Irrigation development and 'the Nexus': Ideology, politics and practices of Mekong region hydraulic control paradigm

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Abstract

Reforming and modernizing approaches to irrigation development appears to be a central part of the meteoric emergence of the "Water-Food-Energy Nexus" concept, in maintaining a managerial and technocentric thematic focus of the leading promotional institutions, albeit wrapped up in superficially newer narratives such as an ecosystem services approach or enabling a "green economy". Yet historically, irrigation development approaches supported by international aid organizations have consistently applied instrumental approaches that have been party to power centralization of the hydraulic bureaucracies and elites, whether intentional or accidental. These were often implemented on the basis of a strongly normative rhetoric of sustainability, participation, decentralization, integration across sectors, multi-use systems and other terms that pepper the Nexus lexicon. In the fast-changing and increasingly contested Mekong Region waterscapes, there is evidence to suggest that international development organizations promoting "WFE Nexus" approaches to regional and national stakeholders still tend to deliver relatively depoliticized and technocentric approaches to irrigation development (some bordering on utopian) that maintain the status quo and deter institutional adaptation by hierarchical hydraulic bureaucracy partners within centralized sovereign nation-states. Using examples from Thailand, Lao PDR and Cambodia this paper explores some of the modern ideological drivers and politics of irrigation development to illustrate the replication of governance (mal)practice and unequal access to resources. This paper argues that unless there is more open, critical and applied evaluation of the irrigation sector which implicitly acknowledges the contested politics of domestic and regional water management by WFE Nexus advocates, it is likely that the present development paradigm will continue largely unchallenged.

Introduction

In many respects, the Water-Energy-Food Security Nexus (henceforth "WFE Nexus" or just, "Nexus") narrative has enjoyed a meteoric rise to prominence in development discourse that few might have predicted just five years ago, prior to the 2011 Bonn conference[1] that launched it. The WFE Nexus concept seems to have galvanized a wide range of organizations around a common discourse, which has been termed a "new approach in support of food security and sustainable agriculture" (The Food and Agriculture Organization of the United Nations, 2014). It has unified international organizations such as the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), the

[1] This refers to the November 2011 conference titled, "The Water, Energy and Food Security Nexus – Solutions for the Green Economy" held in Bonn, Germany, as a preparation for the Rio+20 conference held the following year in Brazil.

International Food Policy Research Institute (IFPRI), the Global Water Partnership, the CGIAR stable of eleven agencies, the Asian Development Bank (ADB) and a host of multilateral and bilateral donors plus certain non-government organizations (e.g. the World Wildlife Fund, the Stockholm Environment Institute and the Stockholm International Water Institute) have rallied around the concept, evident in a string of reports released since 2011. A Nexus approach, it is reasoned, integrates management across sectors and scales, and can "support the transition to a Green Economy, which aims, among other things, at resource use efficiency and greater policy coherence" (Hoff, 2011:7). The supporting organizations have been quick to adopt the Nexus terminology, it seems, even when it is not entirely clear how it will improve on existing development approaches in practice or indeed, whether it offers anything truly novel or fresh to development debates, especially in the field of water resources development and management.

Water is recognized as playing a central role in the Nexus, given meaning in the literature by such expressions as "water flows through the veins of the economy" and "water: the bloodstream of the biosphere", suggesting its inseparability from the goals of the emerging Green Economy (Hoff, 2011:16). Strong emphasis is placed on improving water efficiency in agricultural and energy usage and in particular, productivity in rainfed agriculture and energy-intensive irrigation. Distinction is made between blue and green water sources and differential uses and management challenges, while a case is made by Hoff (2011) for the need to focus on consumer behaviour as well as changes in technology and managerial interventions required for more eco-rational and productive uses of water in agriculture. However, relatively little is said about the political and institutional changes that would be required to bring about such a major transformation in the present water resources development paradigm, either in the developed or developing nations. In effect, water resources management is still presented as a technocentric and essentially apolitical field of development, contrary to the significant strides made by researchers in demonstrating otherwise (e.g. Hirsch, 1998; Hirsch and Morck-Jensen, 2006; Mollinga, 2007; Molle et al., 2008; Warner et al., 2008; Molle et al., 2009). There are potential alternative "nexuses" to explore, but only rarely do mainstream development organizations rise to the challenge, such as the social power, water resources and capital nexus proposed by Swyngedouw (2006), where water and society are conceptualized as operating within a "hydrosocial" cycle.

Most subsequent reports and documents promoting the Nexus, stress the challenges in addressing problems of climate change, resource scarcity, overexploitation and environmental degradation while meeting greater food production needs due to rising demand, with the FAO report mentioned above stating that "60 per cent more food will need to be produced in order to feed the world population in 2050". The authors project that this increase will be met by raising total global water withdrawals from irrigation by 10 % in the same period. Drought and water scarcity are recurring themes through the Nexus literature with frequent mention of coming water crises, brought about partly by climate change. Irrigation development is seen as both an adaptation and mitigation measure to climate uncertainty. A report from UNESCAP highlights how groundwater for irrigation in some Asia Pacific nations is often being extracted at rates far in excess of the rate at which they are replenished (Adnan, 2013). They identify the availability of low-cost pump sets and subsidized electricity as being partly to blame for the unsustainable extraction rates in parts of India, Pakistan, northern China and the Murray-Darling Basin, Australia. Other well-documented sustainability issues include soil salinization,

waterlogging, low water use efficiencies and poor aquifer management. In common with others uncritically promoting the Nexus, Adnan (2013:37) argues that what is required to address water food security concerns is the "revitalizing" of irrigation, which in practice would mean investment in the upgrading of irrigation infrastructure and use of "smarter technologies" to "unlock productivity gains". This is essentially a message repeated from earlier reports produced by the same suite of organizations, which were in many respects far more detailed and comprehensive in arguing the case for different approaches to water management for agriculture (e.g. Molden, 2007; Mukherji et al., 2009; Foresight, 2011), but from an equally technocentric and managerial worldview. However, in further advocating for the adopting of the WFE Nexus perspective in managing groundwater irrigation, the same author goes so far as to state, "the nexus can help in preventing intra- and inter-state conflicts and may increase the pace of track-one diplomacy in places such as the Ganges-Brahmaputra Basin" (Adnan, 2013:38). The actual novelty of the Nexus approach has been questioned by Jeremy Bird, Director of IWMI, at a keynote speech at the Institution of Civil Engineers, London in May 2014, suggesting it just frames existing debates slightly differently "at a time of heightened competition" in the world (Bird, 2014).

It would be useful, I believe, given the prominence with which the WFE Nexus concept has been afforded in recent years by nominally influential international organizations, to consider to what degree some of the claims made by advocates surrounding future directions in irrigation development stand up to critical scrutiny, taking the case of a single distinct region which has been specifically identified as having qualities that lend itself to a Nexus approach. In particular, I am interested in making enquiries concerning where Nexus proponents envisage the future prospects of irrigation development lie at a regional and national level, what is the basis on which assumptions are made and how complete is the analysis? The region selected, the Mekong region[2], seems appropriate both because it is a disparate region experiencing rapid but uneven economic growth, but also because it is an arena of growing contestation over governance issues related to hydraulic development, where the Nexus concept has been suggested as a way forward to deliver more environmentally and socially sustainable development pathways (e.g. Hoff, 2011; Bach et al., 2012; Smajgl and Ward, 2013).

The WFE Nexus concept in the Mekong Region

In the case of the Mekong Region, while proponents' claims for the utility and benefits of the WFE Nexus may not necessarily be as hyperbolic as elsewhere in Asia, it has still nevertheless been relatively uncritically promoted by some mainstream development organizations, which collectively exert a considerable influence on the dominant development discourse. A number of major conferences have been convened across the region to promote the concept to diverse stakeholders in state, private and civil society sectors (Middleton et al., 2015). The UNESCAP-commissioned report mentioned above highlights the task of sensitizing multiple stakeholders to "the need of embracing a nexus perspective", which it suggests will lead to the recognition of the importance in and protection of natural capital, plus "needs to acknowledge the need to maintain ecosystem functions and livelihood" (Adnan, 2013:47). The report is replete with similar

[2] This geographical construct, sometimes referred to as the Greater Mekong Subregion, incorporates all of Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, plus China's Yunnan and Guangxi provinces. It covers an area of 2.6 million square kilometers and is home to over 300 million people.

examples of essentially empty rhetoric. For Bach et al.(2012:9), in a report commissioned by the Mekong River Commission (MRC), it is acknowledged that whilst addressing issues of food security, "governments often respond with initiatives that increase water consumption and energy intensive irrigation". They maintain that agricultural production can be "sustainably" increased through the use of supplementary irrigation in "rainfed" agricultural environments and changing other agricultural practices, including devoting time and resources to improving water use efficiency. While the same report recommends water managers pay attention to ecosystem services, such as waste water treatment, wetlands restoration and maintenance of environmental flows. They argue, "ecosystem services underpin water, food and energy security and in a green economy this natural infrastructure is recognized. The key to working with ecosystem services in the water, energy and food nexus is to be able to quantify them and estimate their economic value" (Bach et al., 2012:9). On closer examination, there appears nothing essentially novel in the latest prescriptions, which have mostly been recommended and trialed in past development interventions in the Mekong region at regional, national and local levels, such as trials of environmental flows (see Blake et al., 2009; Lazarus et al., 2012), without significant impact or demonstrable improvement in outcomes. Moreover, many interventions have occurred in numerous contested waterscapes where rights and livelihood outcomes for local resource users have demonstrably declined, especially in the footprint of large-scale dam projects (e.g. Sneddon, 2000; Sneddon and Fox, 2006; Foran and Manorom, 2009; Middleton et al., 2009; Matthews, 2012).

Another recurring theme under the Nexus concept is the ideal of three primary production sectors working in concert to provide "rational" solutions to the socio-economic needs of both upstream and downstream users and sharing benefits, especially in the case of storage dam management. It is normally described as a "multi-purpose approach", which can be used "to provide solutions to food security issues by increased irrigation and at the same time, to provide water supply, energy, flood protection, jobs and economic development" (Bach et al., 2012:9). MRC and the various CGIAR centres, through the on-going Water, Land and Ecosystems (WLE)[3] initiative, have become an enthusiastic supporter of this concept, without sufficient historical recognition of past failed outcomes. Again, there is absolutely nothing intrinsically new in this recommendation, which has been the staple justificatory response of river basin planners and water developers since the dawn of the era of large dam construction in the Mekong Region, back in the early 1950s. Indeed, the cascade of seven mainstream dams on the Mekong proposed by United States Bureau of Reclamation (USBR) and the United Nations Economic Commission for Asia and the Far East (ECAFE) were all conceived as "multipurpose" developments, with hydropower, irrigation, flood control and navigation improvement functions (Middleton et al., 2009). A major component of the plan, inspired in part by the Tennessee Valley Authority (TVA) project in the US, was to divert water from the Pa Mong Multi-Purpose Dam on the Thai-Lao border into the "arid and impoverished" Northeast region of Thailand to ostensibly develop irrigated agriculture, industry and agribusiness (Molle et al., 2009). Even at a relatively early stage of the feasibility studies, serious questions were being asked about the social, ecological and economic wisdom and risks of developing such large "monolithic concrete

[3] According to the website of the CGIAR Research Program on Water, Land and Ecosystems, "WLE promotes a new approach to sustainable intensification in which a healthy functioning ecosystem is seen as a prerequisite to agricultural development, resilience of food systems and human well-being." The program is led by the International Water Management Institute (IWMI). (Source: http://www.iwmi.cgiar.org/research/cgiar-research-programs/water-land-and-ecosystems/ Accessed 30 July 2015)

structures whose immediate return is inflation of national ego" (White et al., 1962). The same lead author, in a more guarded reflection, made the following observations which subsequently were resolutely ignored by the same national elites referred to previously, in whom ultimate sovereign authority rests (pre-eminent domain) and if anything, control decision-making processes more tightly today:

> For any combination of resources and technology it is possible to recognise optimum and limiting uses of water under given social aims, so that, for example, the limit of economic justification for a new hydroelectric and flood control installation on the Mekong's main stem, or for a small irrigation and power project on one of its tributaries, can be appraised. The determination of economic efficiency involves an estimate of future streams of benefits and costs for a desired time horizon at a suitable interest rate, and may be performed as an aid in selecting projects, in choosing among alternative designs for projects or systems so as to find the optimum one, or in deciding upon repayment, financial and administrative arrangements.
>
> Source: (White, 1963:422)

The World Bank and its regional allies and advocates, including the Electricity Generating Authority of Thailand (EGAT) which it helped establish in 1969, have long advocated for multi-purpose dams be constructed in Thailand and all the major projects were constructed as such, stating their benefits would include hydroelectricity, irrigation, flood prevention, fisheries, tourism, etc. Historically, there have only been two major bureaucratic developers and implementers of large dams in Thailand, namely EGAT and the Royal Irrigation Department (RID), both highly resistant institutions to external scrutiny and change (Molle, 2005; Molle et al., 2009). Moreover, it was pointed out decades ago that in the context of dams built by these powerful hydraulic bureaucracies, they can rarely, if ever, be managed in practice as genuine multi-purpose structures, as both the logics of the sectoral managers and inter-agency competition that exists in the political environment ensure that they remain to all intents and purposes, mono-specific in their management regime. The following comment debunking the myth of multi-purpose dams was made by Thai critics of the national dam development paradigm over thirty years ago:

> .....the idea of a 'multi-purpose' dam is misleading. Agricultural demand for water and energy demand for electricity are rarely in tune, so there is always a trade-off between one use and the other. It is pie-in-the-sky to expect a dam to release water to supply both energy and water demand simultaneously. If a dam is mainly designed for energy generation, agriculture will derive very little benefit from it – and vice versa.
>
> Source: (Tuntawiroon and Samootsakorn, 1984:294)

The WFE Nexus claims to offer a credible alternative to the "business-as-usual" approach to hydraulic development in the Mekong Basin, according to Hans Guttman (2012), CEO of MRC in a keynote speech at an international conference on transboundary river management held in Thailand, who raised a number of institutional obstacles to overcome first, such as inter-ministerial cooperation and sector prioritization. Yet, it could be argued that the present Nexus approach is equally unwilling as its predecessors to ask searching questions of the dominant

rationale employed by national elites in the execution of dams "at any cost", as evidenced by the virtual inability of the MRC and its donor organizations in practice to exert meaningful constraining influence on key decision-makers within the Lao PDR and Thai government's controversial decision to proceed with the Xayaburi (Matthews, 2012; Middleton, 2014) Mekong mainstream dam and, more recently, the Malaysian consortium-backed Don Sahong dam[4] (Baird, 2011; International Rivers, 2014), let alone numerous other built, under construction or planned large-scale dams with recognized potential "catastrophic" transboundary environmental impacts on tributaries across the basin (Ziv et al., 2012).

Thus, one might reasonably enquire, if such conventional development prescriptions did not bear "sustainable" fruit over half a century ago, but are still being repeated *ad nauseum* (by a section of external stakeholders at least) as a legacy of unsolved problems accumulates, one wonders why their present adoption should be any more likely to be successfully adopted and internalised, in a context of less or decreasing leverage by the Western development community over decision-making processes, and arguably a more vexed "problemshed" (see Mollinga et al., 2007)? After all, the Mekong region is now in the midst of a barrage of hydraulic and non-hydraulic development infrastructure investment from China and other intra-regional nations (several could be recognized as modern hydraulic societies in their own rights) that take a rather different and more elementary approach to and worldview of "development" and "the problem", when compared with the complex, technocentric and normative Nexus discourse.

Under "Nexus" thinking and rhetoric, most water resources provision for agriculture is framed as water for irrigation. That most crops worldwide are grown on land not officially considered "irrigated" and "irrigation" itself has become an inherently loaded term, in both English and some of the languages of the region, seems to have been lost in the hype created around "the Nexus perspective". For example, in stressing that "water and food security are equally important for sustainable development", Fritz Holzwarth[5] outlines the following points about the importance of water at a conference on the Nexus convened by the MRC, "Water is needed for irrigation: up to 90 % of water use for irrigation in arid countries. Water is also needed for energy generation (via hydropower and for cooling power plants). And, most importantly, water is needed as drinking water"(Holzwarth, 2014, p.3). The WFE Nexus constructs an artificial narrative of "trade-offs" between the divergent interests of each sector that decision-makers are expected (with appropriate assistance) to rationally balance for optimum efficiency, benefit sharing and sustainability (Konig, 2014). The MRC, amongst others, has gamely risen to the challenge presented by donors and development "partners".

While several post-Bonn interpretations of the Nexus appear to be strongly irrigation-centric in their outlook and focus on food, water and energy security, this differs quite markedly from earlier outputs from the CGIAR institutions, which placed more emphasis on putting a broadly interpreted water resources management perspective nearer the centre of food production and ecosystem thinking. For example, the Comprehensive Assessment of Water Management in Agriculture stressed that the greatest potential increases in agricultural yields were from rainfed

[4] It should be noted that neither of these dams were specifically mentioned at the 2012 Mekong2Rio conference on the WFE Nexus, perhaps in deference to the Thai hosts and Viraphonh Viravong, the Deputy Minister for the Ministry of Energy and Mining, one of its staunchest proponents in the single party state.
[5] Is identified as being the former Deputy Director-General of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Directorate Water Management.

areas, where it noted many of the world's poorest rural people live and where effectively managing water was the key to such increases and reducing poverty (Molden, 2007). As a policy action, Molden (2007:3) stressed that leaders, planners and policy makers need to fundamentally change the way they think about water, recommending, "instead of a narrow focus on rivers and groundwater, view rain as the ultimate source of water that can be managed. Instead of blueprint designs, craft institutions while recognizing the politically contentious nature of the reform process. And instead of isolating agriculture as a production system, view it as an integrated multiple-use system and as an agroecosystem, providing services and interacting with other ecosystems." Crucially, he also emphasized the need to "reform the reform process", in particular targeting state institutions as the principal drivers of change in agricultural water management and development processes. These recommendations, in fact, only repeat and formalize well documented work made several decades before by development researchers and practitioners in Africa and elsewhere, such as Adams (1992) and Barrow (1987; 1999).

How are such carefully deliberated perspectives and recommendations synthesized by a wide range of scientists dealt with in a practical application or theoretical assessment consciously adopting the Nexus approach, such as that of Smajgl and Ward's (2013) assessment of certain development strategies considering cross-sectoral and transboundary impacts in the Mekong Region? Firstly, there does not appear to be a reference to Molden's groundbreaking report, or indeed much other critical literature available concerning water resources governance in the Mekong from IWMI or a range of other organizations working in the region that one might have imagined would be cited in such a document claiming to develop novel analytical tools, methodologies and empirical processes for understanding the dynamics and linkages of the Nexus, in comparison to official reports from multilateral development organizations and banks, themselves with a vested interest in the hydraulic development paradigm. While the overall tenor of the book is relatively positive towards large-scale irrigation development in the Mekong, assuming it to be pro-poor, good for agricultural productivity and a boon to the rural economy, with perhaps some mitigable environmental impacts, only one chapter takes an alternative view. Fullbrook (2013), in his chapter on the dimensions of food security in the Mekong Basin development paradigm, goes further than other authors in examining some of the fundamental assumptions underlining links between hydraulic development (including irrigation), food security and socio-economic welfare in the Lower Mekong Basin. Considering several past irrigation project failures in Northeast Thailand, he questions the social, economic and ecological rationale and limits of further irrigation development in the region, stating "expansion of irrigation is self-defeating giving [sic] the nature of the geophysical environment because greater salinity would overwhelm initial gains in cultivation". Further, he maintains that "irrigation's assumed efficiency is not well proven especially given limitations in labour, administration and markets. The efficacy of small and medium irrigation projects, including wells, weirs and reservoirs developed in Thailand has not been comprehensively assessed." The last point about scale of technological intervention will be discussed in more detail later.

Development pathways with regards to irrigation development under the Nexus approach appear to be in danger of being "locked in" with more effort being put into resource use efficiency, technological modernization, institutional capacity-building of water users' associations and increased efforts at water storage expansion in some locations deemed

"underdeveloped", through constructing more hydraulic infrastructure. But due to the lack of attention to the socio-political drivers of hydraulic development, especially those instigated by the national elite and state institutions the international organizations tend to partner with in each of the Mekong region countries, there is a danger of supporting projects that favour the interests of the elite (in state and private sectors), but leave the poorer groups in society more disenfranchised and marginalized than ever. This reflects on the overall context of the irrigation development paradigm over the past 50 years at least in the Lower Mekong Basin when critically examined, as will be illustrated by some of the empirical examples provided below. But the international development community as a whole has demonstrated a poor record of learning from its mistakes, perhaps due to a dearth of willingness to facilitate critical evaluation of its projects and programmes, a shortcoming admitted in a self-critical USAID report (Clapp-Wincek and Blue, 2001). The authors found that over time there were fewer evaluations being conducted by USAID and "of most concern" was "the very limited number of in-depth, program evaluations", that might help USAID as an institution learn from its lengthy involvement in the irrigation development sector (Clapp-Wincek and Blue, 2001:iii). They noted how far too often evaluations were linked with "success stories", while weaker projects and programmes were de-selected from critical appraisal, thus often perpetuating their failings. Compounding the problem of resistance to critical external evaluation within donor organisations is the position of irrigation development itself as an idea or discourse within the prevailing worldview of those holding decision-making power at the national level, which instinctively shies away from such concepts as transparency, accountability and openness to the scrutiny multiple stakeholders. Considering World Bank funded irrigation projects, Berkoff (2007:189) questions why there appears to be such over optimism of performance in irrigation project appraisal documents, while *post-facto* evaluations invariably tend to show disappointing results, made the following observations concerning potential explanations for the gap between project expectation and actual outcome:

> "- The political dynamics invariably favour a project going ahead. Irrigation is so obviously a *good thing* - who can be against it?
> - As we have seen, economic analysis is inherently uncertain and unstable. Over-optimistic assumptions are difficult to refute, and unwitting optimism is widespread.
> - The self-interest of beneficiary farmers who do not have to pay is obvious. So are those of an Irrigation Department with incentives for justifying an irrigation investment programme. Similar incentives influence irrigation staff in lending agencies, and the contractors and consultants employed to evaluate and construct irrigation projects. Programming and finance ministries that serve a broader national interest often restrain irrigation expenditures but are seldom able to fully prevent it.
> - Above all, being funded largely from the national budget, there is ultimately no real financial accountability. Surface irrigation has been heavily subsidized. Even groundwater is typically subsidized in real terms through electricity prices or other subsidies, and seldom if ever bears the externality costs associated with falling water tables. Or else groundwater develops in symbiosis with public surface irrigation that itself has been heavily subsidized (e.g. where tube wells exploit aquifers recharged by surface losses as in North China and much of the Indian subcontinent)."

Turning now to the issue of an artificial dichotomy often created between general understandings of and responses to irrigated and rainfed agriculture, it is worth considering how each is defined in a local context, and just as importantly who makes the distinction and sets the criteria. In Thailand and other mainland Southeast Asian states, deliberate management of surface water by farmers (i.e. the ultimate users and supposed beneficiaries of "development") through the paddy field environment is usually not considered "irrigated" agriculture, unless the farmers are located within the boundaries of official irrigation systems (i.e. state-sanctioned projects). Instead, the arbiters of the definition or informational gatekeepers, (the RID in the case of Thailand – see below), consider this type of agriculture as "rainfed" farming (in a dichotomous separation) and as such, is considered by default managerially and technologically deficient or inferior to that classified as "irrigated". Even rice crops that are patently irrigated by water sourced from a farmer's personal labour or mechanically pumped from a pond, river or well is not considered "irrigated" in the logic of Thailand's bureaucracy. And the international research and development institutes charged with collecting data on performance, efficiency, coverage and other measures of "development" invariably meekly accept and reproduce the official data verbatim and without question. In effect, this implies that the vast majority of farmers who farm wet rice in paddy fields in the LMB are classified as "rainfed" farmers, even when they are carefully irrigating their crop and managing water on days when not a single drop of rain falls. Thus, they become easy targets for the hydraulic bureaucracies to modernize their traditional and regressive practices to save them from the mercy of the rains by introducing them to the civilizing effects of state-managed irrigation. In practice, such targeting only serves to make them more legible and visible to the state and its organs (Scott, 1998). This surely is a travesty of definition of irrigation in its multiple guises and overlooks the contributions of farmers and multiple other categories of water users to managing the waterscape.

Furthermore, from a linguistic analysis of "irrigation" in the Thai language, we find further evidence of discursive power at play in dictating the politics of knowledge, about who is privileged to speak, where legitimate knowledge and authority resides and just as importantly, how knowledge is discursively constructed in a Foucauldian sense. I refer to the commonly-used Thai word for irrigation - *chonla-prathaan* – which has its etymological origins in the Pali-Sanskrit words, *chonla* (water) and *prathaan* (royally-bestowed)[6]. According to Molle (2003:229), providing water in Thailand is "traditionally the prerogative of the king, who mediates its supply from supernatural forces." This relationship can tentatively be traced back to the "theocratic hydraulic" regime of the Angkor Empire, which was an influential antecedent of the Sukhothai kingdom in Thailand, in which water resources have been recognized as being controlled more for symbolic and religious purposes, than for more worldly uses in irrigated agriculture (van Liere, 1980; Falvey, 2000). There are historical precedents elsewhere in Asia, including the royal courts of Java and Bali (REF), and also Tamil Nadu state in southern India, where Mosse (2003:55) noted, "understood in terms of kingly acts of gifting, royally instituted grants and privileges, this landscape of tanks and channels is a representation of order and authority in rural society; a spatial order like others such as modern public buildings or urban spaces imbued with power and also the potential for conflict."

[6] A former provincial head of the Nakhon Phanom Agriculture and Cooperatives Office, described the meaning of *chonla-prathaan* to me thus: "Irrigation in Thai, if you translate it directly in Thai, means 'free'. Because *chonla* is the water and *prathaan* is the free gift. It's a gift from the Royal Family. Gift from the King" (Source: interview with Sansonthi Boonyothayan, 24 November, 2009).

Yet in the present day, for many ordinary Thais, irrigation water is popularly understood to be a material and symbolic gift from a benevolent, paternalistic king to his people, which transcends the realm of the Thai state and its agents who are merely regarded as mere intermediaries in the process[7]. However, it can be no coincidence that the bureaucracy charged with the provision of irrigation development is called the Royal Irrigation Department (*grom chonla-prathaan*), although it is perhaps more surprising to learn that up until the early 1930s and the end of absolute monarchy, this department was referred to as *grom thod-nam*[8]. Thus, the linguistic adoption through bureaucratic formalization of the older symbolic link to monarchy for irrigation provision is a modern construction that significantly post-dates the supposed national transition to a constitutional monarchy. Furthermore, according to the Royal Irrigation Department (RID) which acts as the both the public arbiter and gatekeeper of knowledge concerning irrigation, the official definition of "irrigation", as laid down in the State Irrigation Act (No.4) of B.E. 2518 (1975): "*Irrigation" means any undertaking carried out by the Royal Irrigation Department to procure water or to retain, store, reserve, control, supply, drain, or allocate water for agriculture, energy, public utilities or industry and includes the prevention of damage caused by water as well as navigation within the Irrigation area.*" Earlier and broader definitions of irrigation adopted in the People's Irrigation Act B.E. 2482 (1939) are lost in the newer definition. Thus, other agricultural water management practices which in most other times and places would qualify as being patent examples of "irrigation", are disqualified on the basis of the RID's definition. In this sense, irrigation development may be conceived as a "technology of power" of the elite, which serves to reinforce the Thai state's regime of truth i.e. the type of discourse it accepts and makes function as true (Foucault, 1980).

Empirical examples from within the Mekong Region

To illustrate past Western development interventions in the Mekong region irrigation sector, which adopted rather similar justificatory narratives to the WFE Nexus concept in their implementation and have sometimes been touted as "models" of development, I would like to provide a few examples selected from development projects in NE Thailand, Cambodia and Lao PDR that I am personally familiar with. All of these projects, in my view, have proven ostensible failures in terms of meeting their own predefined development targets, outside of hydraulic construction goals (e.g. number of small/medium/large reservoirs built, volume of water stored, number of pumps installed, kilometers of canal constructed or rehabilitated, etc), and have most certainly failed to become "sustainable" or replicable examples. Notwithstanding this personal long-view perspective, they were judged qualified "successes" through internal evaluations conducted during the life of the project, as is common in the development industry, yet have never been subject to rigorous external evaluation *ex-post facto*, as is also the norm in the sector. I should point out that the examples I have chosen were all partly funded by bilateral or multi-lateral aid programmes and subscribed to the dominant development discourse of their time, much of which shared several common denominators with the main tenets of the Nexus discourse. Another commonality was that all projects were implemented by a domestic hydraulic bureaucracy (with the exception of Theun-Hinboun Hydropower Project, which was a

[7] To provide another salient example, artificial rainfall is termed "*fon luang*" (royal rain) in common parlance in Thailand and is generated in times of drought by state-owned planes operated by the Bureau of Royal Rainmaking and Agricultural Aviation under the Ministry of Agriculture and Cooperatives, but is sometimes believed to be generated through the metaphysical intervention of the semi-sacred monarch, a message reinforced by state propaganda and the popular media.

[8] *Thod-nam* is a more descriptive and neutral term, meaning to dam or to channel/carry water, and was the earlier commonly used central Thai word for irrigation.

consortium of domestic and international interests), which was somewhat restrained in its influence during the international development agency involvement, but expanded its authority and hegemony over resource management immediately after the end of external financing, contrary to the expectations of the donors who anticipated a wider co-management scenario between state and civil society groups. Hydropower projects are often a shared domain between private sector and state interests, but irrigation projects by contrast, are generally the exclusive or pre-eminent domain of state agencies.

The North-East Water Management and Sustainable Irrigation Programme (NEWMASIP) was an European Union-funded project that operated across several Northeastern provinces between 1991-98, that partnered with the Royal Irrigation Department (RID). The EU granted 29 million ECU's for the project, while the Thai government gave 18.54 million ECU's, much of it in-kind. The project's main aims was threefold: a/to improve water security b/ to strengthen farmer groups; and c/ provide agricultural alternatives to farmers, to achieve and overall objective "to increase farmer's net incomes on a sustainable basis" (Euroconsult and Ltd, 1998). In practice, the project spent most of its budget on infrastructural and hardware items, including rehabilitating several large or medium irrigation schemes in the region, and the hiring of foreign experts to oversee the project. There is little evidence available, however, to suggest that the project achieved its aims, in the context of Northeast farmers' steadily leaving the land for better economic opportunities off-farm as part of a general agrarian shift, whether they occupied irrigated land or not. The project completion document admitted that there was low interest in dry season cropping at the irrigation systems NEWMASIP had invested heavily due to the changing socio-economic circumstances of NE Thailand, thus, "severely erod[ing] the economic justification for investment in irrigation system rehabilitation and improvement" (Euroconsult and Ltd, 1998). Instead, it recommended "investment in agricultural and marketing development, institutional development, and training, are likely to show much higher returns than investment in 'hardware', (which is only partially used)" (ibid.). As one of the senior consultants on NEWMASIP concluded: "Irrigation system development, rehabilitation and improvement (modernization) is not a goal in itself; it is a means to achieve higher agricultural production, productivity, and increased farm incomes. If the latter can hardly be achieved, the rationale for irrigation development disappears" (Brolsma, 1996:134 emphasis in the original). So how was this report and various project documents produced by NEWMASIP received? On the part of the EU, I do not know, although they ceased to support any more irrigation projects in Thailand, but on the part of the Thai government, the recommendation to reduce funding towards irrigation hardware seems to have been entirely ignored, as the RID has continued to be the department that receives on average 50 % of the entire budget of the Ministry of Agriculture and Cooperatives, whilst it has spent the vast majority of those funds on new irrigation infrastructure for many years (Turral, 2008). It also transpired during PhD fieldwork conducted in 2010 that the entire collection of project reports produced by NEWMASIP, had been removed from the Khon Kaen RID regional office at which the project was based with officials uncertain about their whereabouts, but were later coincidentally located having been seemingly untouched in years, tied up in bundles at the Bangkok RID headquarters library (Blake, 2012). This anecdote points to the material conditions pertaining within "blackbox" hydraulic bureaucracies that ensure that lessons remain unlearned and the prevailing structural hierarchy is reinforced and reproduced. It would be interesting to know whether the EU is aware that the knowledge

outputs of European taxpayers' money has to all effects been buried, as this speaks to one of the core assumptions of the Nexus development narratives.

The Theun-Hinboun Hydropower Project (THHP) and later built, but integral Theun-Hinboun Expansion Project (THXP) is a 500 MW trans-basin diversion hydropower project in central Lao PDR, which belongs to a consortium of corporate owners from Thailand (GMS Power), Norway (state utility - Statkraft A.S.) and the state utility of Laos itself, Electricité du Lao (EdL). It is a large and complex infrastructure project that has impacted thousands of poor households in two provinces and caused serious negative environmental impacts to hundreds of kilometres of two ecologically diverse river systems, many of which have been left unmitigated or partially mitigated since construction began in 1995 (Anonymous, 1999; Barney, 2007; FIVAS, 2007). However, it was originally vaunted as a "win-win" hydropower project by the ADB lenders for its purported negligible social and environmental impacts and contribution of clean, cheap energy to the regional economy (Ryder, 1999; Blake, 2014), exactly the sort of dam project that might be seen as desirable under the Nexus discourse with its preoccupation on "multipurpose dams", trade-offs and sustainability (see: http://www.water-energy-food.org/en/practice/view__585/building-the-sustainable-dam-the-challenges-of-meeting-energy-and-livelihoods-objectives-at-the-same-time.html Accessed 28 July, 2015). One of the livelihood mitigation measures undertaken by the Theun-Hinboun Hydropower Company to compensate for loss of cropland to exacerbated rainy season flooding, erosion, damaged riverbank gardens and serious loss of capture fisheries caused by the altered hydrological and sediment regime was to support the construction of irrigation projects along the floodplain of the recipient rivers, namely the Nam Hai and Nam Hinboun. The intention (first conceived during the dam design phase) was to provide impacted households with a secure staple crop from dry season irrigated rice cultivation, through system hardware provision, and subsidised water delivery, credit for input purchase and agricultural extension in the first few years of operation, before it would become self-supporting. However, after an initial peak in rice yields in the first year or two of operation, production has markedly fallen since as multiple unforeseen (but foreseeable) problems have arisen that have not been adequately addressed by THPC or its partners in government . The irrigation systems have overall been a failure, replicating a scenario found across much of Laos during recent years, where dry season pumped irrigation for rice has been a core state policy nationwide (Hoanh et al., 2009). Yet, perversely, THPC and the government of Lao (GoL) has continued implementing this policy in newly resettled villages along the Nam Hai and Hinboun[9], that were additionally impacted by the THXP operations since it was commissioned in late 2012 (Phounvixay et al., 2013; Sparkes, 2014). From my own assessment and anecdotal reports by various other sources, dry season irrigated rice cultivation is only practiced by the more wealthy members of any given village as it favours those with adequate capital to cover input costs, such as fuel, fertiliser, pesticides, labour, ploughing and water pumping, which are beyond the means of the poorer households in the village. Where poorer families may initially have been able to borrow money from a revolving fund set up by THPC, this soon ran into difficulties as they skimped on pesticides and fertiliser and had insufficient yields to cover their loan and interest payments, so fell into debt with the fund from

[9] According to a senior employee of Statcraft, THPC had expanded irrigation systems since THXP began by 250 ha as of 2013, and in many cases THPC was said to be leading the Water Users Groups established by the Company, immediately raising fundamental questions about sustainability (Sparkes, 2014).

an early stage and withdrew. Unlike wet season cultivation practiced before the dam, dry season cultivation requires a considerable degree of risk and capital resources to make a profit, and even then it is not guaranteed. Hence, many families are now more food and income insecure than they were before the project was built, causing them to migrate out of the area to survive. Irrigation development has not proven the magic bullet hydropower mitigation and compensation strategy that was envisaged by proponents, yet perversely continues to be heavily promoted and expanded by state agencies and overseas development organisations in Laos (and elsewhere), without a comprehensive examination of the costs, risks and benefits, or critical evaluation of past interventions.

The Stung Chinit Irrigation and Rural Infrastructure Project (SCIRIP) is a large-scale irrigation development scheme that was originally partially constructed during the Pol Pot-led Democratic Kampuchea regime, but was resurrected by the Hun Sen regime and secured a loan package from the Asian Development Bank (ADB) and Agence Française de Développement (AFD) in the early 2000s (Thuon, 2013). ADB financed infrastructure design and construction and AFD financed institutional capacity building, supposedly to ensure sustainable co-management by state agencies and water users. It was designed by international experts to supply a command area of 12,000 ha on the poor, sandy soils of the lower Stung Chinit river in Kampong Thom province to the north of Phnom Penh. The project was initially estimated to cost US$ 23.8 million, but due to multiple cost overruns during the construction phase between 2001-08, the loan to the government of Cambodia ended up nearer US$ 30 million (Thuon et al., 2009). The project was sold as a "multi-purpose" project and intended to be a model for others to replicate later, having irrigation and fishery benefits in principle, which were supposed to be a catalyst for local economic development and poverty reduction. In the event, by 2008 less than 2,000 ha were being supplementary irrigated in the wet season and about 300 ha were being irrigated for rice in the dry season, when the main demand for irrigation falls. Yields are low and there have been predictable problems of soil quality decline, pests and disease, largely unaddressed by inadequate local extension services. When I visited the project in February 2013, there was an estimated 40 ha of irrigated paddy only being grown across the system, according to a local state official (personal communication, Deputy Director, Kampong Thom Provincial Department of Water Resources and Meteorology (PDoWRAM), 26 February 2013). The lack of system maintenance and sense of infrastructural abandonment was palpable, although the state authorities were working closely with an AuSAID-funded project[10] to build a similar project nearby, apparently actively duplicating failure without learning local development lessons. While a so-called Farmer Water Users Committee (FWUC) had been established under the financial support of AFD and technical implementation by a French NGO and a Cambodian NGO, it was clearly not functioning as planned and had trouble collecting sufficient money from farmers (an "Irrigation Service Fee") in-line with the dominant ideology of donors, to cover the basic costs of operation and maintenance of secondary and tertiary canals. Meanwhile, there had been few fishery benefits in the reservoir while the low height storage dam had effectively blocked upstream fish migrations and a fish pass built retrospectively as a mitigation measure had failed to restore fish runs and was also semi-abandoned. In terms of hydraulic control and system management, the project was still effectively being run in a hierarchical manner by the central bureaucracy, but

[10] The Dutch manager of this project privately admitted to me that the project was located in that province for mainly reasons of political expediency and did not want to rock the boat nationally over a few million dollars expenditure.

influenced by local and national political elites over some major decisions. Food security had evidently suffered in some villages with the loss of fish, wetlands and non-timber forest products, while relatively few people had benefited from the irrigation scheme itself and some families had lost production land to the reservoir, though there might have been benefits attained from the secondary infrastructure that came with the project, such as roads, schools, clinics and markets.

Such examples point to a societal fascination with state-controlled irrigation development that stretches back decades (if not centuries to earlier types of state formation) that are scale independent. That is to say, local elites have captured and controlled access to water resources (and other associated material resources) at much smaller, local scales than the more recent centralisation of the arena to the national level, which may be related to changes in access to technology and finance rather than an unwillingness to engage in vast hydraulic works on the part of a national elite. Although irrigation infrastructure was extensively built from the early part of the twentieth century in French Indochina and non-colonised Siam, probably the last era when conditions were so favourable for such monumental hydraulic infrastructure construction was back in the 9th-13th centuries, during the reigns of the Khmer great theocratic kings (Mabbett and Chandler, 1995).

Irrigationalism

In Thailand, and no doubt other countries of the Mekong Basin, irrigation development is strongly driven by ideological factors, as well as conventionally acknowledged economic, technological and conventional instrumental drivers associated with resource scarcity, demographics and desire for agricultural intensification and modernization. This ideology of irrigation development has been termed "*irrigationalism*" (Blake, 2012) and is broadly similar to the social phenomenon termed "irrigationism"[11] proposed for certain Sub-Saharan African countries by Adams (1991) or an "irrigationist philosophy" noted in the visions of arid land transformation and conquests over nature by agricultural pioneers and political leaders in Australia's Murray-Darling Basin (Hamilton-McKenzie, 2009). *Irrigationalism* differs insofar as it encompasses not only utopian notions of vanquishing nature, modernism, technocentrism and developmentalism, but also more primordial nationalistic sets of beliefs, values and actions that help to make it a core dominant ideology of the national elite. The Khmer Rouge regime of 1975-79, when tripling rice yields through irrigation development became a core goal of the "Super Great Leap Forward", was an extreme example of this ideology turned into praxis (Bultmann, 2012), but Thailand would seem to offer a less despotic and more successful variant in terms of its societal acceptance and longevity (Blake, 2012). For contemporary Thailand, and perhaps Cambodia and Lao PDR, irrigationalism is one of the core drivers of irrigation development that can be used to explain the rise of not only pan-regional projects like the Green Isaan, Khong-Chi-Mun Project or its successor the US$ 5 billion Water Grid Project conceived under the Thaksin Shinawatra regime (cf.Floch et al., 2007; Molle et al., 2009), but also a plethora of much smaller scale projects that pepper the waterscape, mostly hardly used for irrigation. Following Postel's (1999:228) assertion arising from a poorly acknowledged politicization of

[11] Irrigationism, according to Adams (1991:297), was embedded in conventional "views of the nature of development as transformation and modernization, embraced the notions growing in the 1950s and 1960s of a supposedly apolitical and technically sophisticated 'green revolution' route to development"

irrigation decision-making in numerous countries, "the rules of the irrigation game are stacked against efficiency, fairness and sustainability."

Conclusion

The WFE Nexus is a global discourse that has been rather hastily translated into local development policy recommendations and strategies, at least in the case of the Mekong Region, where water resources control and access is highly contested. The Nexus has been labeled "an immature concept", partly as a result of the way it tends to conceal political issues such as "inequality, the manufacture of scarcity and international political economy and geopolitics" (Allouche et al., 2015). Foran (2015:669) goes further and calls the Nexus a political project that manifests as an unfolding and contested" political agenda. Whilst I would not disagree with these evaluations, based on my understanding of its rapid promotion and adoption as a universalizing discourse within the Mekong Basin region and the more aid-dependent nations, the Nexus framing appears to endorse a continuation of the "business-as-usual" pathway with regards to irrigation development, restricted thus far to a relatively limited set of actors and institutions. That is to say, it turns a blind eye to the ongoing trends of centralization of decision-making power within relatively opaque and unaccountable national hydraulic bureaucracies and does little or nothing to challenge the status quo or structural inequalities. By not questioning existing societal power relations or more dominant state discourses of hydraulic development, in particular the ideological justifications and development myths propagated by elite domestic actors and institutions, it will only serve to entrench societal power disparities and protect already deeply vested interests. As well as lacking a firm empirical grounding in Southeast Asian water resources governance, the WFE Nexus lacks a focus on environmental justice, suggests Middleton et al.(2015). Without challenging the present unsustainable paradigm, it is likely more effort will be put into focusing on demand-side solutions through construction of further hydraulic infrastructure, often under the guise of irrigation "modernization" narratives. And more funds will be devoted to continuing support of autocratic and patrimonial organizations that dictate the national dominant discourse in each country and have aided greater social control goals, perhaps best illustrated by the experience of Thailand's hydraulic development regime touched on in this paper and elsewhere (e.g. Blake, 2012). Rhetorical lip service will be paid to participation (e.g. PIM), decentralization and efficiency, as indeed was the norm under previous concepts championed by the international development community (such as IWRM, IBFM, and climate change mitigation measures), and all unquestioningly adopted by MRC and other domestic "hydrocracies" over the last decade or so. These discourses are all basically managerial, instrumental and technocentric viewpoints, often going to great lengths to avoid or deny a political rationale in water resources governance and knowledge production (see Kakonen and Hirsch, 2009). Likewise, there is little or no recognition of the widespread ostensible failure of past irrigational development approaches in parts of the Lower Mekong Basin, even the sector's inability to achieve the relatively modest goals set by advocates and ideologues, as this presumably, would be an admittance to the uncomfortable presence of a threadbare emperor. This might well be a reason why the sector is so short of independent, critical analyses amongst different disciplines, especially in recent decades. The Nexus is neither designed nor constructed to address any of the past shortcomings with regards to social injustice of the hydraulic mission, as it already appears to have largely determined the answers and conditions for self-replication.

References

Adams, W. M. (1991). "Large Scale Irrigation in Northern Nigeria: Performance and Ideology." *Transactions of the Institute of British Geographers* 16(3): 287-300.

Adams, W. M. (1992). *Wasting the Rain: rivers, people and planning in Africa.* (London: Earthscan).

Adnan, H. (2013). The Status of the Water-Energy-Food Nexus in Asia and the Pacific. Discussion Paper**:** 58. (Bangkok: United Nations Economic and Social Commission for Asia and the Pacific).

Allouche, J., C. Middleton and D. Gyawali (2015). "Technical Veil, Hidden Politcs: Interrogating the Power Linkages Behind the Nexus." *Water Alternatives* 8(1): 610-626.

Anonymous (1999). "Always very little, always very late: The ADB and the Theun-Hinboun Hydropower Project." *Watershed* 4(3 March - June 99): 44-50.

Bach, H., J. Bird, T. J. Clausen, K. M. Jensen, R. B. Lange, R. Taylor, V. Viriyasakultorn and A. Wolf (2012). Transboundary River Basin Management: Addressing Water, Energy and Food Security. (Vientiane, Lao PDR: Mekong River Commission).

Baird, I. B. (2011). "The Don Sahong Dam: Potential Impacts on Regional Fish Migrations, Livelihoods and Human Health." *Critical Asian Studies* 43(2): 211-235.

Barney, K. (2007). Power, Progress and Impoverishment: Plantations, Hydropower, Ecological Change and Community Transformation in Hinboun District, Lao PDR. YCAR Papers. Political Ecology Series. 1**:** 139. (Toronto: York Centre for Asian Research, York University).

Barrow, C. (1987). *Water Resources and Agricultural Development in the Tropics.* (Harlow, Essex: Longman Scientific and Technical).

Barrow, C. J. (1999). *Alternative Irrigation: The Promise of Runoff Agriculture.* (Abingdon, Oxon.: Earthscan).

Berkoff, J. (2007). Some economic aspects of large rice-based projects in Southeast Asia. The Future of Large Rice-Based Irrigation Systems in Southeast Asia. T. Facon**:** 184-200. (Ho Chi Minh City, Viet Nam: FAO Regional Office for Asia and the Pacific).

Bird, J. (2014). The Water, Energy and Food Security Nexus - is it really new? Gerald Lacey Memorial Lecture. (London).

Blake, D. J. H. (2012) *Irrigationalism*: The Politics and Ideology of Irrigation Development in the Nam Songkhram Basin, Northeast Thailand.Unpublished PhD thesis. University of East Anglia, Norwich.

Blake, D. J. H. (2014). "Massive Mekong dams taking a toll on local communities." *The Nation* 8 July, 2014.

Blake, D. J. H., R. Friend and B. Promphakping (2009). The Nam Songkhram River Basin landscape transformations and new approaches to wetlands management. *Contested Waterscapes in the Mekong Region: Hydropower, Livelihoods and Governance.* F. Molle, T. Foran and M. Käkönen**:** 173-202. (London: Earthscan Publications).

Brolsma, A. (1996). *Technical Features and Implications of Modernisation: the NEWMASIP experience.* Modernization of Irrigation Schemes: Past Experiences and Future Options, Bangkok, Thailand, Food and Agriculture Organisation of the United Nations.

Bultmann, D. (2012). "Irrigating a Socialist Utopia: Disciplinary Space and Population Control under the Khmer Rouge, 1975-1979." *Transcience* 3(1): 40-52.

Clapp-Wincek, C. and R. Blue (2001). Evaluation of Recent USAID Evaluation Experience. Working Paper No. 320**:** 84. (Washington: Center for Development Information and Evaluation, US Agency for International Development).

Euroconsult and M. A. Ltd (1998). North-East Water Management and System Improvement Project (NEWMASIP - Agreement ALA/TH/8914). Completion Report. Volume 2: Agricultural Development**:** 38. (Bangkok: Royal Irrigation Department).

Falvey, L. (2000). *Thai Agriculture: Golden Cradle of Millennia.* (Bangkok: Kasetsart University Press).

FIVAS (2007). Ruined Rivers, Damaged Lives: The Impacts of the Theun-Hinboun Hydropower Project on Downstream Communities in Lao PDR**:** 66. (Oslo: The Association for International Water Studies (FIVAS)).

Floch, P., F. Molle and W. Loiskandl (2007). Marshalling Water Resources: A Chronology of Irrigation Development in the Chi-Mun River Basin, Northeast Thailand. M-POWER Working Papers**:** 57. (Chiang Mai: Mekong Program on Water, Environment and Resilience).

Foran, T. (2015). "Node and Regime: Interdiciplinary Analysis of Water-Energy-Food Nexus in the Mekong Region." *8* 1(655-674).

Foran, T. and K. Manorom (2009). Pak Mun Dam: Perpetually Contested? *Contested Waterscapes in the Mekong Region: Hydropower, Livelihoods and Governance.* F. Molle, T. Foran and M. Kakonen**:** 55-80. (London: Earthscan).

Foresight (2011). The Future of Food and Farming (2011). Final Project Report**:** 40. (London: The Government Office for Science).

Foucault, M. (1980). Truth and Power. *Power/Knowledge: Selected Interviews and Other Writings (1972-1977).* C. Gordon**:** 109-133. (New York: Pantheon Books).

Fullbrook, D. (2013). Food Securuty in the Wider Mekong Region. *The Water-Food-Energy Nexus in the Mekong Region: Assessing Development Strategies Considering Cross-Sectoral and Transboundary Impacts.* A. Smajgl and J. Ward**:** 61-104. (New York: Springer).

Guttman, H. (2012). Water, Food and Energy Security in the Mekong Basin. Keynote Speech. Mekong2Rio International Conference on Transboundary River Management**:** 4. (Phuket, Thailand: Mekong River Commission).

Hamilton-McKenzie, J. (2009). "California Dreaming: Selling the Irrigationist Dream." *Journal of Historical amd European Studies* 2(July): 27-38.

Hirsch, P. (1998). Dams, resources and the politics of environment in mainland Southeast Asia. *The Politics of Environment in Southeast Asia: Resources and Resistance.* P. Hirsch and C. Warren**:** 55-70. (London and New York: Routledge).

Hirsch, P. and K. Morck-Jensen (2006). National Interests and Transboundary Water Governance in the Mekong**:** 171. (Sydney, Australia: Australian Mekong Resource Centre, University of Sydney).

Hoanh, C. T., T. Facon, T. Thuon, R. C. Bastakoti, F. Molle and F. Phengphaengsy (2009). Irrigation in the Lower Mekong Basin countries: the beginning of a new era? *Contested Waterscapes in the Mekong Region: Hydropower, Livelihoods and Governance.* F. F. Molle, T. and Käkönen, M.**:** 143-171. (London: Earthscan).

Hoff, H. (2011). Understanding the Nexus. Background Paper for the Bonn2011 Conference: The Water, Energy and Food Security Nexus. (Stockholm: Stockholm Environment Institute).

Holzwarth, F. (2014). Keynote 2: Water, Energy and Food Security Nexus in Transboundary River Basins. Second Mekong River Commission Summit. Cooperation for Water, Energy and Food Security in Transboundary Basins under Changing Climate**:** 7. (Ho Chi Minh City, Vietnam).

International Rivers (2014). Trial and Error too Risky for the Don Sahong Dam: A Technical Review of the Don Sahong's 2013 Environmental Impact Assessment**:** 9. (Berkeley, CA: International Rivers).

Kakonen, M. and P. Hirsch (2009). The Anti-Politics of Mekong Knowledge Production. *Contested Waterscapes in the Mekong Region*. F. Molle, T. Foran and M. Kakonen**:** 333-355. (London: Earthscan Publications).

Konig, C. (2014). *The Water, Energy and Food Security Nexus in the Mekong Basin: German development cooperation provides nexus solutions*. (Bonn, Deustche Gesellschaft fur Internationale Zusammenarbeit (GTZ) Gmbh).

Lazarus, K., D. J. H. Blake, J. Dore, W. Sukraroek and D. S. Hall (2012). Negotiating Flows in the Mekong. *Politics and Development in a Transboundary Watershed: The Case of the Lower Mekong Basin*. J. Ojendal, S. Hansson and S. Hellberg**:** 127-153. (Dordrecht: Springer Science).

Mabbett, I. and D. Chandler (1995). *The Khmers*. (Oxford, UK and Cambridge, USA: Blackwell Publishers).

Matthews, N. (2012). "Water grabbing in the Mekong Basin - an analysis of the winners and losers of Thailand's hydropower development in the Lao PDR." *Water Alternatives* 5(2): 392-411.

Middleton, C. (2014). The Politics of Uncertainty: Knowledge Production, Power and Politics on the Mekong River. International Conference on Development and Cooperation of the Mekong Region. Rethinking the Sustainability of the Mekong: A Critical Understanding of the roles of Mega-Development and ODA**:** 19. (Seoul National University, South Korea).

Middleton, C., J. Allouche, D. Gyawali and S. Allen (2015). "The Rise and Implications of the Water-Energy-Food Nexus in Southeast Asia through an Environmental Justice Lens." *Water Alternatives* 8(1): 627-654.

Middleton, C., J. Garcia and T. Foran (2009). Old and New Hydropower Players in the Mekong Region: Agendas and Strategies. *Contested Waterscapes in the Mekong Region: hydropower, livelihoods, and governance*. F. Molle, T. Foran and M. Kakonen**:** 23-54. (London: Earthscan).

Molden, D., Ed. (2007). *Water for Food, Water for Life: Comprehensive Assessment of Water Management in Agriculture*. London and Colombo: Earthscan and the International Water Management Institute.

Molle, F. (2003). Allocating and accessing water resources: practice and ideology in the Chao Phraya River Basin. *Thailand's Rice Bowl: Perspectives on Agricultural and Social Change in the Chao Phraya Delta*. F. Molle and T. Srijantr**:** 229-265. (Bangkok: White Lotus).

Molle, F. (2005). Irrigation and Water Policies in the Mekong Region: Current discourses and practices. IWMI Research Report**:** 43. (Colombo, Sri Lanka: International Water Management Institute (IWMI)).

Molle, F., P. Floch, B. Promphakping and D. J. H. Blake (2009). The 'Greening of *Isaan*': Politics, Ideology, and Irrigation Development in the Northeast of Thailand. *Contested Waterscapes*

in the Mekong Region: Hydropower, Livelihoods and Governance. F. F. Molle, T. and Käkönen, M.**:** 253-282. (London: Earthscan).

Molle, F., T. Foran and P. Floch (2009). Introduction: Changing Waterscapes in the Mekong Region - Historical Background and Context. *Contested Waterscapes in the Mekong Region: Hydropower, Livelihoods and Governance*. F. Molle, T. Foran and M. Kakonen**:** 1-19. (London: Earthscan).

Molle, F., P. P. Mollinga and R. Meinzen-Dick (2008). "Water, Politics and Development: Introducing Water Alternatives " *Water Alternatives* 1(1): 1-6.

Molle, F., P. P. Mollinga and P. Wester (2009). "Hydraulic Bureaucracies and the Hydraulic Mission: Flows of Water, Flows of Power." *Water Alternatives* 2(3): 328-349.

Mollinga, P. P. (2007). Water Policy - Water Politics: Social Engineering and Strategic Action in Water Sector Reform. ZEF Working Paper Series. H.-D. Evers, S. Gerke, P. P. Mollinga and C. Schetter. 19**:** 35. (Bonn: Center for Development Research, University of Bonn).

Mollinga, P. P., R. S. Meinzen-Dick and D. J. Merrey (2007). "Politics, Plurality and Problemsheds: A Strategic Approach for Reform of Agricultural Water Resources Management." *Development Policy Review* 25(6): 699-719.

Mosse, D. (2003). *The Rule of Water**:** Statecraft, Ecology and Collective Action in South India*. (New Delhi: Oxford University Press).

Mukherji, A., T. Facon, J. Burke, C. de Fraiture, J.-M. Faures, B. Fuleki, M. Giordano, D. Molden and T. Shah (2009). Revitalizing Asia's Irrigation: To sustainably meet tomorrow's food needs**:** 39. (Colombo, Sri Lanka: International Water Management Institute and Food and Agriculture Organisation of the United Nations).

Phounvixay, V., L. Bouapao, C. Sayalath, S. Phosalath, V. Ngonvorarath, A. Sisouvanh and K. Lazarus (2013). Development of Water Resource Infrastructures and Livelihood Benefits: A case of Theun-Hinboun Expansion Project, Lao PDR.**:** 60. (Vientiane: CGIAR Challenge Program on Water and Food).

Postel, S. (1999). *Pillar of Sand: Can the Irrigation Miracle Last?* (New York: W.W. Norton & Company).

Ryder, G. (1999) "The Theun-Hinboun public-private partnership - part 1 of 3." *Mekong Utility Watch*.

Scott, J. C. (1998). *Seeing Like a State. How Certain Schemes to Improve the Human Condition Have Failed*. (New Haven & London: Yale University Press).

Smajgl, A. and J. Ward (2013). Mekong Region Connectivity. *The Water-Food-Energy Nexus in the Mekong Region: Assessing Development Strategies Considering Cross-Sectoral and Transboundary Impacts*. A. Smajgl and J. Ward**:** 1-18. (New York: Springer).

Sneddon, C. and C. Fox (2006). "Rethinking transboundary waters: A critical hydropolitics of the Mekong basin." *Political Geography* 25(2): 181-202.

Sneddon, C. S. (2000) Altered rivers: socio-ecological transformations, water conflicts and the state in Northeast Thailand.University of Minnesota, Ann Arbor.

Sparkes, S. (2014). "Sustainable Hydropower Development: Theun-Hinboun Expansion Project case study, Laos." *Water Resources and Rural Development* 4(October 2014): 54-66.

Swyngedouw, E. (2006). Power, Water and Money: Exploring the Nexus. Human Development Report Office Occasional Paper**:** 84. (New York: United Nations Development Programme).

The Food and Agriculture Organization of the United Nations (2014). The Water-Energy-Food Nexus: A new approach in support of food security and sustainable agriculture**:** 20. (Rome: The Food and Agriculture Organization of the United Nations).

Thuon, T. (2013). Localizing Development and Irrigation Management in Cambodia. *Governing the Mekong: Engaging in the Politics of Knowledge*. R. Daniel, L. Lebel and K. Manorom**:** 163-184. (Selangor, Malaysia: Strategic Information and Research Development Centre).

Thuon, T., L. Lebel and R. C. Bastakoti (2009). Making projects fit: early lessons from Stung Chinit Irrigation Scheme and Rural Infrastucture Project, Cambodia. M-POWER Working Paper Series**:** 18. (Sri Lanka, Cambodia: CGIAR Challenge Program on Water and Food).

Tuntawiroon, N. and P. Samootsakorn (1984). Thailand's Dam Building Programme: Past Present and Future. *The Social and Environmental Effects of Large Dams. Volume 2*. E. Goldsmith and N. Hildyard. 2**:** 291-303. (Wadebridge, Cornwall: Wadebridge Ecological Centre).

Turral, H. (2008). Policies and Strategic Planning for the Thailand Irrigation Sector Reform Programme. Final Technical Report**:** 117. (Bangkok: The Food and Agriculture Organization of the United Nations and the Royal Irrigation Department).

van Liere, W. J. (1980). "Traditional Water Management in the Lower Mekong Basin." *World Archaeology* 11(3): 265-280.

Warner, J., P. Wester and A. Bolding (2008). "Going with the flow: river basins as the natural unit of water management?" *Water Policy* 10(Supplement 2): 121-138.

White, G. F. (1963). "Contributions of Geographical Analysis to River Basin Development." *The Geographical Journal* 129(4): 412-432.

White, G. F., E. de Vries, H. B. Dunkerley and J. V. Krutilla (1962). *Economic and Social Aspects of the Lower Mekong Development*. (Bangkok: United Nations. Economic Commission for Asia and the Far East. Committee for Co-ordination of Investigations of the Lower Mekong Basin).

Ziv, G., E. Baran, S. Nam, I. Rodriquez-Iturbe and S. A. Levin (2012). "Trading-off fish biodiversity, food security, and hydropower in the Mekong River Basin." *Proceedings of the National Academy of Sciences of the United States of America* 109(15): 5609-5614.