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Unsustainable Development in the Mekong: The Price of Hydropower

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1. Introduction

What is sustainable development? Since its inception at the 1992 Earth Summit, "sustainable development" has been woven into the language of development and global change. Recognising that past development paradigms have been fixated on economic growth, marginalising social and environmental dimensions of progress, the concept of "sustainable development" has attempted to reconcile all three developmental dimensions (Moldan et al, 2012). Broadly understood, "Sustainable development" not only integrates these societal goals, but also ensures that the health of human and natural systems are not compromised for the benefit of future generations. However, this concept has remained the holy grail for development, implementation falling short of theoretical ideals (UNEP, 2012). Furthermore, its broad and open nature has resulted in many interpretations, each fiercely contested on multiple scales (Zaccai, 2012). In the following sections, I illustrate some challenges for sustainable development through examining hydropower development in the Mekong Basin. Using the successor framework to the Millennium Development Goals (MDGs) – the Sustainable Development Goals (SDGs), I highlight the unsustainable trajectory of hydropower development in the Mekong river basin and lay down several policy imperatives for sustainability.

Over the past two decades, the world has witnessed tremendous progress in human development. Under the MDG framework, countries have made significant improvements in poverty alleviation, gender equality, education and healthcare provision. However, there is still much room for improvement for people and planet. In the 21st Century, many now speak of the Anthropocene, where human activities are now rivalling the forces of nature, shaping the landscape and processes of the planet (Steffen et al, 2007). Widespread and destructive, this human footprint is threatening the stability of the natural and societal fabric sustaining human well-being (MEA, 2005; Rockström et al, 2009). Responding to this challenge, Griggs et al (2013) have proposed a successor framework to the MDG to represent the challenges of sustainable development, better manage trade-offs and maximise the synergies between developmental goals. 6 goals encapsulate the drive for human progress; thriving livelihoods, sustainable food security, sustainable water security, universal clean energy, healthy and productive ecosystems, and governance for sustainability. As will be argued, hydropower development in the Mekong has

prioritised energy security at the expense of the other dimensions of sustainable development.

2. Overview - The Mekong River Basin

The Mekong River is one of the world's largest and diverse river systems. Beginning its life in the Tibetan Plateau from snowmelt and driven by the seasonal monsoons, it snakes 5,000km through China, Myanmar, Laos, Thailand, Cambodia and Vietnam before meeting the South China Sea (Adamson et al, 2009). During its journey to the ocean, it breathes life into both human and other-than-human communities. Indeed, the Mekong basin is home to one of the planet's biodiversity hotspots, regions containing endemic and threatened species (Myers, 2003). Biological diversity is also accompanied by cultural diversity, with over 70 ethnic groups living along its course (Middleton, 2011). From this assemblage, coupled human-natural systems emerge from the various complex interactions between ecosystem health, biodiversity, livelihoods and cultural-spiritual practices (Liu et al, 2007). Such systems, featuring non-linear thresholds, are poorly understood. As a result, irreversible tipping points are often crossed unknowingly, with adverse effects on all communities. Such is the case with the Mekong's flood pulse, the annual variation that introduces spatial and temporal complexity to the river basin, around which biological, agricultural, economic and cultural-spiritual systems revolve around. In disrupting material and energy flows along the Mekong, hydropower dams, compromise the health and functioning of these coupled human-natural systems (Grumbine et al, 2012).

Because of the transboundary nature of the Mekong, there are many obstacles to sustainable river governance, notably competing national interests (Campbell, 2009; Dore et al, 2012). Recognition of the need for cooperation and collaboration among the Mekong countries began in the late 1950s to ostensibly manage and develop Mekong water resources for hydropower and agriculture (Sneddon and Fox, 2006). Under the auspices of the United Nations Development Program (UNDP), the Mekong Committee was formed to provide the necessary hydrological data for development purposes. Of course, it was also in the American interest to counter communist influence within the Indochina region (Sneddon and Fox, 2006). However, Cold War geopolitics and proxy conflicts destroyed all prospects for cooperation.

With the end of the Cold War and the cessation of the Cambodian civil war in the early 1990s, Mekong cooperation revived. In the wake of conflict, the Mekong Committee renewed impetus towards regional development with the 1995 Mekong Agreement, which created the Mekong River Commission (MRC) to coordinate transboundary development of the Mekong's water resources. Moreover, the Asian Development Bank (ADB) also spearheaded the Greater Mekong Subregion (GMS) programme in 1992 to promote economic development and technical cooperation within the region. Engagement with regional neighbours has also resulted in several initiatives to further cooperation within the Mekong, such as the Mekong Basin Development Cooperation (1996), the Development Triangle Initiative (2000) and

the Lancang-Upper Mekong River Commercial Navigation Agreement (2001) (Chang, 2013). Notwithstanding, as will be demonstrated, Mekong governance is still fragmented, driven by national interests, and detrimental to local communities and ecosystems.

3. Energy Security and Development in the Mekong

Regardless of criticism, expansion of hydropower on the Mekong is admittedly a developmental imperative. For most of the people in the Mekong countries, secure and clean energy supplies remain elusive. Most households still depend on traditional sources of fuels, such as wood or charcoal (ADB, 2008), which causes health and safety problems for users. Almost a fifth of the people in the Mekong live in poverty and lack basic water and sanitation infrastructure, a need that could be easier met with reliable energy supplies (Grumbine et al, 2012). Moreover, in the years to come, the electricity consumption in these countries is expected to grow. Already, in the period 1990-2006, electricity consumption has tripled, slightly outpacing production (ADB, 2008). By 2025, the urban population in Mekong countries is expected to grow by 33 million, increasing energy demands. Complicating matters is the fact that developmental stages, energy resources and electrification rates are highly uneven between the Mekong countries. For instance, while Thailand and Vietnam possesses developed grid systems for cross-border power exchanges, Cambodia, Laos and Myanmar have lower quality grid infrastructure (Zhai, 2010). Likewise, electrification rates vary from 95% in the relatively developed regions of Yunnan, China and Thailand, down to 18% in Cambodia (ADB, 2008).

To meet this energy and human development challenge, it becomes necessary to tap the massive hydropower potential of the Mekong River, of which only a small proportion has been exploited. Laos, for example, is planning 60 potential hydropower projects and is expected to increase hydropower production from 1,000 MW to 30,000 MW by 2029. Thailand, for which industry accounts for half of GDP, and which is expected to grow, is also promoting hydropower development in neighbouring Cambodia, to access cheap and abundant electricity supplies (Chang, 2013).

To this end, various institutional arrangements have been initiated to promote cooperation in hydropower development, most notably a regional power market between the Mekong countries (Zhai, 2010). Not only would hydropower development drive economic growth, but multilateral cooperation would result in lower investment, operation and energy costs (Yu, 2003; Watcharejyothin and Shrestha, 2009; ADB, 2013). Indeed, a regional, interconnected grid is projected to produce savings of up to $145 billion and reduce carbon emissions by 11% (Zhai, 2010). However, as much as developing hydropower on the Mekong enhances the energy security of the Mekong peoples, the trade-offs incurred in the health of other human and natural systems make it an unsustainable enterprise.

4. Ecological Impacts

Because hydropower dams modifies and obstructs material and energy flows along a river's course, the health of ecological systems which depend on such flows is compromised. This is especially pertinent to a large river system like the Mekong, which is driven by spatial and temporal variations in flow regimes. On a fundamental level, hydrological flows on the river are altered by impounded reservoirs and regulating water flow (He et al, 2006). While the flow regime of the Mekong is so large as to be unaffected by dam operations, continual hydropower development has caught up, and now flow rates are visibly affected. Although such flow regulation can be positive, functioning as flood control, increasing irrigation, enhancing river navigation and combating saltwater intrusion on agricultural lands, disruption of the river flow has adverse effects on ecological systems (He et al, 2006). Migrating fish are not able to reach their breeding or feeding grounds, enriching sediment is trapped behind reservoirs and soil erosion occurs downstream where flow rates are increased. Furthermore, because of the altered flow rates, habitats are also modified. Water levels in the Tonle Sap lake in Cambodia are expected to rise during the dry season and fall during the wet season due to dam operations (Arias et al, 2012). Consequently, the extent of flooded area is expected to change by 1,000 square kilometres, with implications for sediment deposition, nutrient cycling and habitat provision.

Dam construction can have ecological impacts by introducing industrial chemicals and heavy metals, whose impacts are poorly understood, into the ecosystem. Investigations around the Manwan, Dachaosheng and Nuozhadu dams in the upper Mekong basin have revealed significantly higher levels of arsenic, cadmium, chromium, copper, nickel and lead in reservoirs and downstream areas (Chen et al, 2011). Introduced into the ecosystem, such toxic substances enter the environment, accumulate in marine organisms, eventually posing health risks to organisms and communities higher up the food chain.

In addition, riparian communities are destroyed when water levels rise, flooding vegetation that provide food and habitat to riparian fauna (Li et al, 2012). Moreover, the resulting soil erosion increases the risks of landslides. Further up the trophic level, phytoplankton populations and distribution are also affected when dams block the flow of rivers, creating artificial reservoirs, causing changes in water temperature, pH, suspended solids or flow velocity (Li et al, 2013a). Because the river is fragmented, distinct conditions develop in habitat fragments which result in changes in phytoplankton composition and abundance. Consequently, eutrophication can result, with economic and ecological impacts on the surrounding human and natural communities. Likewise, fish communities are also affected by altered habitats (Li et al, 2013b). Loss of habitat and shifting hydrological conditions interfere with migratory patterns and changing the distribution and reducing abundance of fish species. Ultimately, such disrupted trophic, hydrological and geomorphic processes may expose the ecosystem to risks of bioinvasions from exotic or invasive species (Walder, 2008). As much as invasive species may not necessary result in negative impacts, contributing to ecosystem diversity and

functionality, ecosystem interactions are hard to predict and any human modifications should be approached with precaution (Schlaepfer et al, 2011).

Although recent studies have made it clear that dam development come with a high ecological price, the hydropower impacts on ecosystems and biodiversity are still poorly understood and understudied (He et al, 2006; Orra et al, 2012). Moreover, current environmental assessments often do not meet international standards. The Environmental Impact Assessment (EIA) conducted for the Xayaburi Dam in Cambodia was extremely limited (Baran et al, 2011). Not only did it exclude livelihood concerns, but biodiversity and ecosystem assessments were not comprehensive enough. Proposed fish passage mechanisms did not consider the unique characteristics of the fish species of the Mekong. Without contextualised ecological knowledge to guide hydropower development, ecosystem health will be compromised, driving unsustainable development. Hence, it is imperative that the knowledge gap be bridged, technical expertise and policy frameworks developed to ensure that hydropower development occurs in an ecologically-sensitive manner.

5. Coupled Human-Natural Impacts

In addition, because of the close linkages and dependence between human and natural systems in the Mekong basin, ecological impacts result in cascading implications for human communities. Accordingly, the hydrological, ecological and geomorphic changes on the Mekong have resulted in adverse impacts on the livelihoods and food security of human communities in the Mekong basin (Sneddon and Fox, 2006; Middleton, 2011). As the world's largest in-land fishery, the Mekong river sustains the livelihoods of 40 million people, who depend on fishing for their livelihood and subsistence. In fact, the Mekong river provides an estimated annual catch of 240,000-400,000 metric tons of fish worth at least USD$1.2 billion (Sneddon and Fox, 2006). More importantly, Mekong fisheries provide an irreplaceable source of protein for the communities in the region, constituting between 47-80% of dietary requirements (Dugan et al, 2010). As such, reductions in fish populations would have serious repercussions on the nutritional state of Mekong communities. Unfortunately, as a result of the aforementioned hydrological and ecological impacts from dam development, fish productions have already witnessed a decline of 10-26% over the last few years, threatening the livelihoods and well-being of Mekong communities (Orra et al, 2012). Along the Thai-Lao border, fishing catches have declined 50% in the period of 2001-2003 (Middleton, 2011).

Hydropower development has also contributed to the erosion of Mekong culture and traditions as the collective spiritual beliefs, value systems, traditions and modes of life are compromised (Matthews, 2012). For the people of the Mekong, the physical landscape where they live and which sustains them is also a landscape where their cultural heritage and identities are embedded in (Tengberg, 2012). Hence, when the local ecology of a Mekong community is altered, disturbed or destroyed because of hydropower development, all ties – physical, economic, cultural and spiritual – are severed (Matthews, 2012). Inundation of land where entire villages are resettled cause the literal uprooting of a community from the local ecology, around which their

cultural beliefs, practices and ways of life have evolved. Material cultures such as livelihood practices (fishing nets, practices, traps) and traditional ecological knowledge are rendered obsolete. For instance, because of the decline in fishing catches due to dam operations, indigenous fishing methods have vanished as fishing families turn to alternative means of livelihoods such as tourism. For instance, fishing using cormorant birds is an indigenous fishing method found in Guilin village of the Yunnan province in China. However, as fishing is unable to sustain families, fishing communities have turned to providing tour services (Noll et al, 2010).

6. Unsustainable Governance

Underlying the social and environmental distortions around hydropower development in the Mekong is flawed governance paradigms. Governance for sustainability has to be transformational, inclusive and adaptive (Griggs et al, 2013). For one, in order to be transformative, governance processes has to be comprehensively multi-scaled to address and correct structural flaws. However, the main governing mechanism in Mekong hydropolitics has been the Mekong River Commission established in 1992 to prevent water shortages by governing flow regimes. Thus, the ecological and human complexity of the Mekong is reduced to a one-dimensional measure of hydrological regimes (Sneddon and Fox, 2006; Middleton, 2011). Naturally, social and environmental concerns outside hydrological flows will be neglected. EIAs were often poorly conducted. In the EIA for the Yali Falls dam in Vietnam, the project boundary was a mere 6km. Moreover, neighbouring Cambodian authorities were not notified (Dore et al, 2012). In addition, a major impediment towards cooperative Mekong governance is the over-riding concern of national interests and sovereignty among the Mekong countries (Campbell, 2009). For instance, China is not a member of the MRC, not sharing hydrological data with other countries, limiting ecological understanding of changes in the Mekong ecosystem.

Because the MRC is based on principles of consensus, non-binding decision-making and non-interference in intra-state affairs, it is ham-stringed by limited political commitment from the Mekong countries. For example, words such as "rules" have been contested by Thailand, because it infringes on Thai sovereignty to govern resources within its national boundaries (Campbell, 2009). Notification and collaborative mechanisms are poorly developed. Vietnamese efforts to construct levee banks to promote irrigated rice resulted in severe flooding in Cambodia, causing tensions to flare between both parties. Thus, the MRC is unable to craft a coherent vision for Mekong development. Consequently, without a collective front, it is not possible to effectively govern the transboundary nature of the Mekong River.

Furthermore, agenda-setting and decision-making in matters concerning hydropower development have been made exclusive to state and private entities such as government agencies, banks and corporations (Yong and Grundy-Warr, 2012). Such an arrangement maintains existing power relations, limits local participation in discussion and marginalises local concerns over social and environmental abuses

(Sneddon and Fox, 2007). Although the MRC has established dialogue with large international NGOs, it has limited engagement with small local NGOs and local communities (Campbell, 2009). Consequently, such exclusionary processes promotes a developmental bias to emerge within the discourse surrounding hydropower development, further marginalising alternative development perspectives (Sneddon and Fox, 2006). For instance, an uneven influence over policy discourse has apportioned blame for declining fishing stocks to poor fishers, overlooking the salient role of commercial fishing activities (Friend and Arthur, 2012). The end result is that Mekong development has been appropriated by neoliberal forces that have succeeded in framing the river system for certain privileged groups of actors, at the expense of local communities. Without an inclusive governance process, certain perspectives are empowered while others are marginalised and silenced, resulting in inadequate knowledge for governing complex coupled human-natural systems.

7. Policy Imperatives Towards Sustainability

Fundamentally, the aforementioned socio-ecological compromises can be attributed to under-scaled governance institutions and processes. Participatory governance of the Mekong has been poorly implemented, contributing to marginalisation of certain groups of people (Sneddon and Fox, 2007). Therefore, Mekong governance needs to evolve towards greater polycentricity, involving a comprehensive range of stakeholders.

Such polycentric governance would not only promote more robust river management by promoting diversity in problem-solving, but also contribute to a greater sense of accountability and legitimacy (Sovacool, 2011). Additionally, because local stakeholders are consulted and integrated into planning and decision-making, governance can be responsive to local needs and contexts. Thus, Mekong governance is resilient to dynamic shifts in the environment, being able to respond and adapt through local ecological knowledge. Admittedly, such an approach will run up against many challenges, such as unequal power relations within and between communities, social classes, ethnic groups, between gender and across ages (Sneddon and Fox, 2007). Moreover, such polycentric governance may encounter difficulties transforming the official discourse around development, which views NGOs and local communities with distrust and suspicion. Simultaneously, polycentric governance is not without drawbacks. Engaging a wide range of stakeholders may result in fragmented networks, which may be difficult to coordinate. Moreover, diversity of stakeholders can also lead to contestations over legitimacy and accountability if not conducted in an equitable and transparent fashion (Sovacool, 2011).

Nonetheless, polycentric governance, if pursued, would also help to bridge the knowledge gap and build up capacity within Mekong governance institutions. Because of limited participation from all stakeholders, ecological knowledge about Mekong processes is lacking. Besides having little resources to develop a knowledge base about Mekong ecology, there is also an under-developed research culture in universities within Mekong countries, which has contributed to poor engagement

with the MRC. Moreover, data-sharing mechanisms are poorly developed, data not forthcoming from countries. (Campbell, 2009). Thus, with greater inclusivity in consultation and integration from polycentric governance, knowledge gaps can be bridged, building the knowledge foundation and forming the networks to build up river governance capacity.

In addition to improving consultation processes, trade-offs have to be better managed. Compensation processes also need to be multi-scaled. Social and environmental impacts may take place across multiple scales. For example, compensation may improve material wealth at the cost of embodied (livelihood skills) or relationship (social capital) wealths (Wang et al, 2013). While villages near the Xiaowan Dam enjoyed better access to education and healthcare due to developed road infrastructure, other communities suffered because they lacked roads. Although government programmes helped diversify incomes in villages, benefits were often unevenly distributed (Wang et al, 2013). The winners and losers of development policies have to be identified, treated and compensated fairly to avoid disenfranchising communities. Thus, compensation policies need to expand their system boundaries to ensure a comprehensive and equitable settlement for displaced and affected communities.

8. Concluding Thoughts

From the first applications of hydraulic manipulation in Mesopotamia to modern dams, hydropower has acted as a significant instrument of change, improving lives by harnessing the kinetic energies of water (Sternberg, 2010). And so, similarly for the developing countries of the Mekong basin, this energy is necessary to drive economic growth. However, in the bid to secure a supply of clean and cheap electricity, social and environmental dimensions to Mekong development have been neglected and compromised. Consequently, hydropower expansion on the Mekong is promoting unsustainable development where the health and interests of ecosystems and human communities are compromised. To ensure a sustainable environment, where human and natural systems can flourish over succeeding generations, governance has to be polycentric and equitable. With a transparency and legitimate decision-making process, coupled with equitable compensation policies, it will be possible to develop the water resources of the Mekong in a sustainable way. In the final analysis, the six pillars of the SDGs are not of equal importance. As important are energy security and livelihoods, without the ecological substrate that sustains human activities, no development can take place. Ultimately, we need to recognise that:

> "[for] sustainable to mean anything, we must embrace and then defend the bare truth: the planet is primary. The life-producing work of a million species is literally the earth, air, and water that we depend on. No human activity- not the vacuous, not the sublime- is worth more than that matrix. Neither, in the end, is any human life. If we use the word "sustainable" and don't mean that, then we are liars of the worst sort: the kind who let atrocities happen while we

stand by and do nothing." (Mcbay et al, 2011)

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