

The Sustainable Management of the Mekong River Basin: Insights from Buddhism

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Introduction

Winding 4,900 kilometers across and between six nations, the Mekong River provides the essential resource for life for over 65 million people embedded within a remarkably rich and diverse ecosystem (Great Rivers Partnership 2015). It is the “circulatory system” for this economically dynamic and increasingly influential part of the world and represents a powerful metaphor of the profound interdependence of life. The significance of the Mekong for the livelihood of so many people, and its potent function as an interconnecting framework, elevate it as a prime concern for sustained and positive development in the region.

At national levels, the significance and interconnectedness associated with the Mekong River does vary considerably: from Cambodia and Laos, with 90% and 87% (respectively) of their population in the basin, to Vietnam (27%) and Thailand (33%), to Myanmar (1%) and China (25% of the Yunnan provincial people but just 0.7% of the total national population)(Kuenzer et al 2012; WWF Global 2015)(see Figure 1). The national contributions to total Mekong flow volumes also vary substantially from around 35% (Laos), to 10-20% for China, Cambodia, Thailand and Vietnam, to only 2% for Myanmar (Mekong River Commission 2005). Hence, there are also considerable differences in the direct interdependence felt via the Mekong’s existence and in the extent of immediate incentives to cooperate for beneficial outcomes.

Trans-boundary waterways are often a major source of conflict. However, if the idea of strong interconnectedness is extended beyond the upstream (cause) to downstream (impact) flow of a major river such as the Mekong, then there is good case for significant potential gains from cooperation. Indeed, profound ecological interdependence at local to global scales is increasingly accepted. In addition to this general paradigmatic shift in scientific and economic perspectives, the Buddhist world view reinforces a need to think in this way, that is, to be aware and take into account the cogency of universal interconnectedness and the close links between thought, intent, action and consequences. For the Mekong Region, this is both highly apposite and opportune given the strong influence of Buddhism across the suite of Mekong countries (see Figure 2).

There has been growing recognition and efforts to enhance cooperation and general economic returns under secular initiatives. From early moves for integrated approaches since 1957 (at least amongst four of the Mekong nations), at least the foundations of international cooperation and a “trans-regional” approach to manage demands upon the Mekong River, is now well established – notably under the auspices of the Mekong River Commission since 1995 (Le-Huu et al. 2003). The generalized view adopted is one of “integrated water resources management” (IWRM) that embeds human water use needs within catchment and fresh water cycles and as an intrinsic part of the ecosystem across the entire relevant spatial and temporal domain. Arguably,

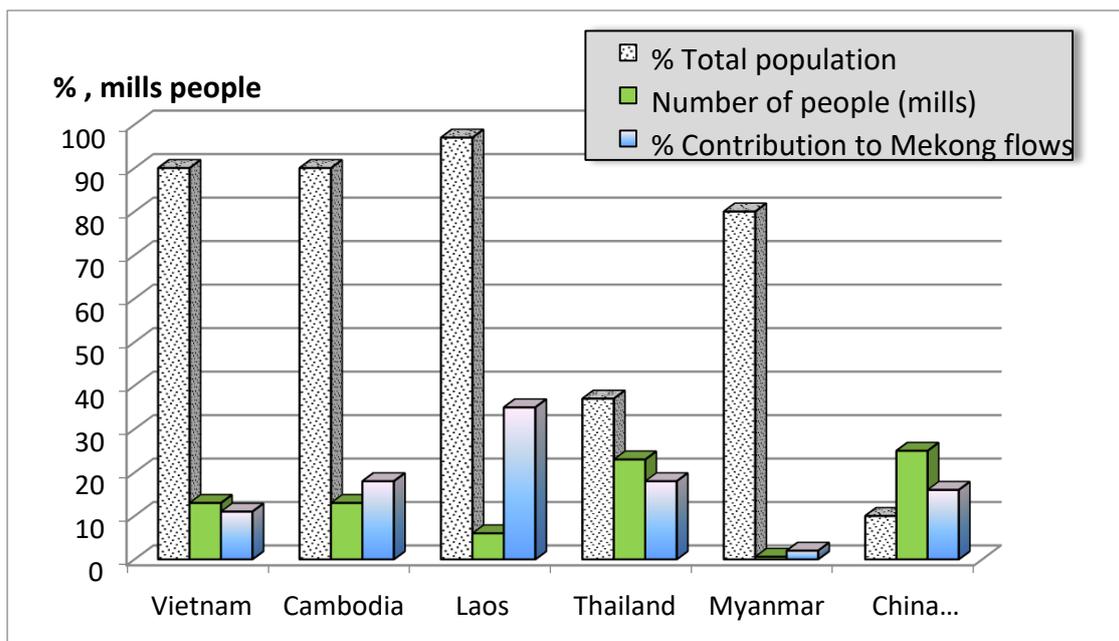
many of the “sustainability thinking” dimensions (and more implicitly, many key Buddhist notions) are already taking hold. International cooperation has been facilitated by peace and growing economic relations over the past two decades.

Nonetheless, some are less sanguine about the extent, institutional capability and effectiveness, and extant positive outcomes from cooperation (for an example of more critical views, see Pech and Sunada 2008). There are certainly a number of major potential, and likely, infrastructure developments that pose as a potential source of dispute (notably the numerous hydropower dams planned for the Mekong tributaries and main-stem). Hence, there would appear to be a need to deepen the international cooperation process to ensure the sustainable management of human use of the Mekong River.

This paper addresses this perceived need and explores how the Buddhist world view can provide a suitable logic and platform to help guide and encourage trans-boundary cooperative strategies and actions for the sustainable management of the Mekong Region, by the suite of Buddhist nations sharing the Mekong River Basin. We examine supporting views inherent within Buddhism. Of particular note and interest here is the notion of dependent origination and the profound appreciation and understanding of the “scientific” nature of ecological and social interdependence. However, we also consider relevant implications of the Four Noble Truths, and the means proffered in the Eightfold Path as well as consistent knowledge and experience available from 21st century environmental science, economics and technology fields.

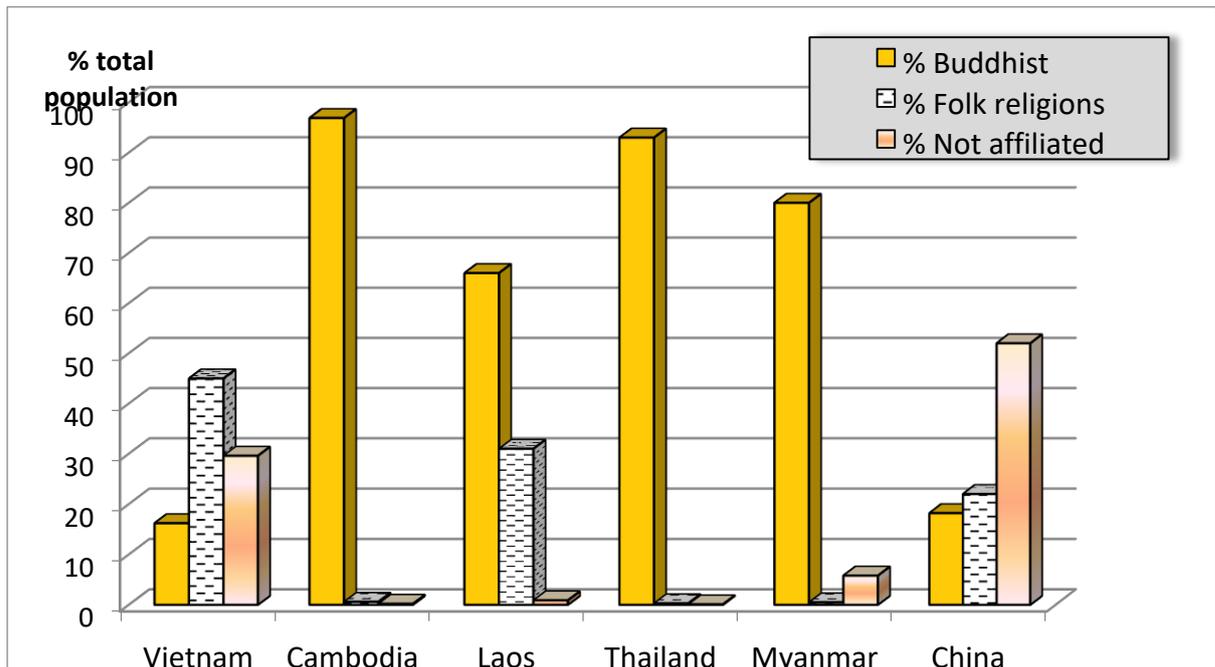
Of course, there are many other natural resource issues in the Mekong Basin, not just water and the river itself. However, many are related and the paper focus is upon water and the Mekong River for parsimony. The same logic and arguments, drawing upon Buddhist insights, would apply across most resource management issues.

Figure 1 - National population in the Mekong Basin (mills and % total, 2010) and % contribution to Mekong flow (2005)



Source: Kuenzer et al. (2013); Mekong River Commission (2005)

Figure 2 - Religious composition of the Mekong Countries (2010)



Source: PEW Research Center (2015)

Environmental Pressures in the Mekong Region:

As noted, the Mekong River system is a vital resource nourishing an immense and highly biodiverse ecosystem and over 55 million people who depend upon rural, natural resource-based economic activities for their livelihood within the Lower Mekong Basin (IUCN, 2011). For the remaining regional population whose livelihoods do not depend directly on the ecosystem services of the Mekong system, the supply of water for domestic and other uses, and general ecosystem services would be likely to be vital for their daily life. Furthermore, the Mekong provides a wide range of economic functions and services to those outside the region – including the provision of hydropower to many nations across the region, the supply of food, forest and other agricultural output, and global ecosystem services such as nutrient cycling and soil formation, rain creation, climate regulation, and air quality improvement, carbon sequestration, existence value, and pharmaceutical and other option values.

The viability of these services to humans is already under pressure from many sources. Continued growth in the Mekong Basin's population and reasonable levels of per capita economic growth, combined with a relatively stable economic structure,⁸⁹ will assure the growth in demand for food, water, agricultural production for export (especially rice), and some industrial output, and will see a concomitant increase in demand for fresh water from the Mekong and its hydrological system. Population in the region is expected to grow by at least 60% by 2050 – largely due to increases in Cambodia, Laos and Vietnam (Peach and Sunada 2008). Hence, the vital services and other benefits provided by the Mekong Basin are under threat.

⁸⁹ Thailand has experienced significant structural change away from agricultural production but this is focused in the larger urban areas outside the Mekong and the north-east is still experiencing high growth in demand for agricultural water (LeHuu et al. 2003).

In order to compile and highlight some of primary socioeconomic drivers, environmental pressures and socioeconomic impacts related to the Mekong River Basin, the popular DPSIR environmental problem analysis framework has been employed.⁹⁰ The DPSIR framework, developed by the European Environmental Agency, takes an interdisciplinary and systems analysis view. Environmental issue themes are typically analyzed as a series of separate steps (D-P-S-I-R) (Kristensen 2004). For example, climate change may be analyzed as beginning with economic activities (and underlying social factors) forming the driving forces (D) that exert material and energy flows (greenhouse gas emissions) and other pressures on the environment (P).

In turn, these generate changes in the state of the environment (S)(e.g. agricultural area available; fish stocks) that lead to impacts upon society as both economic and social costs or benefits (e.g. loss of agricultural output; flooding impacts). These unintended impacts (often called “externalities”), may elicit societal responses (R) via policy and other action to modify the initiating driving forces or, more superficially, to redress pressure and state condition changes. The DPSIR model has been adopted by the majority of the European Community nations as the best way to structure environmental information concerning specific environmental problems so as to reveal existing causes, consequences, effective responses and trends and the dynamic relationships between these components.

A preliminary analysis of the driving forces, pressures and state changes, and societal impacts pertaining to the Mekong Basin are provided in Table 1. It is important to note that, under the DPSIR view, “impacts” (that is, I) refer to economic and social impacts such as fisheries productivity change and not environmental flow or state changes such as nutrient and environmental flow changes (these are covered in P and S). Also, driving forces be both the source of environmental pressure on the Mekong Basin system, but they can also be, in turn, affected by the changes in environmental states. These effects can be positive or negative. For example, while tourism may have some adverse impacts on the provision of Mekong Basin services, it is likely to be positively affected by better water quality and other environmental amenity improvements, and also by some developments, such as dam-building, that can also have a suite of negative impacts on the underlying driving forces (e.g. fishery and agricultural productivity).

In addition to underlying growth in population, and associated food and water needs for direct consumption and export, the WWF (2015) list the four major threats (driving forces) in the Greater Mekong Sub-region as:

- hydropower
- climate change
- habitat loss (from multiple sources)
- illegal wildlife trade

However, perhaps the most definitive aspect of environmental problems, especially broad trans-boundary issues, is the complexity and interdependence between and within driving forces, environmental changes and impacts on society (Thiele 2011). They represent the classic case of “never being able to do just one

⁹⁰ The DPSIR acronym refers to a “causal” flow from Driving forces, to Pressure, to State, to Impact, to Response. The loop is also closed by intentional actions (response) addressing the underlying driving forces or ameliorating pressure or state effects. Environmental state changes from the anthropogenic drivers may also directly impact those driving forces (e.g. their productivity) via altering the natural resource condition basis of those activities.

thing”. The flow-on effects of human actions in communities that are deeply embedded in a highly interconnected web of life in the Mekong ecosystem, are extensive and profound and will reverberate around almost every part of the greater basin system and outside into global ecosystems (and their human economy components).

Hence, the driving forces shown in Table 1 are inter-related as are the pressures and state changes they generate and the impacts back on humans. The “causal” paths between the elements of the table are not exclusive and can only be depicted as a matter of relative magnitude. The pervasive interdependence that must be recognized for achieving sustainability is intrinsic to biogeogenic or natural systems and anthropogenic action and effects are simply an extension of this. For example, Cambodia’s great Tonle Sap lake naturally buffers water flow by storing some of the peak flows from July to September and releasing supplies in low-flow season from October to April (Le-Huu et al. 2003). Indeed, the nature of extensive interconnections in the Mekong region has engendered a dynamic equilibrium between ecological, hydrological, landscape and climate conditions in the region. Human intervention in this equilibrium has been accommodated within these processes until recent decades but the perturbations are now substantial and increasingly significant.

Many of the adverse general social and economic impacts (I) of human intervention in the Mekong Basin tend to result from either (a) consequent reduced supply or depletion of water resources (often within seasonal cycles) or (b) from activities that degrade the resource by changing its quality in terms of nutrient levels and disease facilitation potential. However, there are many other less direct impact sources from humans.

Table 1 An Indicative DPSIR Analysis of the Mekong River Basin

DRIVING FORCES	PRESSURES (P) / STATE CHANGES (S)	(SOCIAL AND ECONOMIC) IMPACTS (I)
<p><u>Direct Water Resource Related</u></p> <p>1. IRRIGATION - local and export. Other agricultural commodities</p> <p>2. HYDROPOWER – electricity generation (primarily for national and export markets)</p> <p>3. NAVIGATION / TRANSPORT - for trade, tourism, community interactions; including blasting to improve navigation through shallow and rapids</p> <p>4. FISHERIES and AQUACULTURE - food source, export; Mekong basin as the world’s largest fresh water fishery</p> <p>5. URBAN WATER SUPPLY – for industry as well as urban populations</p> <p>6. RURAL WATER SUPPLY and sanitation improvements - for non-irrigation local water supply</p> <p>7. DRAINAGE, SOLID WASTE, AND SEWAGE DISPOSAL - principally in urban areas; industry and development.</p> <p>8. TOURISM</p>	<p><i>Pressure and State Changes Combined</i></p> <p>Loss of agricultural land supply – from flooding</p> <p>Loss of agricultural land supply – from inundation</p> <p>Loss of biodiversity rich land – from flooding</p> <p>Loss of biodiversity rich land – from inundation</p> <p>Deforestation (a major issue for the Upper Mekong Basin) (The Mekong Region is considered a biodiversity hotspot area)</p> <p>Environmental flow changes – volume, timing and by quality – from dam, land cover change, and climate change related precipitation change</p> <p>Water quality – nutrient level change</p> <p>Flooding</p> <p>Saltwater intrusion</p> <p>Drought</p> <p>Coastal ecosystem loss – from flow changes and aquaculture and rice cultivation</p> <p>Groundwater supply loss</p>	<p><i>Economic and social costs and benefit changes</i></p> <p>Food and other non-fishery agricultural productivity</p> <p>Fisheries productivity</p> <p>Tourism revenue</p> <p>Disease health – water vector-borne disease incidence</p> <p>Disease incidence – water quality based</p> <p>Community displacement / social dislocation – from dam inundation, flow change and sea level rise</p> <p>Social and economic losses from flooding</p> <p>Energy demands</p>
<p><u>Other Driving Forces</u></p> <p>9. FOREST PRODUCTS</p> <p>10. AGRICULTURAL LAND CLEARING</p> <p>11. ILLEGAL WILDLIFE TRADE</p> <p>12. CLIMATE CHANGE DRIVING FORCES</p>	<p>Sea level rise, precipitation pattern and temperature changes, coastal ecosystem loss, other potential climate change impacts</p>	

Sources: Compiled from Peach and Sunada (2008); WWF (2015)

Perhaps the most dramatic existing and future potential source of perturbation shaking the web of interdependence in the region comes from the construction of hydropower dams on the Mekong's tributaries. In the Lower Mekong Basin, there were 25 operational hydropower dams in (2011), 99-133 tributary (and some mainstem) projects planned or being explored (2011, 2013), and seven dams completed or near-completion on the mainstem of the Mekong in China (2013) (Kondolf et al. 2014; Pearse-Smith 2012). As Pearse-Smith (2012, p75-76) notes:

Over the past fifteen years, however, hydropower development has begun to alter the hydrology of the basin (UNEP, 2006; ICEM, 2010). 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, 2010). 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.

Hydropower dams have an extensive range of environmental and associated social and economic impacts, both positive and negative. A brief list includes:

- tourism and recreational opportunities
- water availability and quality for downstream irrigation and other uses including irrigation and agricultural productivity (food security)
- fisheries productivity (food security)
- flood control
- saltwater intrusion
- agricultural and biodiversity land (inundation)
- nutrient and sediment changes
- social dislocation (inundation and infrastructure)
- loss of agricultural land (infrastructure)
- lower carbon emissions renewable energy supplies
- external economies from infrastructure

(Keskinen 2012 and others)

Many of these impacts are related to the effect of dams in altering the Mekong's environmental flows. The concept of "environmental flows" refers to "the quantity, timing, duration, frequency and quality of water flows required to sustain freshwater, estuarine and near-shore ecosystems and the human livelihoods and well-being that depend on them" (Acreman and Ferguson 2010, p.32). Changes in environmental flows will be important influences upon downstream water availability for a wide range of uses, nutrient levels and other quality conditions, fisheries productivity, saltwater intrusion, flood control and many other services provided by the Mekong.

While it is not appropriate to explore the complex and elaborate positive and negative impacts of dams in any detail here, they clearly demonstrate the profound nature of interdependence in ecological systems – especially those founded on life-vital water cycle and attendant systems.

Relevant Buddhist Wisdom for Sustainable Management of Human Use of the Mekong

As shown in Figure 2, all six nations in the Mekong Basin have very significant Buddhist influence in their sociocultural and political nature, with possible exception of Vietnam and China (at least according to the population percentages regarding Buddhist affiliation). However, it can be argued that both Vietnam and China are likely to have a stronger inculcation of Buddhist-related perspectives than the official statistics reveal when the discouragement of religious activity during their recent histories of austere communism are taken into account. Both nations also have substantial “folk” religion components that may well denote syncretic Buddhist beliefs. Furthermore, there is evidence of a resurgence in Chinese Buddhism since the reforms of the 1970s (Laliberte 2011).⁹¹

This paper continues with its analysis of how Buddhist concepts and world views can help facilitate more intensive and effective ongoing international cooperation in the sustainable management of human intervention in the Mekong River Basin. It is proposed that there is a great deal of potential for utilizing this shared view given the strength of the Buddhist influence across the region.

The dominant strands of Buddhism do vary across the Mekong countries – with the Mahayana branches prevailing in Vietnam and China, and Theravada Buddhism in the other nations. However, the strands share the essential teachings that form the basis for the potential contribution of Buddhism to more effective cooperation and planning. Three critical fundamentals include the notion of dependent origination (in its various forms and extensions), the Four Noble Truths, and the Eightfold Path. While it is possible to interpret Mahayana’s greater concern for facilitating the enlightenment path for all sentient beings as part of self-enlightenment, as a more pronounced recognition of universal interconnectedness, the latter notion remains as a cornerstone of the Theravada tradition (for example, see <http://www.theravada.org.za/environment.asp>).

While many of the underlying views and derivative actions and behaviors of Buddhism can be seen as consistent with those required for the prudent and sustained management of the precious services provided by the Mekong Basin, we focus upon the primary foundations associated with the notion of interconnectedness and dependent origination. There are alternative aspects and interpretations of this quintessential view across the various strands of Buddhism. They include the notions of *paticcasamuppada* or *pañicca-samuppàda* (equivalent to dependent origination) or *engi* (“arising in relation”) as underlying the doctrine or law or karma or *kamma-vipaka*.

The Four Noble Truths, Eightfold Path and other aspects of Buddhism supporting sustainability in the Mekong have some unique contributions but they all tend to rest upon the essential Buddhist cosmology of the fundamentally interconnected nature of the three spheres of human existence:

⁹¹ In 2007, 33% of 4,500 people surveyed across 31 provinces claimed to “believe in Buddhism”. The survey was undertaken by the Research Centre for Religious Culture at East China Normal University (Moxley 2010).

- (1) the individual realm (covering existence, thought and action);
- (2) the collective interrelations or institutions that form society;
- and
- (3) the rest of the natural world (Yamamoto 2003).

Feldman (1998, p.1) describes how *paticcasamuppada* “is a vision of life or an understanding in which we see the way everything is interconnected - that there is nothing separate, nothing standing alone. Everything effects everything else. We are part of this system. We are part of this process of dependent origination.” Similarly, Wagner (2007 p.333) notes that the “Buddhist approach is based on a concept of universal interconnectedness, mutual conditioning and a radical interdependence of all phenomena, and in this respect quite close to modern system theory. In the classical scriptures, reality is compared to a sacred net of many mutually interwoven strings at countless levels.”

In this universal ecology, the “ripples” from events or state changes in one realm directly spill over into the others - spatially, temporally and transcendentally - and bounce back upon the originator’s own welfare. In accordance with the a growing overall societal trend towards holism, this basic perceptual framework is highly compatible with the important new wave of environment sciences (for example, ecological economics, ecology, contemporary social ecology and natural health with their paradigmatic shift towards the primacy of nature and the “embedding” of humans, and their artefacts and built environment, within the rest of the natural world. It also aligns with the causal reciprocation views that now prevail in post-structuralist social science.

Despite the “other-worldly” fatalism sometimes ascribed to Buddhism, it can also be interpreted as providing a strong case for active and effectual pro-environmental initiatives. This is undeniably associated with both the importance attributed to the external world as the relevant context for spiritual progress and with Buddhism’s profound belief in the interconnectedness that permeates the universe. In Buddhism, all things, including plants, humans and other animals, and inanimate objects, are joined as part of the field of Buddha existence (or “Buddha-nature” in Mahayana) (Payutto, 1994; Inoue, 1997).

Environmental care is also intimately tied to a maxim of abstinence from injury to life and a boundless loving-kindness to all beings (*ahimsa* and *metta*). As discussed earlier, the interconnectedness between the three spheres of human existence (individual, society and nature) also underlies the natural order and karmic causality principles that explain the centrality of compassion in the Buddhist world view and highlight the importance of careful reflection upon the full, long-term consequences and intent of production, consumption and other human actions. As every action affects the whole universe and the self only exists in relation to others, actions that exploit the social or material world are self-injuring. The unified and interconnected nature of the universe suggests that “violent” action or intervention that consumes and damages the natural-material world, will have adverse repercussions in direct proportion to the extent of intervention.

In Buddhism, the law of dependent origination explains how all outcomes, results or effects (*vipaka*) of speech, action or body arise from a multiple causes or actions with intent (*kamma*). In turn, these causes arise from other *vipaka* and phenomena cease when the pre-conditions change. This is basis of the law of *kamma-vipaka* which adds the qualitative aspects by identifying how ignorant action with

“unskilful” or bad intent will lead to adverse results across the three realms (society, nature and back on self). “Skilfulness” is gauged by the extent to which craving, greed, delusions or aversion are embodied in the underlying motive and intent of the original action (Attwood 2003).

The mental component is critical here – deliberate, willful action is the source of (un)skilfulness. In Buddhism, the significance of consequent cause-effect chains, with ramifications far beyond the primary target of the originator’s action (and usually back upon the initial agent), is closely aligned with the central notions of “spillover effects” or “externalities” in contemporary economic–environmental thought (Daniels 2003).

However, there is also a strong argument that modern interpretations of Buddhism cannot simply rely upon skillful intent as the basis for “good” decisions and action. We are now aware, and have the capacity to gauge, many of the extended spillover or flow-on effects of our choices. In a complex, highly interdependent world, overcoming ignorance to fully explore and investigate the consequences of projects and other actions would be a vital aspect of effective Buddhist-inspired strategies for cooperation for the sustainability of the Mekong region.

Recognition of the Four Noble Truths would also play some role in helping cooperative action for the sustainability of the region. A detailed review of the Four Noble Truths and the Eightfold Path is not provided here on the assumption that the audience is familiar with these essential Buddhist precepts.⁹² In short, the Four Noble Truths warns of the futility of relentless expansion of consumption, and attendant production and demands upon environmental resources and labor and other social conditions as a means of providing true increases in well-being beyond the securing of essential physiological needs.

This wisdom is not of the same relevance in the Mekong region as in high income consumer market economies, given a need for substantial growth in material standards of living to provide for basic food, health and shelter needs and security. Nonetheless, it would help in the deferral of short-term economic gain motives in favor of actions promoting inter-connected well-being.

The prevalence of *dukkha* or pervasive dissatisfaction has profound economic consequences because it is associated with the existence of an eternal gap between what people want, and the satisfaction they receive, from biophysical reality. There are minimum needs that must be met to avert physiological deprivation, but in consumerist economies, the desire to satisfy systemic, constantly regenerated wants is a major motive of our lives, thoughts and actions, and permeates almost every aspect of society. Arguably, we really seek sustained satisfaction (and not the creation of new desires) but, instead, are attracted to and become “addicted” to an irrational process of short-term satisfaction of dynamic and endless wants.

A substantial part of the global market economy is predicated upon, and reproduced by, stimulating desire and maintaining the want-satisfaction gap – closure of this hiatus would certainly call for a major transformation in the nature and distributional outcomes of the economy as it now stands. The environmental harm and disturbance of the want– satisfaction roundabout and associated treadmill of production results from extensive biophysical intervention in the ecosphere in search of materials, water and energy for the extraction, manufacture, transport and services that expand economic activity and feed the relentless drive for new want satisfaction.

⁹² A description of the Four Noble Truths and Eightfold Path can be found in numerous sources on-line and in print. For an overview in relation to sustainability issues, see Daniels (2005).

The Eightfold Path details the multifaceted nature of changes in understanding, mental processes, patterns and thoughts, and actions and behavior that are required for progress towards reducing suffering (Sangharakshita 2007). The eight aspects have a natural flow from wisdom (right understanding and right aspiration) to moral commitment (right speech, action and livelihood) to mental regulation (right effort, mindfulness, and concentration) but they are presented as mutually reinforcing goals rather than a necessary linear sequence.

A central theme throughout the Eightfold Path is the principle of moderation or “the Middle Way”. As learned from the Buddha’s direct experiences in seeking the appropriate mental and behavioral *modus operandi* towards Nirvana, the effective path lies between the extremes of hedonistic self-indulgence and sensual pleasure, and excessive selfmortification or asceticism (Gunasekara 1982). Accordingly, the Eightfold Path contains a host of guidelines that directly shape the motives and nature of the human interface with the external world, and has great relevance for the sustainable economic activity and management.

Again, the principal features of the Eightfold Path lead to the need for thought and behavior that is carefully cognizant of their effect on others (and all facets of the “three realms”) and hence, back upon the welfare of the initiator.

Given profound interconnectedness and related concepts of interdependent wellbeing, a guiding maxim for human effort and action is to minimize harm or “violence” to one’s external environment. In the modern context, this does not necessarily mean inaction or no intervention, but Buddhist-inspired world views would advocate limiting intervention until the full social, economic, environmental and moral consequences of those actions are likely to be. This is not selfless altruism but a case of “intelligent self-interest” (XIV Bstan’ dzin-rgya, 1999) where loving kindness and compassion regarding our effects upon others is recognized as a key aspect of increased happiness for oneself.

Buddhist Inspired Strategies and Responses

In this section, we examine some of general influences that Buddhism may have in helping to garner interconnectedness-based international cooperation for sustainability in the Mekong region. It does not directly-focus upon specific economic development policies in the region (which is well-documented elsewhere) or the analysis of the Basin Development Plan (BDP) (1995) and legal and institutional frameworks though these developments are vital to the success of cooperative strategies and Buddhism-aligned perspectives would be likely to support such moves.

As noted, sustainability concepts and a concerted coordination process is already underway in the Mekong region. This is clearly evident in the establishment of the Greater Mekong Subregion and Mekong River Commission intergovernmental body with the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin and the BDP in 1995 (Le-Huu et al. 2003). However, there are still perceived to be major existing and new threats to sustainability in the region and the need for effectual cooperation will increase significantly in the near future (see Pech and Sunada 2008 and WWF 2015).

In practice, building on shared world view of Buddhism towards this end can happen in terms of (1) practical scientific assessment (identifying and quantifying the full range of social, economic and environmental costs, benefits and risks) and (2) political action in terms of consensus building, decision-making and resource support for greater cooperation and scientific assessment.

The range of areas for areas for cooperative benefit are extensive - agriculture, forestry and fisheries, transport, energy development, tourism, community development, flood control, drought alleviation and the mitigation of climate change impacts.

Perhaps the single most important potential contribution of Buddhism would be the thorough acceptance and adoption of the deeply inter-connected nature of nature and the associated interdependence approach required for achieving sustained and real increases in well-being. The key outcome from this view would be the minimization of harm or disruption to the ecosystem (including humans as a part thereof) whilst providing material needs and ensuring community capital. The only way to achieve this is via increased knowledge of impacts of development and programs (and component projects) for sustainability assessment and the application of Buddhist-inspired practical wisdom based on non-harm and related criteria.

Profound interconnectedness is so clearly manifest in the case of the complex, large and rich natural systems of the Mekong. While assessing the full range and extent of the consequences of any actions is an extremely difficult task, a Buddhist world view would see that the path to interdependent well-being is vitally dependent upon making intensive efforts to understand and assess the nature of cause-effect relations and interdependencies within this system so that interventions could be assessed in terms of, at the least, the crude magnitude of the perturbation or “net harm” cast upon the system (and back on humans). There are a host of existing and developing scientific methodologies for such “sustainability analysis” - ranging from Strategic Environmental Assessment (already used for the mainstream dams on Mekong (see ICEM 2010)), ecological analyses, “physical economy” techniques that measure the material and energy flows, and social and community impacts assessments. The shared aim is the minimization of society’s biophysical throughput or metabolism and other negative externality effects that flow on in cause-effect chains across space and time.

There has been a strong growth in organic, holistic views of the human-nature relation and the need to “ecologize” economic systems. One of the most recent and comprehensive incarnations of this integrated, synthetic framework is the theoretical, empirical and policy utility attached to the depiction of the operation of the society and its economy in terms of a “metabolism”. The socioeconomic metabolism consists of a network or “circulation” of physical flows of materials and energy (inputs and waste output) between nature and the economy, and the transformations and accumulations of these flows for human production and consumption within the economy.

These techniques include the related tools such as life cycle assessment, material and energy flow analysis, ecological footprints and environmental input-output tables (see Daniels and Moore (2001), Daniels (2002) and Wiedman et al., (2011)). These tools are growing rapidly in terms of application, sophistication, global and impact coverage, and methodological integration. Essentially, the ‘socioeconomic metabolism mapping’ or SEMM methods share a goal of measuring and “mapping” the resource and other biophysical flows, and often social impact effects, of consumption and production. The economy is a complex and highly inter-related entity and specific goods, services, sectors and other economic activity cannot be considered in isolation. A basic premise is that every action leads to a complex set of “ripples” through the (increasingly global) economy leading to impacts well beyond its original limited spatial and temporal domain. The parallels between the measurement of externality impacts, and knowledge and care for the law of *kamma-vipaka*, are obvious and clear.

Buddhist-inspired economies and the suite of sustainability tools aimed at analyzing and reducing society's metabolism share similar bases in terms of their perception of the relationship between humans, society and nature/the universe. A central theme is interconnectedness and the concomitant role of external effects beyond the initiating or transacting parties. It substantiates the need for economic actors to "internalize" their actions so that their market and non-market behavior and choices take into full account the extended influence of their intent and actions on the three interwoven spheres of human existence (their individual selves, the community and the natural world).

Typically, many of the SEMM sustainability analysis tools focus upon externalities linked to biophysical economy flow measurement across:

- a) all stages of the energy life cycle of projects in a region - exploration, production and harvesting, preparation, transport and storage, further processing, purification; utilization; recovery, waste and decontamination and by-product storage, as well as
- b) full supply chain social, economic and environmental externality impacts (positive and negative) of material and energy flows, land use change, and environmental state changes associated with each life cycle stage.

Ecological data and greater knowledge and understanding of basin dynamics and management are also critical and community-level research can effectively contribute to the knowledge and data that informs decision making in the Mekong setting and in helping to ensure that the needs and priorities of local people are taken into account.

A pivotal aspect consistent with the Four Noble Truths is also the recognition that non-consumptive activities can increase wellbeing and that action guided by endless craving and selfish material attachment will lead to further suffering rather than happiness. In specific regard to the natural environment, this change in belief, attitude and motive should have a beneficial impact by minimizing, or at least moderating and managing production activities (and consumption) so that material and energy throughput (and hence, environmental exploitation) and environmental state changes are mitigated.

In summary, such techniques provide a very useful knowledge base – a contextspecific episteme – about the likely nature and magnitude of action-effect and flow-on effects through the economy, society and nature (paralleled in the generalized view of Buddhism and *kamma-vipaka* flows through self, society and the universe). Better interconnectedness and "karmic spillover" knowledge can help operationalize the practical wisdom that Buddhism offers for effective sustainable energy analysis. With this knowledge, a general guide to decision-making might be that "less disturbance is better". Precautionary approaches involving less violent options and low levels of entropy conversion and intervention in natural cycles would tend to be strongly favored in management cooperation based on basic Buddhist insights. This would help make decisions with full regard to interconnectedness and minimum harm given resource demands required to generate real and sustained growth in well-being for the region (and beyond). In addition, a key goal to help minimize impacts would focus upon the development of technology for water and other resource-efficiency gains at appropriate scales of efficiency.

A *kamma-vipaka* approach to sustainability would emphasize and encourage research and development for cooperative international planning, assessment and strategic policy regarding water and other key environmental resources in the Mekong

basin and would provide useful insights, in combination with related sustainability analysis techniques, to create effective and productive but less harmful, more gentle, economic development.

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