, unexpected flooding events can wash away productive assets such as fishing boats and equipment. The case of the Yali Falls dam also demonstrates that *agricultural* assets, including crops and livestock, are at risk of loss to flooding events and unusual flow fluctuations as well (Lauridsen, 2004).

[2] Fish catch per fisher declined about forty-four percent between the 1940s and 1995 (UNEP, 2006).

2.3 The Impact of Hydropower Development on Agriculture

Hydropower development adversely affects the productivity of agriculture by degrading or depleting a number of natural resources that constitute vital agricultural inputs. Perhaps the most obvious way hydropower development restricts agricultural productivity is by reducing the supply of agricultural land. A minimum of 9,000 hectares of agricultural land is expected to be inundated by the proposed Lower Basin mainstream dams (ICEM, 2010a). The land that replaces it will invariably be less productive, as per the principle of the low-hanging fruit. The unpredictable and severe flooding that can result from hydropower development can also affect the supply of suitable agricultural land. Flooding can wash away crops and livestock, and there is a strong fear in Vietnam that upstream hydropower development could induce salt-water intrusion in the Mekong delta (Wyatt & Baird, 2007; Rix, 2003; Hoanh, Facon, Thuon, Bastakoti, Molle & Phengphaengsy, 2009). Salt-water intrusion increases the salinity of agricultural land, affecting the fertility of the soil and, in severe cases, renders the land unsuitable for agricultural purposes (UNEP, 2006). Hydropower development further intensifies soil salinity by reducing the wet season flood pulse that otherwise flushes out much of the salt annually (Weatherebee, 1997; Goh, 2004; Lam, 2009).

A less obvious, yet no less significant, threat to Mekong agriculture is the reduction in the supply of natural nutrients that results from hydropower development. In the absence of costly large-scale synthetic fertilization programs, the reduced supply and delivery of natural nutrients will reduce soil fertility and further constrain agricultural productivity (Blake, 2001). Currently, approximately 26,400 tones per year of nutrients "are supplied to the Mekong floodplains and delta by the fine-sized suspended sediment load" (ICEM, 2010a, p. 79). The floodplains of the Mekong region are reliant on these nutrients for fertilization, especially the Cambodian and Mekong delta floodplains (ICEM, 2010a). Dams, however, trap nutrient-carrying sediment load, preventing it from reaching the floodplains (UNEP, 2006). The current nutrient load will be reduced by seventy-five percent by 2030 if all of the proposed mainstream hydropower development projects go ahead (ICEM, 2010a). An estimated fifty percent of the Mekong's annual sediment load is derived from the Chinese section of the Mekong Basin; the construction of the Yunnan cascade therefore poses a disproportionately large threat to the supply of nutrients downstream. The reduction in the wet-season flood pulse caused by dams also limits the annual natural distribution of nutrients by floodwaters (Goh, 2004).

A loss of forested land, both as a direct and indirect result of hydropower development, will further constrain agricultural productivity. Deforestation affects agriculture by accentuating flood and drought events and destabilizing soil (UNEP, 2006). While the amount of forest inundated by hydropower development will be small relative to the total forested area of the Mekong Basin (ICEM, 2010b), the inundation does contribute to a larger trend of decreasing forest cover throughout the basin (MRC, 2010a). As seen in the cases of the Pak Mun and Yali Falls dams, hydropower development also contributes to deforestation indirectly, as it induces migration away from the river into forested areas, which are subsequently cleared as substitute agricultural and residential land (UNEP, 2006; Wyatt & Baird, 2007).

Finally, continued hydropower development could harm Mekong agriculture by reducing the availability of clean freshwater. While freshwater

scarcity is unlikely to become a major issue in the foreseeable future, were it to worsen, it would impose a massive constraint on agricultural productivity by limiting the amount of water available for irrigation. Water quality, however, is a more pressing concern, as it is likely to be degraded as development of the Mekong River continues. While the Mekong is "still regarded as a fairly unpolluted river with generally good water quality" (MRC, 2010a, p. 60), increasing industrial, agricultural, and hydropower development is beginning to have an effect (MRC, 2010a; UNEP, 2006). For instance, in the Se San River, downstream from the Yali Falls dam, water quality is reportedly more turbid than it was before the dam was built. This is due to the increased riverbank erosion that results from fluctuating river levels.

3. Reduced Food Security

3.1 The Importance of Fishing to Food Security

Agriculture and fisheries are so important to rural[3] regions of the Mekong that the people are described as having "river-based livelihoods" (Shoemaker, Baird & Baird, 2001, p. 59). Fish, together with rice, forms "the foundation of food security in practically all riparian countries" (Sarkkula et al., 2009, p. 227). The four Lower Basin nations in particular "feature the highest consumption of freshwater fish in the world" (ICEM, 2010a, p. 96). Any reduction in fish catch or agricultural productivity will therefore threaten local livelihoods and food security (Sarkkula et al., 2009). Without access to capture-fisheries and other free sources of nutrition, such as forest products and wild game, malnutrition is a major concern for the poorest people of the basin. Poor nutrition is already common in the Cambodian and Lao areas of the Mekong Basin, causing stunting and wasting, threatening children's health and lowering life expectancy (ICEM, 2010a).

Fishing is not just an activity of the poor: all socio-economic classes fish (Garaway, 2005), and small-scale family fishing produces most of the basin's total fish catch (MRC, 2010b). However, a recent case study highlights that the "poorest groups are deeply dependent on aquatic resources, and are therefore particularly vulnerable to the changes in river flow and availability of aquatic resources" (MRC/WUP-FIN, 2007, p. 81). "Fisheries do not only benefit the people living next to the river or the floodplains, but all of the Lower Mekong Basin countries" (Sarkkula et al., 2009, pp. 242-243). For example, the exceptional levels of aquatic production in the Tonle Sap region are not only of critical importance for Cambodia, but for the entire Mekong Basin (Sarkkula et al., 2009).

3.2 The Importance of Agriculture to Food Security

Rice "is the staple for most of the region's inhabitants" (MRC, 2010b, p. 8). In the Lower Mekong Basin, over ten million hectares of cultivated land is used to produce it (MRC, 2010b). Rice is generally eaten at all meals in the Mekong Basin, and contributes seventy-six percent of the average daily calorific

[3] About eighty-five percent of the Lower Mekong Basin population live in rural areas (MRC, 2010a).

intake. With an average calorific intake of only 2,407 compared to a food poverty line of 2,100 calories, any decrease in the production of rice would be troublesome. Those living in areas of the Mekong Basin where rice is less available, generally have the lowest calorific intakes (MRC, 2010a).

The Mekong delta is a particularly important agricultural region in the Mekong Basin, accounting for the majority of Vietnam's food production (Cabrera, 2003). Over half of the rice farms in Vietnam are located in the delta, so any disruption to the delta's agricultural productivity could be especially problematic for the country (MRC, 2010a).

Riverbank gardens, common all along the Lower Mekong, are another threatened agricultural tradition (Roberts, 2001; Blake, 2001). They are used to grow a variety of fruit, vegetables and other crops, which provide an important supplementary food source during the dry season (Roberts, 2001; Jenkins, McGauhey, & Mills, 2008).

4. Reduced Economic Security

4.1 The Importance of Agriculture and Fishing to the Local Economy

Throughout the Mekong Basin, agriculture involves a mix of commercial and subsistence production. Generally, farming households' primary focus is on production for household consumption, with any surpluses sold to generate income (MRC, 2010a). Therefore, as well as strongly influencing food security and rural welfare, agricultural productivity also has a critical influence on "the economic growth that ultimately helps alleviate poverty" (MRC, 2010a, p. 178).

Eighty-three percent of the economically active population in the Lower Mekong Basin is engaged in a water resources-related activity as their primary occupation.[4] This includes "farming, fishing, collection of other aquatic animals, or edible plants, aquaculture, use of mini-hydro, fish processing, fish marketing, marketing of other water-dependent products, net making/repairing, boat making and/or repairing and farm labour" (MRC, 2010a, p. 48). Clearly, therefore, the constraint of agricultural or wild-capture productivity would also impose a major constraint on economic productivity.

Agriculture is "the single most important economic activity in the [Lower Mekong Basin]" (MRC, 2010b, p. 8). In a recent survey, seventy-three percent of Lower Basin households said agriculture was the most important occupation in their household. Fifty percent of rural households in the Mekong corridor reported receiving income from the sale of rice, making it easily the most common source of income of those surveyed (MRC, 2010a).

Agriculture is also the largest employment sector in each of the Lower Mekong Basin nations, employing between sixty-five and eighty-five percent of the labor force in Vietnam, Cambodia, and Lao PDR. "Even in Thailand, where agriculture accounts for less than 10 per cent of GDP, 70 per cent of the workforce in the northeast region works in the agricultural sector" (MRC, 2010a, p. 48, citing MRC, 2003). When focusing just on the riparian population of the

[4] Based on a survey of five different ecological zones in the Lower Mekong Basin (MRC, 2010a).

Lower Basin nations, it is estimated that around ninety percent of all people are engaged in agriculture (Blake, 2001).

Fishing is the next most important economic activity in the Mekong Basin. As well as the important contribution it makes to regional food security, it also provides significant economic benefits. Many locals who fish for subsistence also sell their surpluses in order to supplement their primary income, which is usually from agriculture. Twenty-five percent of rural households in the Mekong corridor reported receiving income from the sale of their own fish catch, making it the second most common source of income of those surveyed (MRC, 2010a). The cash income from the sale of fish surpluses is often used to buy rice seed for the following season (MRC, 2010b). The local fishing industry also creates economic opportunities for those involved in supporting industries such as the manufacture, sale, and repair of fishing equipment (MRC, 2010a).

4.2 Constrained Agricultural and Fishing Productivity as a Constraint on Local Incomes and Profits

Hydropower development over the past six years has already impacted local economic productivity. Nearly one in six households polled in a recent survey reported having a member who has changed occupation due to the declining productivity of aquatic ecosystems. "The high degree of dependence of the population on water resources for livelihoods and food security implies a high vulnerability to declining availability, quality, and diversity of the resources" (MRC, 2010a, p. 51). In Cambodia alone, more than one million people face losing their livelihoods if the two proposed Cambodian mainstream dams proceed (ICEM, 2010a). The 21 percent of households that claim to have no second occupation are especially vulnerable to the effects of increasing resource scarcity in the Mekong Basin (MRC, 2010a).

Another factor reducing profits will be expenses incurred in battling the environmental changes and scarcities resulting from hydropower development. In particular, the cost of large-scale fertilization programs—required to compensate for the reduced supply of natural nutrients—will heavily affect the profitability of local agriculture. Irrigation costs, too, will increase as farmers move to more marginal land. The costs of replacing productive assets that are either destroyed by flooding, or rendered unsuitable for the altered ecological conditions, will also impact the economic viability of agricultural and fishing livelihoods (Blake, 2001).

If agricultural and fishing productivity declines, the surpluses of farmers and fishers will be reduced or eliminated, reducing their cash income. In some cases, such as near the Yali Falls dam, many farming households' agricultural output was so reduced that they were forced to sell the little rice they did produce and borrow rice to eat (Perera, 2007). Ultimately, this could result in a purely subsistence-based local economy where farmers are only able to produce enough food for their own consumption, with no surpluses to be exchanged for other goods.

The Yali Falls dam is a rare instance of Mekong hydropower development where the economic impact has actually been assessed in monetary terms. McKenny (2001) assessed the income of Cambodian households situated downstream from the dam site before and after the dam's construction. He found that the average household income fell from 109 US dollars per month before the dam's construction to forty-six US dollars per month three years after

its construction. This amounted to a combined annual income loss of 2.5 million US dollars for 3,434 households within a three-year period. Additionally, property losses of 800,000 US dollars were recorded, although this is thought to be an underestimate due to the difficulty of quantifying many of the losses (Wyatt & Baird, 2007); the resulting loss in economic productivity is also hard to measure. Flooding caused by the Yali Falls dam has also killed a number of Cambodian villagers, and declining water quality has made many more fall ill (Saroeun & Stormer, 2000; Perera, 2007).

4.3 Constraints on Purchasing Power

The depletion and degradation of renewable resources resulting from hydropower development is likely to be reflected in price rises. For example, with the depletion of forested areas, wood prices are likely to rise (Homer-Dixon, 1999). Because wood constitutes a key input cost, it will make heating, cooking and building more expensive. The purchase of wood will therefore consume more of the household budget of many Mekong locals, reducing the amount available for other items in the budget. Those buying fish and agricultural outputs will likely experience similar price rises as environmental scarcities worsen, with the urban poor particularly at risk (ICEM, 2010a).

Some of the most serious potential economic impacts of hydropower development on the people of the Mekong Basin are not easily valued in monetary terms. Many of the region's people are "poor in monetary terms, but rich in natural resources" (Sarkkula et al., 2009, p. 239). In this regard, they rely on natural resources for their "income," which is not necessarily in the form of cash (MRC/WUP-FIN, 2007; Sarkkula et al., 2009). For example, the Nam Songhram wetlands in northeast Thailand "are considered to be … 'nature's supermarket' where you need no money to 'shop' [for] the large variety of different resources they provide" (MRC/WUP-FIN, 2007, p. 83). Hydropower development will reduce the availability of these natural sources of wealth, which will force many locals to find ways of earning cash income in order to buy the resources they need.

The prevalence of subsistence agriculture obscures the true economic value of the Mekong's natural resources. Current estimates of the total economic value of fish production in the Mekong Basin vary, ranging from two to three billion US dollars per annum (Barlow, 2008; Dugan, 2008). However, we must add to this the unknown value of all subsistence fish catches that never enter the market place, making an accurate valuation of Mekong fisheries very difficult (Sarkkula et al., 2009; MRC, 2010b). Attempts to calculate an accurate valuation of total agricultural production—and thus the value of natural resource inputs to agricultural production—encounter the same challenges as do fisheries.

Difficulties in measuring renewable natural resource wealth mean that the negative economic impacts of hydropower development are often underestimated (MRC/WUP-FIN, 2007; Sarkkula et al., 2009). This oversight is especially common in macro-level social and economic assessments, as the losses in wealth that result from hydropower development often occur at the micro-economic level (MRC/WUP-FIN, 2007). Therefore, despite general agreement that the health of the ecosystem feeds directly into the livelihoods of the local people of the Basin, the local level implications of hydropower development are largely overlooked by policy-makers at the national level (MRC/WUP-FIN, 2007; Sarkkula et al., 2009). Policy-makers consider the current lack of large-scale

hydro-development to be an underutilization of the Mekong's resources. In reality, however, the Mekong's resources are being extensively utilized on a smaller, more local scale (Sarkkula et al., 2009).

5. Conclusion

The livelihoods of the Mekong Basin population are inextricably linked to the region's natural resources. Any agent of environmental change that compromises these resources will therefore have a profound impact on local livelihoods. A reduction in the productivity of fishing and agriculture will have major consequences for the food and economic security of the local people. Hydropower development will deny much of the basin's population the ability to sustainably support themselves. Many will be forced to find alternative livelihoods, which will often lead to further environmental destruction, highlighting the unsustainability of continued hydropower development.

It is important to take an interdisciplinary approach while assessing the impact of natural resource development projects. While environmental impact assessments have often been conducted for Mekong hydropower projects, the social impacts have generally received significantly less attention. Assessing only the environmental impacts fails to recognize the value of these natural resources, in their current state, to the basin's inhabitants.

As summarized by Witoon Permpongsacharoen:[5] "This is the lifeblood, the life source, for millions of people. You simply cannot afford to make any big mistakes with the Mekong" (Blake, 2001, p. 5). If the basin's inhabitants are to maintain the livelihoods they have enjoyed for centuries, policy-makers must strike a delicate balance between the pursuit of economic growth and the conservation of natural resources (Rix, 2003). This undoubtedly involves looking at more sustainable alternatives to the proposed hydropower projects.

[5] Director of the Thai NGO 'Towards Ecological Recovery and Regional Alliance'.

Bibliography

Adamson, P. T., Rutherfurd, I.D., Peel, M. C., & Conlan, I. A. (2009). The Hydrology of the Mekong River. In I. C. Campbell (Ed.), *The Mekong: Biophysical Environment of an International River Basin* (pp. 53-76). Amsterdam, The Netherlands: Elsevier. doi:10.1016/B978-0-12-374026-7.00004-8.

Barlow, C. (2008, November). *Impacts of Mainstream Dams on Fisheries and Mitigation Options - Current Status of Knowledge* [Slideshow]. Presented at the Mekong Fisheries Programme Mainstream Dams Conference. Retrieved from http://sydney.edu.au/mekong/documents/events/barlow_presentation_mainstrea mdamsconf_nov08.pdf.

Blake, D. (2001). *Proposed Mekong Dam Scheme in China Threatens Millions in Downstream Countries. World Rivers Review, 16*(3), 4-5.

Cabrera, J. (2003, January 5). *The Rape of a River. Bangkok Post.* Retrieved from http://groups.yahoo.com/group/CambodiaNews/message/3891.

Dugan, P. (2008, September). *Examining the Barrier Effects of Mainstream Dams to Fish Migration in the Mekong, with an Integrated Perspective to the Design of Mitigation Measures* [Slidehow]. Presented at the Regional Multi-Stakeholder Consultation of the MRC Hydropower Programme. Retrieved from http://www.mrcmekong.org/download/Presentations/regional-hydro/Consultation%20Presentation%20(final%2025%20Sep%2008).pdf .

Elhance, A. P. (1999). *Hydropolitics in the Third World: Conflict and Cooperation in International River Basins.* Washington, D.C.: US Institute of Peace Press.

Friend, R., Arthur, R., & Keskinen, M. (2009). *Songs of the Doomed: The Continuing Neglect of Capture Fisheries in Hydropower Development in the Mekong.* In F. Molle, T. Foran, & M. Käkönen (Eds.), *Contested waterscapes in the Mekong Region: Hydropower, Livelihoods and Governance* (pp. 307-332). London, England: Earthscan.

Garaway, C. (2005). *Fish, Fishing and the Rural Poor: A Case Study of the Household Importance of Small-Scale Fisheries in the Lao PDR. Aquatic Resources, Culture & Development, 1*(2), 131-144. doi:10.1079/ARC20059.

Goh, E. (2004). *China in the Mekong River Basin: The Regional Security Implications of Resource Development on the Lancang Jiang* (Working Paper 69). Singapore: Institute of Defence and Strategic Studies. Retrieved from http://dr.ntu.edu.sg/handle/10220/4469?show=full.

Hirsch, P. (2011). *China and the Cascading Geopolitics of Lower Mekong Dams. The Asia-Pacific Journal, 9*(20). Retrieved from http://www.japanfocus.org/-Philip-Hirsch/3529.

Hoanh, C. T., Facon, T., Thuon, T., Bastakoti, R. C., Molle, F., & Phengphaengsy, P. (2009). Irrigation in the Lower Mekong Basin Countries: *The Beginning of a New Era*? In F. Molle, T. Foran, & M. Käkönen (Eds.), *Contested waterscapes in the Mekong Region: Hydropower, Livelihoods and Governance* (pp. 143-172). London, England: Earthscan.

Homer-Dixon, T.F. (1999). *Environment, Scarcity, and Violence*. Princeton, NJ: Princeton University Press.

ICEM (International Centre for Environmental Management). (2010a). *Strategic Environmental Assessment of Hydropower on the Mekong Mainstream*. Hanoi, Viet Nam: Mekong River Commission. Retrieved from http://www.mrcmekong.org/ish/SEA/SEA-Main-Final-Report.pdf.

ICEM (International Centre for Environmental Management). (2010b). *MRC SEA for Hydropower on the Mekong Mainstream: Impacts Assessment (Opportunities and Risks)*. Vientiane, Lao PDR: Mekong River Commission. Retrieved from http://www.mrcmekong.org/ish/SEA-Baseline/SEA_impacts_assessment_report_Discussion_Draft-15May.pdf

Jenkins, K., McGauhey, L., & Mills, W. (2008). *Voices from the Margin: Economic, Social and Cultural Rights in Northeast Thailand: Pak Mun Dam*. Pak Mun, Thailand: Peace and Human Rights Center of Northeast Thailand. Retrieved from http://www.internationalrivers.org/files/Pak%20Mun%20Report%20CIEE%20 English%20smallfile.pdf.

Lam, T. D. T. (2009, June 13). *Saltwater Intrusion Adds to Water Woes*. *IPS News*. Retrieved from http://ipsnews.net.

Lauridsen, P. E. (2004). *Transboundary Water Management in the Mekong: River of Controversy or River of Promise*? In J. Bosen & H. E. Ravnborg (Eds.), *From Water "Wars" to Water "Riots"? - Lessons from Transboundary Water Management*. Copenhagen, Denmark: Danish Institute for International Studies. Retrieved from http://www.diis.dk/graphics/Publications/WP2004/jbo_hmr_water.pdf.

Lee, G., & Scurrah, N. (2009). *Power and Responsibility: The Mekong River Commission and Lower Mekong Mainstream Dams*. Sydney, Australia: Australian Mekong Resource Centre & Oxfam Australia. Retrieved from http://www.oxfam.org.au/resources/filestore/originals/OAus-PowerandResponsibilityEnglish-1009.pdf.

Matthew, R. A. (1997). *Rethinking Environmental Security*. In N. P. Gleditsch (Ed.), *Conflict and the Environment* (pp. 71-90). Dordrecht, The Netherlands: Kluwer Academic Publishers.

McKenny, B. (2001). *Economic Valuation of Livelihood Income Losses and other Tangible Downstream Impacts from the Yali Falls Dam to the Se San River Basin in Ratanakiri Province, Cambodia*. Phnom Penh, Cambodia: Oxfam America.

MRC (Mekong River Commission). (2003). *State of the Basin Report 2003: Executive Summary*. Phnom Penh, Cambodia: Author.

MRC (Mekong River Commission). (2009a). *Initiative on Sustainable Hydropower* (Draft Work Plan). Vientiane, Lao PDR: Author. Retrieved from http://www.mrcmekong.org/programmes/hydropower/hydropower-pub.htm.

MRC (Mekong River Commission). (2009b). *The Flow of the Mekong* (MRC Management Information Booklet Series No. 2). Vientiane, Lao PDR: Author. Retrieved from http://www.mrcmekong.org/download/programmes/ep/MRC-IM-No2-the-flow-of-the-Mekong.pdf.

MRC (Mekong River Commission). (2010a). *State of the Basin Report 2010*. Vientiane, Lao PDR: Author.

MRC (Mekong River Commission). (2010b.) *State of the Basin Report 2010 Summary*. Vientiane, Lao PDR: Author.

MRC (Mekong River Commission). (2011). *About the Mekong*. Retrieved from http://www.mrcmekong.org.

MRC/WUP-FIN (Mekong River Commission & Finnish Environment Institute Water Utilisation Programme). (2007). *WUP-FIN Phase 2: Hydrological, Environmental and Socio-Economic Modelling Tools for the Lower Mekong Basin Impact Assessment*. Vientiane, Lao PDR: Authors. Retrieved from http://www.eia.fi/wup-fin/wup- fin2/publications.htm.

Perera, A. (2007). *First the Rivers, then the Forests: a Fragile Balance*. Retrieved from Oxfam America website: http://www.oxfamamerica.org/articles/first-the-rivers-then-the-forests-a-fragile-balance/?searchterm=None.

Radosevich, G. E., & Olson, D.C. (1999, June). *Existing and Emerging Basin Arrangements in Asia: Mekong River Commission Case Study*. Paper presented at the Third Workshop on River Basin Institution Development. Retrieved from the World Bank website: http://siteresources.worldbank.org/INTWRD/918599-1112615943168/20431963/MekgongRiverComCaseStudy.pdf.

Rix, A. S. (2003). *The Mekong River Basin: A Resource at the Cross-Roads of Sustainable Development*. *Temple Environmental Law & Technology Journal 21*(103), 103-129.

Roberts, T. R. (2001). *Downstream Ecological Implications of China's Lancang Hydropower and Mekong Navigation Project*. In C. Min, H. Huabin, & L. Liming (Eds.), *Biodiversity Management and Sustainable Development in the Lancang-Mekong River in the New Millennium*. Xishuangbanna, China: Yunnan Research & Coordination Office for Lancang-Mekong Sub-

regional Cooperation. Retrieved from http://vxtbg.brim.ac.cn/Symposium/Proceedings.pdf.

Sarkkula, J., Keskinen, M., Koponen, J., Kummu, M., Richey, J. E., & Varis, O. (2009). *Hydropower in the Mekong Region: What Are the Likely Impacts upon Fisheries?* In F. Molle, T. Foran, & M. Käkönen (Eds.), *Contested waterscapes in the Mekong Region: Hydropower, Livelihoods and Governance* (pp. 227-252). London, England: Earthscan.

Saroeun, B., & Stormer, C. (2000, March 17). Viet Nam Dam Full of Lethal Surprises. *Phnom Penh Post.* Retrieved from http://www.ngoforum.org.kh/Environment/Docs/impacts_of_the_yali_falls_da m_on.htm.

Shoemaker, B., Baird, I. G., & Baird, M. (2001). *The People and Their River: A Survey of River-Based Livelihoods in the Xe Bang Fai River Basin in Central Lao PDR*. Vientiane, Lao PDR: Canada Fund for Local Initiatives.

UNEP (United Nations Environment Programme). (2006). A Snidvongs, and S-K Teng. *Mekong River, GIWA Regional Assessment 55*. Kalmar, Sweden: University of Kalmar.

WCD (World Commission on Dams). 2000. *WCD Case Study: Pak Mun Dam, Mekong River Basin, Thailand*. Cape Town: Author.

Weatherebee, D. E. (1997). *Cooperation and Conflict in the Mekong River Basin*. *Studies in Conflict and Terrorism* (20), 167-184.

Wyatt, A., & Baird, I. G. (2007). *Transboundary Impact Assessment in the Sesan River Basin: The Case of the Yali Falls Dam*. *International Journal of Water Resources Development 23* (3), 427-442. doi:10.1080/07900620701400443.

Xayaburi Dam Work Begins on Sly. (2011, April 17). *Bangkok Post*. Retrieved from http://www.bangkokpost.com.