DEVELOPMENT CORRIDORS PARTNERSHIP

IMPACT ASSESSMENT FOR CORRIDORS: FROM INFRASTRUCTURE TO DEVELOPMENT CORRIDORS

Edited by:
Jonathan Hobbs and Diego Juffe Bignoli

2022

The Development Corridors Partnership

The Development Corridors Partnership (DCP) is a research and capacity development initiative. It is a collaboration between institutions from China, Kenya, Tanzania and the UK. The main objective is to deliver effective research and capacity-building to help improve corridor planning and management. It aims to ensure that development corridor decision-making is based on sound scientific evidence and effective use of available planning tools and procedures, to ensure that risks are avoided and opportunities exploited. The DCP comprises partners from the University of York, the University of Cambridge, London School of Economics, Sokoine University of Agriculture, the University of Nairobi, as well as the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), African Conservation Centre, the World Wide Fund for Nature (WWF), the Chinese Academy of Agricultural Sciences and the Chinese Academy of International Trade and Economic Cooperation (CAITEC).

DCP Partners:

For the purposes of this publication, DCP collaboration was extended to experts representing Netherlands Commission for Environmental Assessment, the Centre for Energy, Petroleum and Mineral Law and Policy at the University of Dundee, the University of Queensland, the Columbia Centre on Sustainable Investment, the GOBI Framework for Sustainable Infrastructure Initiative (comprising the University of Oxford, University of Central Asia and the Independent Research Institute of Mongolia), The Biodiversity Consultancy, the Wildlife Institute of India, the Endangered Wildlife Trust and Ecotecnia Ingenieros Consultores SRL.

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Foreword

In the course of a long and varied working life, I have been privileged to work with, or learn from, a stimulating panoply of individuals who are committed to contributing to the economic, social, and environmental development of all aspects of the United Nations Sustainable Development Goals.

Jon Hobbs and Diego Juffe-Bignoli are, thankfully, two of these individuals. I was delighted to learn that they had come together to produce, for the Development Corridors Partnership, a rich and stimulating collection of research reports, case studies and assessments relating to the array of efforts made under the rubric of 'development corridors'. They were determined to express the conviction that decisions made, primarily by governments, regarding the planning and building of Corridors, really must be informed by an evidence-based understanding of the consequences – positive or negative – of these decisions. And they have succeeded. But Jon Hobbs will never read these words. He was hospitalized after the bulk of the work was complete, and, to the deep sadness and regret of all who knew him, he passed away at the end of September, 2021.

Jon and Diego sought out and recruited a daunting array of researchers, scholars and stakeholders to shed light on the processes currently underlying the world of development corridors today. They certainly succeeded.

The work was initiated before the onset of the COVID-19 pandemic, and as governments turn to the formidable challenge of restoring economic vitality without further damage to the climate, it becomes even more imperative that impact assessment be understood, embraced and improved. Jon and Diego have shown us the way forward for a journey which absolutely must be embarked upon.

They would be first to recognise that the Development Corridors Partnership as a whole must be commended for showing – in many different ways and places – that, not only is the need for impact assessment clear and present, but so are the skills and commitment of researchers, scholars and stakeholders. These are to be found in an impressive coming together of universities, civil society organizations and business groups, and communities.

All are part of an outstanding initiative, funded by the UK Research and Innovation Council, and managed by the UNEP-WCMC. This initiative has been embraced by some of the best minds that have been turned to the task of ensuring that – while we attempt to bring economic and social benefits to people, in line with the United Nations Sustainable Development Goals – we do not risk significant environmental and social costs, and thus actually undermine long-term development successes.

So, I urge you to read this book, and figure out how you might improve your own contribution to the challenges ahead. Jon and Diego have set out a case. It needs to be taken up, not set aside; acted on, not just talked about. It is in your hands.

John Harker

Chair of the Development Corridors Partnership Independent Advisory Board,
Nova Scotia, Canada.

Dedicated to the memory of Jon Hobbs
who was the architect and driving force of this book

Executive Summary

Driven by increasing globalisation, the development aspirations of nations, and the need to access resources, an infrastructure boom is impacting many regions of our planet. New infrastructure projects are traversing diverse landscapes over hundreds of kilometres, often crossing international borders and penetrating into remote areas previously unaffected by industrialisation and urbanisation. These large-scale projects, mostly spanning several regions in a same country, but often linear and transnational in nature, are generically called corridors. Depending on the nature and objectives, they can be transport, infrastructure, growth, resource or economic corridors.

The rapid development of corridors globally presents environmental planning professionals with numerous challenges. **The primary need is to ensure that decisions about these developments are informed by an evidence-based understanding of their consequences – both positive and negative.** This will enable infrastructure development to meet development needs without adversely impacting ecological systems or human welfare. Improving the quality of infrastructure policies, plans, programmes and projects, by ensuring they include the necessary environmental and social scrutiny, is urgently required now - and will be for the foreseeable future. This challenge is the unifying theme of this publication.

Using insights from Africa, Asia and South America, this sourcebook compiles 24 contributed papers written in 2021, covering many facets of the opportunities and challenges presented by the rapidly growing number of infrastructure and corridor developments around the world. Prevailing planning practices are reviewed through case studies along with the efficacy of some of the available tools to conduct systematic and comprehensive impact assessments. The latter includes Strategic Environmental Impact Assessment (SEA) and Environmental Impact Assessment (EIA).

As the title suggests the underlying thesis of this publication is that, where they are justified, **there are significant benefits in ensuring that corridors that contain single purpose infrastructure developments (utility, infrastructure or transport) progress through a carefully planned sequential process of diversification and expansion to ensure the maximisation of benefits in full-blown 'development corridors'.** In this book, development corridors are therefore aspirational. They comprise areas identified as priorities for investment to catalyse economic growth and development. They should be developed with multiple stakeholders and social, economic and environmental interests and interdependencies in mind. With the integration of sustainability principles and appropriate environmental and social standards, development corridors could become true '(sustainable) development corridors'. They should be planned to maximise positive opportunities and minimise negative risks. Without this, today's short-term successes will become tomorrow's challenges and long-term human welfare and ecosystem integrity will be undermined.

Overview of contents

This book brings together a wide range of perspectives from experts, researchers, and practitioners around the world with the purpose to foster greater collaboration and increase our global understanding of corridors and their benefits and potential negative impacts. 13 of the 24 chapters are written by independent experts and researchers from Australia, Bolivia, Brazil, China, India, Kenya, Mongolia, South Africa, Tanzania, UK, and the USA. The book also includes 11 chapters containing material gathered by the Development Corridors Partnership, a programme of work led by UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and funded by the UK Government via their Global Challenges Research Fund.

The collection of papers in this sourcebook is divided into five sections. First an introductory section where we introduce some key terms and definitions that underpin this work (Chapter 1). We then explore some key principles and aspirations of corridors such as delivering the Sustainable Development Goals (Chapter 2), ensuring theory and practice align (Chapter 3), ensuring financial sustainability (Chapter 4), properly assessing environmental sensitivity (Chapter 5) respecting human rights (Chapter 6), or maximising, co-benefits (Chapter 7).

In the next three sections, we present 15 case studies from three continents: Africa, Asia, and Latin America. These case studies explore key challenges and lessons learned from specific planned, ongoing, and already implemented developments. They are presented as individual stories that readers can explore.

The final and fifth section aims to summarise lessons learned from a 4-year research and capacity building programme specifically aiming to understand the key challenges and opportunities around corridors and that has been the major driving force of this work: The Development Corridors Partnership project (DCP). DCP is a collaborative partnership across UK, Kenya, Tanzania and China, funded by the UK Research and Innovation Global Challenges Research Fund (see Chapter 23).

The book finishes with an overview of the lessons learned from the contributed papers included in this book and develops ten principles for corridor planning and delivering a meaningful and comprehensive impact assessment (Chapter 24), which we summarise here as ten key messages.

Key messages

1

Corridors must seek to achieve positive sustainability outcomes:

The mindset underwriting environmental planning of most infrastructure developments has been to mitigate negative impacts. The planning of few existing corridors is based on their role in supporting a sustainability vision for a country or region in which they are situated. Corridor developments must therefore be based on sustainability principles and support progress towards national, regional and international sustainable development goals. A true development corridor will seek to do good, as well as to mitigate negative impacts.

2

Integrated and inter-disciplinary approaches are needed:

Corridor developments are extensive, complex, multifaceted features traversing many landscapes. They can bring about significant transformational change to physical, economic, social, and cultural systems, and serve as interconnecting features. Yet engagement in corridor planning is often constrained by limited disciplinary and institutional involvement, with projects often superimposed upon communities. Corridor developments need diverse expertise and experience in their planning and management, including local stakeholder knowledge, avoiding disciplinary, institutional, or sectoral silos, that can result in policy conflicts, contradictions, and inconsistencies.

3

Corridor proponents should clearly demonstrate consideration of alternatives:

Corridor options should not be limited to a preferred proposal favoured by an elite. Corridor developments must consider all feasible alternatives (including maintenance of the status quo and no corridor development) and make the risks and opportunities of each option explicit and transparent through meaningful consultation. An important requirement in all corridor planning is to justify the need for a wide choice of options and an explanation of the potential benefits it will bring and to whom, in comparison with the alternatives. Any necessary trade-offs and how any significant potential negative impacts will be effectively managed, and opportunities created must be explained.

4

Public participation and stakeholder engagement should be at the core of corridor planning:

Corridor planning frequently fails to include meaningful participation of all stakeholders. Corridors can profoundly affect the lives and rights of indigenous peoples and local communities, potentially for generations. A common failing is that the first opportunity for local stakeholders to engage arises only after all strategic decisions have already been made and the only option remaining is for them to react negatively to a fait accompli. The meaningful engagement of all stakeholders is necessary to ensure their role is more than reactive. The way corridors are viewed by different stakeholders must be identified, understood, and addressed. Corridor developments must ensure that all interested and affected people are provided with adequate information about a proposal and have meaningful ways to engage in decision-making processes from the outset of strategic planning.

5

Mainstreaming and tiering are fundamental for corridor success:

Corridor planning requires a tiered assessment process, ensuring that environmental and social issues are considered alongside financial and technical considerations from the start of strategic planning or programme development, right though to project specifics. Conceptual corridor planning is frequently dominated by technical and financial suitability criteria with environmental, social, cultural, and human rights sensitivity issues being considered, at best, as externalities, retrospectively, once issues and problems arise. Strategic planning is important because it is when the full range of options is still open for discussion. It also establishes the parameters that will frame and implement a corridor plan or programme. Environmental and social considerations (and the interactions between them) should be considered early in strategic decision-making alongside (and to inform) technical, financial, and economic considerations.

6

An iterative process is needed:

Corridors exist in dynamic environments and need to be responsive to changing circumstances and priorities. Planning must adjust as circumstances and available information changes. The process should identify, map, and engage all interested and affected stakeholders from the earliest stage of corridor planning and throughout the planning and management of the corridor. New concerns and evidence will likely emerge as a corridor development progresses. Corridor planning frequently places undue emphasis on the production of a report (Environmental Impact Report) and its influence on the decision to proceed. The process may not be so linear in nature. It may involve many adjustments and decisions as new evidence emerges and predictions improve. A good-quality report and recommendations is necessary, but they are dependent upon a comprehensive process of ongoing dialogue and engagement with all stakeholders.

7

Corridors must ensure effective use of available tools:

Many corridor environmental impact assessments fail to meet required international standards. Corridor planning and management should make systematic and adequate use of available impact assessment procedures, methods, techniques, and tools to ensure good-quality decisions. The available procedures discussed in this publication (notably Strategic Environmental Assessment and Environmental Impact Assessment) and their associated methods, tools and techniques should be used when appropriate to help ensure that a systematic process identifies all significant potential benefits and development outcomes, and that they outweigh the costs and risks to affected people and their livelihoods and environments. The objectivity and quality of corridor decisions are dependent upon the effective use of the available tools.

8

Plan corridors with resilience and adaptability in mind:

Prevention will always be better than cure in addressing the negative impacts of corridors, and this should be the priority. However, some circumstances dictate an inevitability of negative impacts. Corridors, therefore, need to be designed to be made resilient to anticipated changes and adaptation measures may be necessary as 'coping' mechanisms or to offset unavoidable impacts, such as the impacts caused by climate change. The suitability of measures will require ongoing monitoring and adaptation as needs arise.

9

Seek impact, influence, and implementation capacity:

The decision to proceed with a corridor is ultimately the responsibility of decision makers. They are usually the representatives of all stakeholders' interests and custodians of their natural resources. Any impact assessment report must provide adequate information to ensure sufficiently good-quality decisions. If they are to be effectively implement the recommendations provided. Attempts to improve the performance of planning and associated assessment processes of corridors must tackle the ways in which outcomes are shaped by political contexts and institutional capacities. Approaches to working on assessment processes should integrate political economy analyses and institutional capacity assessment from the outset and on an ongoing basis. Resulting insights should inform the design and implementation of interventions intended to improve planning practice.

10

Evolve from Infrastructure to Development Corridors:

The prospects for linear infrastructure projects to evolve into comprehensive development corridors are often left to chance and spontaneity. Infrastructure projects are often developed in isolation and in an incremental way. For infrastructure projects to progress and become true development corridors, the transition must be systematically sequenced into planning from the start. Assessments must include consideration of potential induced, secondary, synergistic, transboundary, and cumulative impacts likely to result from the corridor development. The progression from infrastructure to development corridors must be based on a systematic, comprehensive, and integrated assessment of the potential positive environmental, social and economic opportunities and the rigorous avoidance or management of negative impacts.

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The Mekong River Corridor: A Critical Test for EIA/SEA Effectiveness

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ABSTRACT

Southeast Asia has one of the most advanced corridor programmes in the world. Since 1998, corridor development has been a flagship programme of the member countries of the Greater Mekong sub-region managed by the Asian Development Bank (AsDB). The AsDB promotes the active transitioning of transport corridors to economic corridors to (ultimately) development corridors, yet none have achieved this status yet. Three regional economic corridors are currently promoted as frameworks upon which to anchor regional development projects and attract investors.[103] However, this chapter focuses specifically on the Mekong river. This is a corridor with a difference. Unlike other corridors described in this publication, the river serves as a natural linear 'corridor' upon which developments are imposed. This is in contrast to most other corridors described in this publication's chapters, where an artificial linear development is overlayed onto an exisiting natural environment. The challenge remain the same; to create better harmony between development and environment. This case study is an illustration of the complexity of managing such a resource as a river, vital for millions of people, while it is under pressures from strong competing interests. In addition, it is a good example of a corridor that has seen pioneering applications of tools intended to address strategic choices, co-benefits, scenario planning, cumulative and transboundary effects. A partial moratorium on new dam developments on the mainstream Mekong currently presents a window of opportunity to appraise the situaiton and undertake research into the true costs and benefits of such developments and to put better systems in place to assess and manage their impacts. Lessons learned in the Mekong corridor will be important for the planning and development of other types of corridors generally.

103 The work of agencies such as the Netherland's Commission for Environmental Assessment supports capacity development in environmental and social assessment in the planning of GMR developments (Netherlands Commission for Environmental Assessment 2017).

18.1 Introduction

This chapter focuses on the recent history of hydropower planning and development based on a literature review. For ease of reference, details of selected hydropower case studies are provided in Annex 1. Substantive references are included at the end or in Table 18.1, while media sources are referenced as footnotes.

Agencies such as the Mekong River Commission (MRC) and the Core Environmental Programme of the Asian Development Bank (AsDB) have been industrious in advocating strategies, tools, training and guidelines to help decision makers identify the median line between development needs and environmental safeguards across the international boundaries of the MRC member countries. Numerous independent institutions track developments and frequently raise alarms about any concerns.

However, in spite of many initiatives, the environmental profession continues to have little significant influence on decision-making. Decisions on projects (or the policies, plans and programmes that frame them) are usually made without adequate assessment and management of their impacts. Instead ad hoc, incremental developments cumulatively threaten the sustainable future of the river. Those with vested interests in projects often remain tolerant of the prevailing laissez-faire attitude demonstrated by some decision makers to managing environmental impacts. This is compounded by a further apparent lack of political will to improve the situation. The absence of the essential components of good governance (effective rule of law and institutions to implement them, transparency and inclusiveness in decision-making, equitable distribution of benefits) is frequently evident. Such challenges are not unique to the Mekong (see Chapter 3), but it is certainly one river with pressing issues to address.

18.2 The Mekong river

If ever there were a situation requiring effective environmental planning and mangement, the Mekong is surely it. Escalating development pressures are being superimposed onto the Mekong, with poor-quality environmental and social standards threatening the systems upon which the security and livelihoods of millions of people depend. The transnational nature of the river subjects it to geopolitical pressures.

The Mekong River corridor provides the core for regional development plans in the Greater Mekong Sub-region (GMS), an economic grouping managed by the AsDB. The Mekong River (known as the *Lancang Jiang* in China) originates on the Tibetan Plateau in Qinghai province and flows for 4,350km through the eastern part of the Tibet Autonomous Region and southwestern China (mostly Yunnan) for over half its length, before either running through or along the borders of Myanmar, Thailand, Lao PDR, Cambodia and Vietnam, where it eventually enters the South China Sea via the Mekong delta. In the process, it seasonally replenishes southeast Asia's largest lake, Tonle Sap in Cambodia. In its upper reaches, the river carves its way through mountainous terrain and over many centuries this topography has helped to protect a rich biodiversity, as well as some remote ethnic communities from invasions and incursions.

It is estimated that 200 million people depend on the GMS's natural capital, and about 60 million live in the river basin itself.[104]

The Mekong River is one of the world's most productive inland fisheries. The river's productivity is dependent upon seasonal variations in flow rates that create a dynamic system of annual flooding and semi-drought conditions to which both wildlife and people have adapted. The Mekong is also considered to be the second most biologically diverse river in the world, after the Amazon. It is estimated that the Mekong provides habitat for about 850 freshwater fish species, but this climbs to more than 1,300 when saltwater species of the delta are included. Many fish species are endemic and about 135 are migratory (more than any other river) (Hortle 2009).

In addition, GMS countries harbour over 430 mammal species, over 800 reptile and amphibian species, about 1,200 bird and at least 20,000 plant species. Among the locally endangered species of the region is the Mekong/Irrawaddy River dolphin (*Orcaella brevirostris)*. While this freshwater dolphin has an extensive range, its distribution on the Mekong is limited to a 190km stretch of the Mekong between Cambodia and Lao PDR, where it is vulnerable; fewer than 100 are estimated to remain.[105]

104 Source: https://www.internationalrivers.org/asia/mekong/

105 Source: WWF Greater Mekong Programme (2020} www,greatermekong.panda.org

18.3 Development pressures

The Mekong is under multiple developments. These include flood control initiatives, canalization for navigation, unsustainable fishing practices, excessive water abstraction, deforestation and urban growth, river sand and gravel quarrying, increasing tourism, pollution and poaching.

This paper focuses on developments to harness the Mekong's hydropower energy and the assessment processes involved. The Mekong is one of the world's most active regions for hydropower development. The policy drivers include energy security, energy trade, self-sufficiency, regional integration, revenue generation, attracting foreign direct investment, power supply diversification and increased access to electricity for the region's industry and people. Energy poverty is widespread and there is a pressing need to increase energy access for the majority of people.

Estimates have suggested that the total potential for hydropower production in the Mekong basin is between 50,000 and 60,000 MW. This is roughly a 50/50 split between the upper (PR China and Myanmar) and lower Mekong (Lao PDR, Thailand, Cambodia and Vietnam). This estimate, however, does not take into account environmental and social factors that should eliminate some of the planned schemes. So far, about 3,500MW of this potential has been realized through projects built largely over the past 20 years.[106, 107]

Eleven dams have been constructed on the upper stretch of Yunnan and at least another 11 are either proposed, under construction or operational downriver on the mainstream of the Mekong. Seven hydropower projects are planned in Lao PDR, two in Cambodia (collectively known as the 'Laos cascade') and two straddling the Lao PDR/Thailand border.[108]

According to a Mekong River Commission (MRC) cost-benefit analysis (known as the 'Council Study' [See Table 18.1]) the riparian countries (excluding PR China) "could see economic gains from full hydropower development of more than $160 billion by 2040" (Mekong River Commission 2018a). Development of hydropower also creates potential synergies with other water related needs, including expanding irrigation and navigation opportunities and improving both flood and drought management. But the Council Study also pointed out that such benefits come with costs, especially natural capital loss. For example, a fisheries decline of US$ 23billion by 2040, loss of forests, wetlands and mangroves of up to US$145 billion, reduction of sediment, resulting in reduced rice production and so on. Overall, it was suggested that dam developments in the Mekong could decrease gross domestic product growth for lower Mekong countries by about US$ 29 billion (Mekong River Commission 2018a).

Proponents promote hydropower as a renewable energy source. This is not a unanimous viewpoint,[109] but it allows countries to claim diversification of their energy mix and shift emphasis in supply away from the current dominance of fossil fuels, which presently account for 70 per cent of all grid-based generation in the GMS

106 This refers to schemes on the main river course, not tributaries of which there are many more. The mainstream receives priority because it offers freshwater species mobility throughout the river basin and supports sensitive natural processes upon which sub-basin wetlands and lakes are dependent. Mainstem rivers provide basin connectivity; River basins provide primary land/water interface.

107 Source: https://www.internationalrivers.org/campaigns/mekong-mainstream-dams.

108 Source: http://www.mrcmekong.org/our-work/topics/hydropower/

109 "10 Reasons Why Climate Initiatives Should Not Include Large Hydro." A Civil Society Manifesto for the Support of Real Climate Solutions (International Rivers USA). (http://org.salsalabs.com/o/2486/p/dia/action3/common/public/?action_KEY=18739)

countries (Asian Development Bank 2008).[110,111]

Hydropower dams and their reservoirs have many and diverse potential negative environmental and social impacts.[112] They can significantly impact ecological processes and hydrological dynamics, they frequently require the displacement of many people, inundate and remove land and forest cover, degrade and destroy habitats, create barriers to wildlife (especially fish) migration, reduce sediment and nutrient supplies to downriver communities and reduce soil fertility, plant health and undermine established livelihoods.[113,114]

In addition to managing such direct impacts, planning and management of hydro power developments must consider the cumulative, secondary, transnational and interconnectivity impacts on this complex river system. According to the MRC's Monitoring Unit, Yunnan's cascade dams have reduced downriver wet season and increased dry season flow rates significantly resulting in erratic contradictions of natural systems (Basist and Williams 2020). This exacerbates the impacts of climate change.[115] In 2019, and "in spite of above normal rainfall and snowmelt in China's portion of the upper basin, nearly all run off stayed behind China's dams" (Eyler 2019). This allegedly exacerbated a drought in downriver countries, adding to *El Nino*-induced conditions. (Eyler and Weatherby 2020). However, opinions are divided on this. Chinese researchers suggest that the upriver cascade dams do not adversely impact downriver water regimes but instead, if well planned and managed, developments could reduce flooding and drought risks and create new opportunities for agriculture, aquaculture and fish farming.[116,117] The MRC were non-committal on this, stating that "more scientific evidence was necessary to conclude that the 2019 drought was in large part caused by water storage in Upper Mekong dams." It urged more open information sharing among stakeholder countries.[118]

This highlighted a critical issue: the need for better sharing of information. Without it, there will be a lack of trust of, inter alia, flow rate data that makes verification of claims and counter-claims very difficult. In 2020, Chinese Premier Li Keqiang pledged that China would start to share year-round hydrological data with the MRC.[119] Meanwhile, a Mekong Dam Monitor was established in the USA (run by Eyes on Earth and the Stimson Centre). It will use satellite imagery to provide "a near-real time picture of how major dams and the climate change impact the Mekong's hydrological conditions."[120]

Dam building often requires access to remote areas (using roads, railways, bridges, tunnels, canals, conveyors, transmission lines, pipelines, etc). This will include direct clearance of vegetation and access to borrow areas for construction materials and may create secondary impacts when forestry or mineral resources become more viable, not all of which may be legally acquired.

It is currently not possible for commercial vessels to navigate the length of the Mekong. Rapids and other physical obstacles occur

110 The GMS countries have diverse energy resources that are unevenly distributed. Most of the fossil fuel resources are in Yunnan and Vietnam. Myanmar and Cambodia have gas fields, mainly offshore, Thailand has limited domestic gas and oil reserves and relies on imports (Asian Development Bank 2008).

111 Although on a downward trajectory, China is the world's largest user, producer and consumer of coal. https://phys.org/news/2015-11-coal-anytime-renewables.html

112 For list of hydro power's negative impacts in the Mekong see: https://www.scientists4mekong.com/list-of-damages-by-hydropower-dams-in-the-mekong-basin/.

113 The Consultative Group on International Agricultural Research monitors the development of dams in the Mekong Region and their impacts on health and food security.

114 In other parts of the world, fish ladders have been employed to aid fish migration. Such innovations are not considered suitable for the Lower Mekong River because of the diversity of species and their behaviours and large numbers of migrating fish.

115 Source: Scientists4Mekong.com

116 Li Xiang of the China Institute of Water Resources and Hydropower Research Institute, Beijing Speaking in 2019 at the 8th MRC Regional Stakeholder Forum (Vientiane PDR Lao).

117 Source: Global Times: "River dams in China helped alleviate drought along Lancang-Mekong, research finds" 2020/7/15.

118 Source: "US govt funded study found that China could have choked off the Mekong, threatening the lifeline of millions in Asia" Pan Pacific Agency News and Analytical Agency. New York, 28 April 2020, CNBC.

119 Speaking at the Third Lancang-Mekong Cooperation Leaders' Meeting, Beijing, 24 August 2020.

120 Source: https://www.theedgemarkets.com/article/us-steps-scrutiny-chinesebuilt-dams-mekong-basin.

in several places. Removal of these is part of the agenda for increasing the Mekong corridor's accessibility for trade. For two decades, the controversial "Mekong rapids-blasting" or "Canalisation Project" has been promoted. The plan is to create a navigable channel for safe, year-round commercial navigation by large vessels along the river, especially between Yunnan (PR China) and Luang Prabang (Lao PDR). In 2000, China, Myanmar, Lao PDR and Thailand signed an "Agreement on Commercial Navigation on the Lancang - Mekong River". However, it has had a stop-start history and work has only been partially implemented to date in China, Myanmar and Lao PDR.

Of concern is that such developments have proceeded without much evidence of adequate consideration of their environmental and social impacts or engagement with affected communities. The consequences of further blasting and disposal of excavated rock in pools will impact important fish habitats, as well as potentially influence river velocity. Thailand has also raised national security concerns. After a recent lull, interest in the project was revived in 2016 at the Lancang-Mekong Cooperation Framework (LMC) (see below). However, yet again, late in 2017, China suspended plans for the project. Nonetheless, as is quite often the case in the Mekong experience, consultations and preparatory work reportedly continued during 2018, again undermining trust and creating uncertainty. In 2020, Thailand's government formally cancelled their commitment to the project in their part of the river, and this has stopped further developments (for now) (Deetes 2020).

18.4 Governance

Governance of the Mekong is complicated by the transnational, multiple and diverse administrations and stakeholders with an interest in the river. More than four overlapping regional programmes provide support to the Mekong region countries on, inter alia, environmental planning and management strategies (the GMS, MRC, LMC and Lower Mekong Initiative [LMI]). These connectivity initiatives cover a wide range of mechanisms aimed at linking hard infrastructure, policies and peoples within the Mekong region. One reason for this apparent duplication of effort is "the competition (between) regional powers, such as China, the US and Japan that want to exert their respective influence through their own proposed mechanisms, and, to a certain degree, to undermine the influence of their rival powers" (Leng 2019). However, it also gives the Mekong countries more opportunities to access new sources of funding for their infrastructure development.

18.5 The Greater Mekong Sub Region (GMS)

The GMS is an intergovernmental economic grouping established by the AsDB in 1992. The GMS comprises six countries: Myanmar, Thailand, Lao PDR, Cambodia, PR China (specifically Yunnan province and Guangxi Zhuang autonomous region) and Vietnam. It sets the development framework for the region by promoting cooperation, integration and connectivity. It also helps mobilize donors' and investors' interests in priority infrastructure projects. The Environment Operations Centre serves as a knowledge hub and provides technical support to the Ministerial GMS Working Group on Environment, which is responsible for regional cooperation in implementing a Core Environmental Programme.

Since 1998, development corridors[121] (DCs) have been key to GMS's strategy, guided by three principles: "environmental resilience, integration and inclusivity". The DCs are intended to further catalyse investments, encourage co-benefits, promote public-private partnerships and, ultimately, facilitate economic growth as a means to reduce poverty across the region (Srivastava 2011). They are the conduits for transforming ad hoc, uncoordinated infrastructure projects into better integrated economic development that links production, trade and markets, while improving the efficiency and effectiveness of the movement of goods, services, labour and capital within the region.

The Chinese-led Belt and Road Initiative BRI has been increasingly superimposed on to the AsDB's economic corridor strategy, providing further regional interconnectivity and raising concerns about the need for more rigorous environmental assessment procedures[122] (see Chapter 16; Baird and Thomas 2020). While the DCs are fundamentally linear in nature, they also include the development of new nodes, special economic zones (SEZ), that are promoted as intensive investment hubs in key places along corridors.

18.6 The Mekong River Commission (MRC)

Within the broad-based GMS, another intergovernmental agency, the MRC (established 1995) provides a river basin-specific institutional framework and technical support. Its mandate is to implement the 'Mekong Agreement for Regional Cooperation' between Lao PDR, Thailand, Cambodia and Vietnam (the founding members). The MRC sees itself as an honest broker, developing plans and collecting data to inform evolving strategies for the sustainable management of the river basin within an Integrated Water Resources Management (IWRM) framework.[123] The MRC has been industrious in its production of strategies and guidelines (see Table 18.1).

121 Three economic corridors are being developed: the North-South Economic Corridor (linking Yunnan with Bangkok via Lao PDR as well as Nanning with Vietnam), the Southern Economic Corridor (linking Cambodia with Thailand, Vietnam and Lao PDR and Myanmar) and the East West Economic Corridor (linking Da Nang in Vietnam, through Lao PDR, Thailand with Myanmar, it intersects the North-South Economic Corridor in Thailand) (Srivastava 2011).

122 For example, in 2018 Myanmar and China signed an agreement to establish the China-Myanmar Economic Corridor (CMEC), as part of the BRI. Stretching 1,700km, the CMEC's network of new railways, communications, SEZs and other major infrastructure projects are intended to link Myanmar (eventually to Yangon) with landlocked Yunnan.

123 IWRM is based on the four 'Dublin principles' formulated at the International Conference on Water and the Environment (1992). It is a process promoting coordinated development and management of water and land resources, in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

Table 18.1 Key assessments, guidelines, tools developed by the MRC to assist the Member Countries achieve a balance between hydropower development and transboundary environment protection

	Title	Date	Notes
Strategic and Planning Assessments			
Strategic environmental assessment (SEA) of Mekong Hydropower	A pioneering Strategic Environmental Assessment of hydropower	2010	Reviewed opportunities and threats of 12 proposed main river hydropower schemes to project their cumulative, long-term implications. The SEA informed subsequent MRC strategies 2011-2015 and 2016-2020; it recommended a 10-year moratorium, called a 'hiatus' by dam proponents, and largely ignored
River Basin Development Plan (BDP)	Assessment of Basin-wide Development Scenarios	BDP1 2001/06, BDP2 2007/10 BDP3 2011/15	Basin development planning provides basin-wide perspectives and creates a transboundary management framework to ensure that nationally planned developments are well coordinated Assessment of cumulative Impacts based on basin-wide scenarios resulting from existing and planned water resource developments (including, but not limited to hydropower); it assessed national water resource development plans against economic, environmental and social assessment indicators
Basin Development Strategy (BDS)	Identifies priorities	Current: 2021/30.	The BDS sets strategic priorities up to 2030 related to development, environmental protection and institutional cooperation, guiding Mekong stakeholders towards achieving improvements in the environmental, social and economic state of the River Basin; it uses national indicator plans and the MRC indicator framework for setting planning, assessment and reporting requirements; it identifies opportunities to strengthen management, increase regional and national benefits to achieve this
Sustainable Development Plan	"The Council Study"; Study of the Sustainable Management of Mekong basin	Updated 2018	Cost–benefit analysis assessing investments in hydropower, irrigation, agriculture and navigation sectors detailing their combined effects (including synergies); an indicator framework comprising social, environment, economic, climate change and cooperation dimensions used to establish the risks and benefits of existing and planned hydropower developments and their impacts on other sectors
MRC Environmental Management Strategy	The Mekong Strategy for Basin-wide Management of Environmental Assets of Regional Importance	2020 (2021-2025)	The first of its kind that covers the whole Lower Mekong Basin; it seeks to restore, protect and manage environmental assets of regional importance
Guidelines and Tools			
Assessment of Basin-wide development scenarios (to support Basin Development Planning)		2010	Tech Guides: 1. Scoping and planning of the assessment of development scenarios; 2. Assessment Methodologies; 3. Assessment of Flow changes; 4. Impacts on river morphology; 5 Impacts on Water Quality; 6. Power Benefits; 7. Agricultural impacts; 8. Salinity intrusion; 9. Impacts on wetlands and Biodiversity; 10. Impacts on Tonle Sap; 11. Impacts on Fisheries; 12. Social Impacts; 13. Economic Benefits and Costs
Design Guidance for Proposed Mainstream Dams in the Lower Mekong Basin		Updated 2018	Tool to help stakeholders better participate in regional fora and Procedures for notification prior consultation and agreement (PNPCAs); provides guidance for dam design and operations founded on the principles of IWRM and the mitigation hierarchy
Rapid Basin-wide Hydropower Sustainability Assessment Tool (RSAT)		Updated 2016	Framework and methodology to support governments to achieve their strategic priorities at basin-wide level. It is based on the Mekong Basin Development Strategy 2011, the IWRM principles and the Hydropower Sustainability Assessment Protocol; it highlights 10 topics /27 sub-topics. Topics: 1: Institutional capacity; 2. Options assessment, siting and design; 3. Economic contribution; 4. Equitable sharing of costs and benefits; 5. Social issues/stakeholder consultation; 6. Environmental management and ecosystem integrity; 7. Flows and reservoir management; 8. Erosion, sediment transport and geomorphological impacts; 9. Fisheries; 10. Safety The Four criteria used to analyse the topics and sub-topics are: 1. River basin planning and management; 2. Energy sector planning and regulation; 3. Hydropower projects; 4. Regulations and governance

Guidelines for Evaluation of hydropower and multipurpose portfolios	2015	Multipurpose uses of dams need to be considered at the outset of project and basin planning; these guidelines consider a project's wider social, economic and environmental implications during development of hydropower strategies (a portfolio process) and to internalize all costs and benefits in economic evaluations used to compare hydropower and other multipurpose options to assist basin planning
Guidance on (1) National to Local benefit and cost sharing options on Mekong Tributaries and Scoping Paper of (2) Regional Benefit Sharing	2014	The MRC Basin Development Strategy required members to report on benefit-sharing options for Mekong tributary hydropower; these guidelines identify priority issues for equitable benefit sharing (monetary and non-monetary); optimizing additional and indirect benefits
Pilot testing (in the Sre Pok sub basin) of the identification of ecologically sensitive sub-basins for sustainable development of hydropower on tributaries	2015	Risk-based guidance to identify ecologically sensitive areas to be protected and those where hydropower can be developed with manageable environmental impacts; makes recommendations for up-scaling the identification of Ecologically Sensitive Areas based on a pilot exercise of the Sre Pok river (Vietnam and Cambodia)
'The Hydropower *Mitigation* Guidelines': for Hydropower Environmental Impact Mitigation and Risk Management in the Lower Mekong Mainstream and Tributaries (Vol 3)	2019	Based on case studies of the Laos cascade, the effectiveness of good practice planning and design mitigation measures are assessed including revenue implications; the indicators included are energy revenues, value of fish products, sediment transfer, nutrient transport, catchment connectivity for fish and overall biodiversity loss; the impacts of the dams were assessed against a series of scenarios
Guidelines for Transboundary Environmental Impact Assessment in the Lower Mekong Basin	Update 2018	A common framework of transboundary assessment that builds on and complements national EIA systems; outlines the mode of cooperation between members to prevent, minimize and manage transboundary impacts
Procedures and Protocols		
Procedures for Notification and Prior Notification Consultation and Agreement (PNPCA)	Ongoing	The PNPCA is the MRC's main procedural tool for encouraging cooperation and dialogue on hydropower plans
Stakeholder Engagement Principles and Statement	Updated 2017	Stakeholder engagement is stated as important in all MRC's key documents (including the 1995 Mekong Agreement) and its Procedures, Basin Development Strategy and Plan etc. A Statement on Public Participation

Other Guidelines/Reviews	
Basin-wide assessment of climate change impacts on hydropower production	2018
Review of existing knowledge on the effectiveness and economics of fish friendly turbines	2015
Review of existing research on fish passages of large dams. and applicability to mainstream Mekong	2015
Guiding considerations of transboundary impacts for hydropower planning and management	2014
Assessment of basin-wide development scenarios (an assessment framework)	2011

One of the MRC's most innovative exercises was the 2010 SEA. Although it has never been accepted as an official MRC report, it advocated for the adoption of an IWRM framework for the Mekong. This meant the adoption of the three main principles of the IWRM, which are:

1. Multi-sectoral approaches;
2. Participation of stakeholders throughout planning and implementation;
   and
3. Consideration of all options for power supply, including enhancement of the role of demand-side management, loss-reduction measures and alternative supply options to ease pressure on natural and other resources (United Nations Environment Programme 2012).

In postulating the future development path, the 2010 SEA considered four scenarios for the main-river Mekong dam programme:

1. No new main-river dams;
2. Deferred decisions on all main-river dams for a set period;
3. Gradual development of main-river power; and
4. Market driven development of main-river projects.

The SEA recommended option two, stating that; "Decisions on mainstream dams should be deferred for a period of ten years with reviews every three years to ensure that essential activities during this period are being conducted effectively" (Mekong River Commission 2010a). The deferment activities included **"**comprehensive feasibility studies of partial in-channel, diversion and other innovative systems […] which do not require dams across the full extent of the river channel, comprehensive assessment and fast tracking of tributary projects that are considered feasible and ecologically sustainable according to current international good practice". The SEA also called for "assurances that the Mekong main-river will never (again) be used […] for *proving* full dam hydropower technologies" (Mekong River Commission 2010).

In spite of how industrious it has been in producing reports, the MRC has been criticized as being weak in its practical dealings with the powerful pro-dam lobby. National interests continue to dominate regional cooperation agendas and the MRC's ability to broker deals between its members is limited (as will be seen in the contentious Don Sahong, Xayaburi cases in Annex 1). It has been suggested that the member states prefer the MRC to be a toothless organization – acting as a facilitator, rather than imposing conditions on its members (Dore 2003). While its members want it to mobilize funds, rather than control their developments, for a variety of reasons, donor funding has been substantially reduced in recent years.[124]

The MRC's weakness is evident in the application of the Procedures for Notification and Prior Consultation and Agreement (PNPCA), on which it relies heavily to exercise influence. According to Article 7 of the 1995 Mekong Agreement, proposing governments are required to hold prior consultations with the other MRC members to discuss the potential transboundary impacts of mainstream dam developments on neighbouring countries. Tributary projects are excluded, only requiring notification. The intention of the PNPCA is to create a platform for stakeholders to engage in assessments of new developments and present technical information on its proposal and an EIA (or more likely, the precursor to an EIA: a less comprehensive initial environmental evaluation [IEE]). These will be assessed by the MRC for quality before forwarding to potentially impacted countries. The consultations are intended to provide suggestions to address any concerns. The process takes six months or more.[125,126]

The PNPCA has been criticized for being a tickbox exercise (as evidenced again by construction work continuing on several schemes, while consultations were still underway) and there are no guarantees that the proposing country will address any concerns raised. The MRC has, on occasion, rejected assessment documents submitted and sent them back for revision. However, neither the MRC (nor the consulted countries) have powers of veto. Whether or not to build a mainstream dam or to implement recommended mitigation measures remains a proposing country's own decision. The only situation when the required process involves a specific agreement is when an inter-basin transfer is proposed. While the MRC is constrained by the need to ensure its guidance is non-prescriptive, it is perhaps not surprising that projects have proceeded without rigorous environmental and social assessments.

124 Source: "Mekong effort fails after years of lavish foreign funding" (19/ 10/2016) retrieved 11 November 2020 from https://phys.org/news/2016-10-mekong-effort-years-lavish-foreign.html.

125 Under the Procedures, any infrastructural project using the mainstream water during the dry season within the same basin, as well as during the wet season between two basins, must undergo the prior consultation process. Applicable projects include large-scale irrigation and hydropower developments, which may cause significant impacts on the environment, water flow and quality of the Mekong.

126 For example, in 2016, a committee was established in Cambodia to resolve compensation and resettlement issues for 1,000 families displaced by the 400MW Lower Sesan II project. The Chinese, Vietnamese and Cambodian joint venture came into operation in 2018, but failed to have community representatives on the committee. Decisions cannot be made on behalf of communities without their input.

Three significant failings can be highlighted for the process.

1. Omitting the tributary dams from the PNPCA ignores the fact that their cumulative impacts can be more severe than mainstream dams.
2. China, a major driving force behind dam developments, is not a member of the MRC: a major handicap to basin-wide coordination.
3. Civil society engagement has been limited.

In 2020, the MRC Council approved a new Basin Development Strategy for 2021-2030 and the MRC Strategic Plan 2021-2025. Both indicate a potential shift in role for the MRC, from one primarily focused on knowledge acquisition and sharing, towards more comprehensive cooperation on water resources development, data sharing and management across the Mekong Basin. For example, work is being initiated on ecosystem services valuation and a basin wide sedimentation management plan. The first Mekong Strategy for Basin-wide Environmental Management of Environmental Assets of Regional Importance 2021-2025 was also approved (Mekong River Commission 2019).

A partial withdrawal of the International Financial Institutions (IFIs) has been underway from the MRC, explained, in part, by their hesitancy to invest in environmentally and socially controversial mega-projects. The investment vacuum has been gradually filled by "Chinese investment banks and companies (who) are not bound to similar standards in their overseas activities" (Heinrich Böll Stiftung, World Wide Fund for Nature and the International Institute for Sustainable Development 2008).

18.7 The Lower Mekong Initiative

Initiated by the USA in 2009, the LMI is a multinational platform engaging Cambodia, Lao PDR, Myanmar, Thailand, Vietnam and the USA, to promote integrated regional cooperation and policy consistency among the five lower Mekong countries. It focuses on these themes: agriculture and food security, connectivity, education, energy security, environment and water, health, gender and other and cross-cutting issues.

18.8 The Lancang-Mekong Cooperation

Since 1996, China (and Myanmar) have been limited to being dialogue partners in the MRC process. A separate agency, the LMC has now been established by China, guided by the Sanya Declaration, which was launched at the First LMC Leaders' Meeting, along with a five-year action plan in 2018. GMS countries have been quick to enlist in the LMC, attracted by an special fund, which was established to implement the action plan based on "trade deals" (Eyler and Weatherby 2020). A LMC Environmental Cooperation Centre was established in Beijing in 2017. While the LMC has similar objectives to the MRC, an Memorandum of Understanding was agreed in 2019, seeking to allay fears of overlap of their activities.

The LMC has recently indicated that it is keen to broaden discussions beyond hydropower schemes to the wider BRI agenda (Eyler and Weatherby 2020). One advantage is that the LMC provides a forum through which to better engage PR China, the biggest promoter of hydropower schemes on the Mekong, albeit under their terms. It is also one, unlike the MRC, in which development agencies are unable to exercise an influence and promote their environmental, social and governance standards. There is little evidence yet that this will lead to better environmental and social planning, and management standards, but the promised data sharing is perhaps indicative of better collaboration (Biba 2018).

18.9 Review of hydropower developments

The Mekong River Basin is one of the world's most rapidly developing regions, albeit with uneven development distributed both within and between countries[127] (Organisation for Economic Co-operation and Development, Asian Development Bank, Mekong Institute 2020). All Mekong countries are engaged in the regional power trade. PR China and Lao PDR are the main net exporters, and Cambodia and Myanmar have the potential to join them. Thailand and Vietnam are the main net importers of electricity.

Although the legislation and guidance exist, it is evident that variable attention is paid by the host countries and hydropower investors to adequately assessing and managing the environmental and social consequences of hydropower developments. China is the lead investor or developer in over 20 hydro projects. Backed by EXIM Bank, Sino-hydro, the largest hydropower dam building company in China, is developing numerous hydropower projects in both Lao PDR and Cambodia, and China Southern Power Grid is either active or exploring opportunities in the Mekong.

Annex 1 provides a summary of significant hydropower developments on the Mekong (status as at 2021). The case studies are selective, rather than exhaustive, and have been included for their value in giving insights into the status of environmental and social safeguards in the Mekong.

127 The Organisation for Economic Co-operation and Development Development Assistance Committee classifies Cambodia, Laos and Myanmar as least developed countries. In contrast, Thailand was classified as an upper-middle income economy in 2011 (Organisation for Economic Co-operation and Development, Asian Development Bank and Mekong Institute 2020).

18.10 Environmental planning and management

18.10.1 SEA

The diverse, interconnected, multivariate and transboundary nature of the Mekong makes it a particularly appropriate candidate for the application of good governance tools such as SEA. It is increasingly being recognized that SEA can strengthen strategic planning of the power sector by creating a better understanding of long-term consequences and assessing different development scenarios, identifying the most sustainable development pathways and establishing the framework for rigorous project-specific EIAs (should hydropower be established as the appropriate option for the future).

Most Mekong countries have SEA legislation, reflecting growing interest in the process over the past decade. A variety of studies have highlighted elements of an SEA process. They have focussed on the issues that lie in the grey area between project EIA and policy SEA, where no discrete boundaries exist, only in degrees of emphasis. These include transboundary (Mekong River Commission 2018b), cumulative (SEATEC 1997; Asian Development Bank 2004; Mekong River Commission 2020), basin-wide (Mekong River Commission 2019), scenario planning (The Delta Study Ministry of Natural Resources and the Environment (MONRE 2015), social impact monitoring and vulnerability assessment (Mekong River Commission 2010b), multisector (Mekong River Commission 2019) and alternative assessments (National Heritage Institute 2017).

The comprehensive SEAs that have been undertaken to date have been primarily of the impact-centred type (i.e. the general project-specific EIA process, but with a broader temporal and spatial coverage). They have recommended frameworks, strategic priorities and processes for identifying and pursuing the most sustainable future for the Mekong.

The most notable impact-centred SEAs undertaken in the Mekong region to date have been the following.[128]

128 Both undertaken by the International Centre for Environmental Management, Australia.

1. MRC's SEA of Mekong Hydropower (2010), which provides a critical appraisal of dam plans and planning. It postulates the future economic benefits of power generation against a wide-range of environmental and social costs, some of which would be irreversible, and highlighted knowledge gaps and scientific uncertainty. Its main recommendation was to defer decisions about future Mekong mainstream dams for 10 years, allowing for further studies and building knowledge of existing dams' impacts, and encouraging decision makers to explore alternative ways to meet energy needs. Not all of the MRC governments accepted the SEA's findings. Lao PDR, for example, continued with the Xayaburi dam's construction within months of the SEA publication. (Mekong River Commission 2010a).

2. The International Finance Corporation's (IFC's) SEA of the Myanmar Hydropower Sector (2018). This SEA assessed the existing and planned hydropower projects in Myanmar (+/- 80 projects) and recommended a procedure to replace the prevailing project-by-project process with basin zone planning (Comprising a classification of river basins to reflect their sensitivity/suitability to dam developments) to be used to guide future project locations. It recommended no go zones in sensitive basins and no hydropower development on the five main rivers of Myanmar (including the Mekong). It also proposed a three-step approval process for hydropower projects (including a specific cumulative affects assessment) and the establishment of new institutions and policies to improve management capacity (International Finance Corporation 2018; International Rivers 2019).

The alternative policy analysis approach to SEA assesses different scenarios to establish how a hydropower development programme could be balanced with other priorities. This approach could be used before clear physical definitions of projects have been finalized, which would be difficult with an impact-centred approach (i.e. during policy formulation).

Several early attempts at policy analysis SEA-like approaches were made. One, a rapid sustainability appraisal (aka SEA), was undertaken of Thailand's Power Development Plan (and the planning processes of the MRC and the AsDB's GMS). The assessment is a type of audit, based on section one of the Hydropower Sustainability Assessment Protocol (drafted by the Hydropower Sustainability Assessment Forum in 2009). It assessed issues such as the implications of Thailand's importation of power from poorer countries (such as Lao PDR) in Thai power planning (AusAid, M-Power and Consortium of International Agricultural Research Centres 2010). Although similar exercises were done in Vietnam and Cambodia, the pioneers have been AsDB, who have advocated a widespread policy approach to SEA. They have applied it in the power sector under the AsDB's Core Environmental Programme (CEP) and Biodiversity Corridors Initiative, supported by their Environmental Operations Centre. For example, in Vietnam, SEA Guidelines[129] exist to provide a national framework for the application of SEAs and this has led to the SEA of National Power Development Plans (PDP) VI and VII.[130] The PDPs are strategic frameworks to guide the energy sector's future development, so that they can meet projected demands with social equity and environmental sustainability based on three growth scenarios. The SEA analysed the potential social and environmental impacts of the various generation and demand-side management options.

SEAs provide a means to identify possible issues and alternatives explored before a plan is finalized. New regulations and a system of payments for ecosystem services have been put in place to ensure enforcement and internalization of current externalities, respectively. Specific recommendations for

129 Vietnam government Circular No. 05/2008/TT-BTNMT. 8.12. 2008,

130 This built on a pilot exercise to consider the potential impacts of 21 hydro schemes included in the Vietnam Power development Plan V1 considered within five scenarios with the impacts of non-hydro power sources in each scenario to meet the same generating needs.

hydropower development include better support for displaced people, the multipurpose management of reservoirs, the development of community forestry, protection plans for the areas surrounding hydropower sites and the preparation of biodiversity management plans in localities of high ecological value. This SEA process is now widely regarded as a benchmark for good practice in integrating environmental factors into strategic planning (Asian Development Bank 2018a; Asian Development Bank 2018b).

The SEA has important lessons for the power sectors of other Mekong countries and shows how a SEA, when fully integrated into a strategic planning processes, will result in more rigorous plans for developments that are based on a better understanding of their implications for the economy, society and environment (Asian Development Bank 2018a). It is anticipated that applying "SEA in preparing power development plans will become standard practice in all GMS countries in the next few years" (Asian Development Bank 2018b) and national legislation will reinforce this requirement, as it has already in Vietnam. This will encourage better assessment of decisions, such as that of Cambodia, which has postponed hydropower developments in the Mekong, but instead expanded the role of coal-fired power plants in its energy portfolio.

In spite of this improving situation, projects are still identified without reference to appropriate energy strategies and regional plans, or sensitivity criteria, against which specific projects can be assessed. "Overarching planning guidance […] with which all development sectors need to comply…. is not in place regionally or for each national component" (Mekong River Commission 2010b). "Unless the Chinese and Mekong governments integrate considerations of ecological sustainability into their national development goals, water governance in the Mekong region will become a failed case of responsibility-sharing" (Yeophantong 2013).

18.10.2 EIA

All Mekong countries now have EIA requirements (supported by regulations, technical guidelines etc.) (Baird and Frankel 2015). While these are generally of international standard, Annex 1 illustrates the diversity in how these are implemented in practice. Many projects lack sufficient EIAs, some even have none. Most countries incline to EIA as a bureaucratic necessity and a self-regulatory responsibility of developers. There is little expectation of monitoring of any compliance obligations and sanctions for non-compliance are often inconsequential to the developer, and so is a limited deterrent. It is not unusual for projects to go ahead in spite of inadequacy, partiality and even alleged illegality in the assessment process.

Reliance is put on the MRC's PNPCA procedures for assessing if an EIA report (or more likely, a prior requirement for an IEE) is of sufficient standard.[131] Some assessments have been sent back for improvements, although there does not appear to be any obligation for these to be made.

It is difficult to undertake quality assurance of project-specific EIA procedures or reports when they are often publicly inaccessible. Compliance monitoring mechanisms for conditions imposed on developers permitted to proceed are even scarcer. In their absence, resort has to be made to unverifiable anecdotal evidence and media reports, which have a tendency to be partisan. These indicate regular concerns about inadequate baseline information, bias towards the positive aspects of projects, ineffective participatory processes and so on. It is also frequently reported that environmental studies run parallel to construction activity, suggesting a project is a *fait accompli* and ensuring reactive mitigation as the only option for aggrieved communities. It is unlikely that EIAs will have adequately referenced contextual considerations and would thus not be very good-quality EIAs, especially in developments with trans-frontier implications. A further frequent criticism is that many hydropower projects are poorly justified,

131 MRC's three-stage EIA: (1) Prefeasibility and Initial Environmental Evaluation (IEE); (2) Feasibility and EIA; (3) EIA Process.

driven by the interests of the investment and construction sectors, not by a demonstrated demand for electricity. Justification for a project and its positive impacts is a fundamental requirement of any EIA and brings the no go alternative into serious consideration.

18.10.3 Public participation

International experience shows that an EIA process without meaningful public participation will be fundamentally flawed. Transparent and inclusive stakeholder engagement (with the possibility to influence decisions) should underwrite both SEA and EIA.[132] There is a general lack of openness to public participation shown by some of the regimes driving hydropower developments in the Mekong. Information on EIAs and other studies are routinely withheld, precluding engagement. There is little evidence of efforts to include civil society (let alone marginalized groups) in consultations. Among those countries with responsibility for the Mekong River, there are some with limited commitments to democratic processes generally, such as press freedom, protection of rights and so on.[133] In some cases, what happens on their portion of the river is considered a sovereign issue, with little notion of shared responsibilities and water stewardship.

Hydropower dam projects are invariably sensitive, divisive and clouded by arguments of national interest/security versus local interests. Water data for the Lancang cascade has even been regarded by China as a state secret. [134]

In reality, the majority of hydropower projects begin without prior knowledge of the people affected, at least about the details that might impact them. Their engagement takes place, at best, after all strategic decisions have been made by those with vested interests in taking a project forward and with agendas to promote the sector or even once construction crews move in; conflicts are thus inevitable. Too often, it appears that public consultations begin with negotiations about compensation for involuntarily resettlement, rather than about a project's merits. A top-down decision-making model dominates (Eyler and Weatherby 2020).

Public participation is a valuable means of improving the prospects of acceptance for large-scale infrastructure projects and essential to address the frequent trust deficit and misunderstandings between communities and developers/governments. Perhaps initiatives such as formation of the Civil Society Organisation Mekong's Peoples Forum in 2020, the developing rights-based approach to rivers (International Rivers 2014b) and the production of Pact's Mekong Partnership for the Environment, Guidelines on Public Participation in EIA in the Mekong Region 2017 will slowly change this.

18.11 Conclusion

Hydropower developments are likely to continue in the Mekong, in spite of the current moratorium. A generally weak regulatory environment, under-resourced capacity and implementation deficit results in poor-quality assessments, management and monitoring of hydropower projects impacts. Environmental damage and socioeconomic grievances are mostly considered after they have occurred, rather than during the planning phases, and

132 A challenge in a situation where in 2019, Transparency International ranked all the MRS countries lowly on the Global Corruption Perception Index (Cambodia 162/180, Lao 130/180 Thailand 110/180 and Vietnam 96/180).

133 For example, the government of Lao PDR does not allow citizens meaningful access to information or consult with them on development projects. In contrast, Thailand has a very vocal Civil Society Organisations sector and an active investigative media.

134 Source: Eyler, B "Science Shows Chinese Dams Are Devastating the Mekong" in Foreign Policy 22 April 2020.

as risks to be avoided or mitigated. Both the Asian Development Bank and the MRC have attempted to improve the situation by providing guidance, but the situation is heavily dependent upon on responsible self-regulation by developers and the political will of government decision makers.

The main hydropower protagonist in the region, China, pursues a policy of non-interference in the domestic affairs of partner countries that host their investments. More Chinese leadership is required if standards are to improve and available tools more effectively applied.[135] Reliance on the current local host country's regulations, standards and systems is a risk-laden strategy when they are not rigorously implemented by those countries. This should not be interpreted as an opportunity to avoid appropriate standards. Robust systems should be put in place to convince investors that more responsible standards are in their own business interest.[136] A key finding of a recent three-year study by International Rivers indicated that "companies neither adhere to nor insist upon accepted international standards". It found that "companies were typically satisfied with much less stringent steps required by host governments, in some cases even failing to ensure compliance with local laws" (Jensen-Cormier 2019;[137] Best 2019) (Klemm 2019).

All operators now have a plethora of guidelines, but a gulf remains between their rhetoric and evidence of practical implementation[138] (Jensen-Cormier 2019). However, this is not a responsibility for developers alone. "Collective action at both the national and regional levels, based on the recognition of common interests and shared obligations is vital if rivers and the invaluable ecological services they provide are to be safe-guarded for the sake of livelihoods and biodiversity" (Yeophantong 2013). An effective route to improved standards is to ensure that they are demand-led by the host countries, insisting that they are applied in projects in their country. Screening systems have been suggested to help host countries select the more committed and responsible operators.[139,140]

No go areas for hydropower and other developments should be identified. Protection of critical parts of the river is necessary to ensure unimpeded pathways and connectivity for water, sediment, fish and so on. This suggests a more selective approach towards which developments to pursue, based on the evidence of the risks involved. The precautionary approach must prevail. The SEAs that have been undertaken recommend no hydropower dams should be built on the mainstream Mekong until better systems for assessing their impacts are established. Perhaps there are signs of hope illustrated by the cancellation of some of the most damaging projects and the current 10-year moratorium on the mainstream Mekong. This has provided a window of opportunity for improving water security, building better systems and ensuring their routine application.

Figure 18.1 Hydropower case studies

135 Source: The Diplomat: Citowicki. P (2020) "China's control of the Mekong" 02/05/2020.

136 Source: Washington Post: Shiban Mahtani; "How China is choking the Mekong" 28/01/2020.

137 For a contrarian view see Source: Shan Jie and Hu Yuwei; "BRI hydropower projects around the world focus on green construction, operation" Source: Global Times: 2020/11/20.

138 E.G. "Guidelines for Sustainable Infrastructure for Chinese International Contractors" China International Contractors Association (2018).

139 Source: China Dialogue: Tianjie. M "Advisors propose new system to regulate China's overseas investments." 04/12/2020.

140 Source: China Dialogue: Klem. J "Chinese hydro companies are falling short on standards." 23/12/2019.

18.12 Upper Mekong

By virtue of their close proximity to the sources of the Mekong, PR China (Yunnan) and Myanmar are classified as Upper Mekong countries.

18.12.1 Yunnan

Table 18.2 The Lancang cascade dams

Name	Installed capacity (MW)	Completion date	Notes
Lancang cascade			
Manwan	1,570	1995/6	Operational; first of the cascade dam; required a 30km reservoir and relocation of 3,500 people
Dachaoshan	1,250	2003	Operational
Jinghong	1,750	2008	Operational; the nearest dam to the Thai border to which power is exported
Xiaowan	4,200	2011	Operational; one of the world's highest compound arch dams (nearly 300m)
Gongguoqiao	900	2011	Operational
Nuozhadu	5,850	2016	Operational; creates the largest reservoir on the Mekong (100km long, 27,490,000,000m) water storage); required relocation of 43,000 people
Miaowei	1,400	2017/18	Operational
Huangdeng	1,900	2017	Operational; construction started without formal approval causing controversy
Dahuaqiao	900	2018	Operational
Lidi	420	2018	Operational
Wunonglong	990	2018	Operational; most recent cascade dam

The Upper Mekong topography of ravines and gorges is well suited to hydropower development. It has been a centre of extensive hydropower developments for the past 20 years. China has built 11 mainstream hydropower dams in this area, of which two are very large storage dams. Many smaller dams are being planned or being built further up-river. A search for relevant EIAs for these dams reveals only limited post facto studies.

An EIA framework (and inclusion of an SEA-like requirement) was established by China's EIA Law 2003. However, amendments in 2016 and 2018 have been criticized for weakening requirements under the original law (Chun 2016; Best 2019). The provinces, autonomous regions and municipalities set the scope for examination and approval of EIA documents for construction projects, unless they are transnational or trans-provincial (when the responsibility falls to the Ministry of Ecology and Environment under the State Council). The weakness of the regulations has been attributed to the devolution of decision- making to poorly resourced local authorities, proponents exploiting loopholes to avoid public participation requirements and allowing legal start of construction activities without an approved EIA (i.e. EIA no longer being a prerequisite before other feasibility studies) (Chun 2016). This effectively allows non-compliance (Cameron

and Wei 2013).[141] National laws devolved by local authorities are unlikely to encourage attention to transboundary and cumulative risks (Greater Mekong Sub Region -Core Environmental Programme 2018).

The downriver impact of the 'cascade' dams on water supply are of particular concern (Mekong River Commission 2018a; Tang 2020). Allegedly, water flows no longer follow the seasonal patterns that people and wildlife have adapted to. Dams raise the Mekong level in the dry season and lower it in the rainy season. In 2020, this culminated in China being accused of limiting the flow of water to the extent that rivers reached their lowest ever recorded levels. Downriver drought conditions prevailed, even though China had had higher than average water levels that year in its catchment. [142] "Chinese policymakers consider water a sovereign resource rather than a shared resource, an approach which has significant influence on countries downstream" (Eyler and Weatherby 2020), a situation that will not promote water stewardship, as a now widely accepted strategy.

Although true of most places, the need for socially and culturally sensitive impact assessments is paramount in this region of the upper Mekong. It is home to at least nine of China's 55 officially recognized ethnic minorities. These historically marginalized communities have survived incursions, yet the opening up of new or improved access to build dams has created a possibility to better integrate them into the China's central state mechanism, threatening their culture and livelihoods (Eyler 2019, p. 51).

Dam construction frequently requires involuntary resettlement of people, resulting in loss of community cohesion, sometimes replacing their upland with unfamiliar lowland oriented livelihoods. The inundation of sites of spiritual and cultural value is not unusual in areas required for reservoirs. Such negative impacts have been considered the necessary cost to be borne by communities in the national interest, that is, necessary to support the rapid growth (and alleviate the pollution) of distant eastern China industrial urban centres; a national programme called Send Western Electricity East. Local governments are mandated to oversee the companies building infrastructure and ensure that they pay adequacy of compensation to those adversely affected.

The Manwan dam, the first of the cascade dams developed in 1995, has been indicative of the difficulties in establishing a fair level of compensation (Eyler 2019, pp. 57-65). A Kunming-based non-governmental organization (Green Watershed) championed local communities' concerns during Manwan's development. Among the concerns raised were those about inadequate compensation (failing to reflect the non-market based values of resources important to the livelihoods of ethnic communities) and the promise of replacement jobs and incomes, which did not always materialize. The communities' concerns were reported to Beijing by the NGO and (then) Premier Zhu Rongji called for a social impact assessment. The re-assessment called for increased compensation, which was duly paid. (Eyler 2019, pp. 60-61).

Hydropower development in Yunnan has received more recent motivation. At the 2020 United Nations General Assembly, President Xi Jinping pledged that China will be carbon neutral by 2060. This was good news for proponents of hydropower (perceived as 'renewable' energy) because their projects can be seen to support a reduction of China's current reliance on imported oil, natural gas and coal (Normile 2020). It should, however, be accompanied by better planning procedures for hydro schemes.

141 Part of the penalty for failing to undertake an EIA is a retrospectively applied 'make-up' assessment, which allows developers to effectively circumvent the restrictions applied by an EIA. (Chung. Z "Has China's Impact Assessment Law lost its teeth" in China Dialogue 20 /07/2016).

142 Source (a) 27th Regional ASEAN Forum, The USA's 'Eyes on Earth ' Group – a view repudiated in a report by Tsinghua University and the Institute of Water Resources and Hydropower Research. (Tang, 2020) (b) Reuters News Agency (2020) (quoting report of 'Eyes on the Earth Group') "Chinese dams held back large amounts of water during drought in downstream countries, report says" USA. 14/04/2020.

18.12.2 Myanmar

Table 18.3

Name	Installed Capacity (MW)	Completion date	Notes
Irrawaddy/Ayeyarwady river Basin			
Myitsone	6,000	On hold	Situated on tributaries of the Irrawaddy Kachin state
Nu – Salween (i.e., Thanlwin) River basin			
Mong Tong (previously known as Tasang)	7,000	Planned (feasibility studies halted, resumed 2013)	Consortium: China (Three Gorges company) and Thailand; Shan state; largest of six proposed dams in Salween river; 90 per cent of electricity planned for export to China/Thailand; redesigned as a two-dam cascade in 2016 Expected to flood 640km2 of farmland, villages and primary forest 200-300,000 people already displaced. 240m high wall
Mekong River basin			
Mongwa	66	Construction	MOU signed; Shan state; 50 m dam wall and 8km2 reservoir
Ken Tong	170	Planned for Completion 2025-2026	Tributaries in Mekong basin; in 2007 an MOU was signed to develop four dams; feasibility studies submitted 2011 Not known if EIAs were undertaken, but legally required
Suo Lwe	240		
Keng Yang	70		
He Kou	138		
Nam Lin	36	2021	

Myanmar has potential as a regional electricity exporter, but it is still in its infancy, albeit it is no less controversial. Myanmar has only four per cent of its territory in the Mekong basin and no mainstream dams are proposed. However, there are three Mekong tributaries with identified hydropower potential: the Nam Lwe, the Nam Lin and the Nam Hkoke.

The regulatory architecture for an EIA system in Myanmar was initiated in 2012 but is still work in progress. Myanmar's Environmental Conservation Law (2012) makes reference to SEAs and states that an SEA may be required if deemed necessary.

Ethnic diversity gives an added imperative for sensitive planning in an area subject to regular conflicts.[143] EIAs need to give extra consideration to any potential risks of aggravating these conflicts further and how to engage people who may be exiled and living in refugee camps.

Myanmar is currently following the conventional hydropower development process exhibited throughout the region with ad hoc, individual project assessments with limited consideration of the cumulative impacts that multiple projects have on river basins. This risk was addressed in 2018 by the World Bank's International Finance Corporation who commissioned a SEA to assess and inform

143 Most existing activity relates to other rivers such as the Nu-Salween (Thanlwin) that runs parallel to the Mekong for part of its 2,851km length, Shweli and Irrawaddy etc. Large scale hydropower potential is estimated at +/- 40,000 MW.

the planning of the hydropower sector in Myanmar (International Finance Corporation 2018).[144] The SEA was treated with scepticism by some CSOs because, as it was funded by the IFC (the private sector arm of the World Bank) there would be an inherent interest in progressing projects[145] (International Rivers 2019).

A project that has received considerable criticism for its poor environmental and social assessment work is the Myitsone dam, in the conflict-prone Kachin state bordering China. The dam is situated at the culturally significant confluence of the Mail and N'Mai rivers (tributaries of the Irrawaddy/Ayeyarwady). It was favoured by Myanmar's previous military junta, but construction was suspended in 2011 by President, Thein Sein. Although construction has apparently still continued with some design modifications.

A further controversial project has been the large Mong Tong project on the Nu-Salween River. It too is in a conflict prone zone, Shan state. The Mong Tong involved an EIA and SIA process (Snowy Mountain Engineering Corporation (SMEC) in 2015). It was criticized for allegedly downplaying negative impacts, seismic risk and human rights concerns.[146] Local opposition hampered consultations, leading to military intervention. Allegedly feasibility studies began before the EIA was concluded questioning the influence of the EIA process Environmental Justice Atlas [updated May 2018] ejatlas.org).[147]

18.13 Lower Mekong

Since the end of the Vietnam war and China's 'opening up', interest in hydropower in the LM has escalated. The estimated hydropower potential of the LM is +/-30,000 MW.[148] Over 11 dams are planned or being built in the main river, many more on the tributaries.

144 Unusually because the IBRD normally leads on SEAs. In the World Bank.

145 https://news.mongabay.com/2016/12/my-spirit-is-there-life-in-the-shadow-of-the-mong-ton-dam/

146 Source: Hnin Wut Yee presentation made to IFC workshop -18/10/2018, during SEA consultations.

147 Source: ejatlas.org.

148 Source: Internationalrivers.org 2018.

18.13.1 Lao PDR

Table 18.4

Name	Installed Capacity (MW)	Date	Status and Notes (at 2020)
Mainstream Dams(Laos Cascade)			
Xayaburi	1,260	Operational 2019	Thailand (SEAN Ch Kamchang); EIA submitted First of the 11 'Laos cascade' dams First 'run of river' dams- but still poses a barrier to fish migration 95 per cent of power generated exported to Thailand Dam wall 100 feet high and nearly 1km long. Resettlement of +/- 2,000 people, reservoir 50km2 Went Operational without agreement and despite strong opposition (first PNCPA 2010)
Don Sahong	360	Operational 2020	Malaysia (Mega First/ Supported by Sinohydro) EIA (IEE) submitted Controversy over the impact on Khone Falls, Siphandone "Run of river", with wall comparatively low and narrow No significant storage capacity (290ha) but still poses a barrier to fish migration 60 people needing relocation (see associated Thako diversion scheme)
Sanakham	1,260 (700)	On hold 2028	China (Datang) Length of wall 1,144m; height 38m; reservoir 94km2 Proposed; on hold following objections from Thailand But in 2020 became the sixth project to be submitted for the MRC PNPCA process EIA reportedly inadequate, out of date and incomplete Would require resettlement of 12,950 people (now possible to reduce to 1,890)
Pak Beng	Undergone revisions:912 (reduced from 1,320)	On hold (was planned to start 2017 now 2024)	China (Datang Overseas Investments) Upper-most dam in 'Laos cascade' Run of River; reservoir 87km2 Originally 6,694 needing relocation (possible to reduce to 4,250) PNCPA 2019
Pak Lay	1,320	On hold 2030	China (CEIEC)/Sinohydro) Length of dam 630m, dam wall 35m reservoir 108km2 Would require resettlement of 18,000 people (now possible to reduce to 5,010) PNCPA 2017
Luang Prabang	1,410	Under construction	Vietnam (Petro Vietnam Power Corp/Thai CH Kamchang) Length of dam 1,106m. Wall 76m, reservoir 90km2 Requires resettlement of estimated 17,700 people (possible to reduce to 5,920) .
Significant tributary dams			
Nam Theun 2	1,075	2010	Multinational; exporting power to Thailand A trans-basin diversion project; financed by private/public institutions including the World Bank
The Nam Ou River Cascade			
Phase 1 Nam Ou 1-6 began operating in 2016 Phase 2 Nam Ou 1,3,4 and 7 expected to be operational in 2021			

Lao PDR has ambitions to be the "Battery of Asia". Electricity currently comprises about 25 per cent of Lao PDR's exports. Thailand is the main electricity market. Lao has developed hydropower projects on the Mekong mainstream (with this market in mind) and has plans for others (known as the "Laos cascade"). Specific concerns exist over how the Laos cascade will impact the downstream floodplains of Cambodia (especially Tonle Sap Lake), Vietnam (the delta) and the livelihoods dependent upon them.

Current activity is mostly on numerous tributary dams. Seven new cascading dams are built or under construction on the Nam Ou,[149] an important Mekong tributary. Villages have been razed to make way for the projects.[150] Many of the dams are regarded as part of China's BRI cooperation programme with Lao PDR, and the latter have apparently granted Chinese investors planning and development rights over the entire Ou River basin.[151]

Lao PDR's first EIA Regulation was issued in 2000 and upgraded to a Decree on EIA No 112/pm (2010).

Lao's Environmental Protection Law (2013) requires that SEAs are conducted while policies, plans and programmes are being developed. In 2012, the IFC launched an advisory service to help improve environmental and social standards and the capacity to implement them in the hydropower sector in Lao PDR.

Critics have complained that Laos projects are shrouded in secrecy. There have been allegations of corruption tied to the awarding of construction contracts and EIAs have routinely been criticized as being of poor quality. (Lovgren 2018).

While the lack of environmental scrutiny and public participation in large-scale projects are not unusual for developments in Lao PDR, one exception that it was hoped would change this was Nam Theun 2 (NT 2). NT2 fell under the influence of IFIs and their safeguard policies, not least the World Bank. The project was initiated in the 1980s, but it was temporarily side-lined by international protests and the 1997/8 Asian financial crisis. The IFIs returned in 2005 and NT 2 began commercial operation in 2010. NT2 is a trans-basin diversion project that transfers water from the Theun river to a reservoir on the Nakai plateau for gravity feeding through turbines before 27km tunnelling to discharge into the Xe Bang Fai River. It required resettlement of 6,200 people and it is an important wildlife corridor, the Nakai plateau. The World Bank and AsDB, who had initially declined participation, reportedly due to environmental and social concerns, were encouraged to ensure a best practice example was created.

Part of the motivation for the IFI re-engagement was their lack of confidence in the Lao government's capacity to effectively manage the risks, transparently manage the revenues, protect people's rights and support relocated communities with adequate compensation without their involvement (see Lower Sesan 2 project below). These concerns were sufficient to mark a return by the World Bank to funding large-scale infrastructure projects after an unofficial 10-year absence in the face of widespread international CSO opposition. They progressed with caution, recognizing the opportunity for a model process to set a benchmark for regional standards. Extensive additional funding for relocation and environmental mitigation measures was provided.[152] One international advisory group (IAG) concluded that the project had involved "one of the most comprehensive and proactive processes ever engaged in by the World Bank" (IAG World Bank, 2001). As part of the process the IFIs produced a pioneering Cumulative Effects Assessment [CEA]) to evaluate the current and future combination of impacts of a number of hydropower developments in several river basins (SEATEC 1997; AsDB

149 Source: China Dialogue (27/03/ 2020): "Loss of faith along the Ou River".

150 Source Washington Post 28/01/2020 "How China's Belt and Road initiative is choking the Mekong River".

151 Source; China Dialogue (25/02/2019)): 25/09/2020 : Thailand under pressure to act against the Sanakham dam project".

152 Although the flooded area itself (equivalent to the size of Singapore) was not considered critical natural habitat, the region had been described as "one of the most intact areas of tropical biodiversity left in the world" (IAG, World Bank 2001).

2004). This was accompanied by other new standards for the region, including in levels of transparency, involuntary relocation procedures and the appointment of several independent expert advisory groups to critically monitor the project. It was suggested that three extensive protected areas on the Nakai Plateau were expected to be better managed through the significant resources made available under the project (Singh 2010). However, the International Rivers NGO has suggested that subsequent monitoring by Lao PDR authorities of the mitigation measures contained in the EMP have been limited and "that the dam's costs outweigh its benefits and represents a "complete failure of water governance in [the] Mekong region" (Shoemaker and Robichaud 2018). "Despite the number of participatory impact assessments conducted prior, during and after the construction of Nam Theun 2 project, questions continue to persist as to whether participation in project planning is indeed possible in Laos where structures of governance remain largely hierarchical and top-down" (AusAid, M-Power and CGIAR 2010).

On the Mekong main river, the Xayaburi scheme has been the most controversial project to date. It was the first of the Laos cascade dams to become operational (in 2019). Xayaburi is described as a run of river dam, arguably implying that it will be less obstructive to fish migration and silt transportation and not require a large reservoir as a holding dam. Fish ladders, passes and sediment-flushing gates have been provided but criticized because the design used is based on structures built in Europe and the USA and is thus inappropriate to the Mekong.[153]

Xayaburi progressed sporadically, due to complaints from downriver Cambodia and Vietnam. It was the first project subjected to the MRC's PNPCA procedure. However, construction went ahead while Cambodia and Vietnam and the MRC's donors continued to raise objections. Cambodia threatened to take Lao PDR to international court if they chose to build the dam unilaterally. In response, the Lao PDR government and the MRC commissioned a number of additional studies but it was suggested that these were simply to justify the development.

Notification of the Don Sahong project was submitted to the MRC soon after the Xayaburi PNPCA process. The Don Sahong only partially dams the mainstream but is in a biologically sensitive location (Khone Falls, Siphandone, or "the Four Thousand Islands"),[154] The area is considered as a potential Ramsar site and construction of the dam would threaten its eligibility for this status. It is situated less than 2km upstream from a deep river pool, which contains Lao PDR's last four Mekong/Irrawaddy dolphins (although dolphins exist in three other river systems in Southeast Asia). Further downstream, at Kratie in Cambodia, there is a larger population (85), but they are threatened by another proposal: the Sambor dam.

The 2013 Don Sahong EIA has been criticized as lacking credibility. The EIA "consists of, at best, sloppy and incomplete research and fails to address a large number of potential and probable effects on fisheries […] it is (in) the worst location possible […] given how important the Hou Sahong channel is for fish migration"[155] (International Rivers 2014a). Following the PNCPA process the MRC has requested additional studies.

A further scheme, the Sanakham has also been proposed on the Mekong main river between Xayaburi and Vientiane, again motivated by export of power to Thailand. It will be the fifth in the run of river projects. A PNCPA is currently in progress (2021) but Sanakham's initial EIA work has already been criticized because it uses outdated and allegedly plagiarized information from earlier EIAs for the Pak Lay and Pak Beng projects. The MRC called it "rudimentary and largely copied" and requested revisions. Yet both the Pak Beng and Pak Lay EIAs had themselves been criticized during their earlier processes in 2017 and

153 The MRC's SEA (MRC 2010) indicated that fish passes were inappropriate for the Mekong.

154 Source: The Economist (2012) "Damming the Mekong river: River Elegy" 13/11/2012.

155 Source: Do Viet Cuong "Is Laos Building a New Illegal Dam on the Mekong River? In the Diplomat, 27/10/2015.

2019, respectively. The projects are on hold. A Transboundary Environmental and Social Impact Assessment and Cumulative Impact Assessment has been undertaken by the developer but could not be accessed (Power China 2018).

With poor EIA quality, fundamental questions about dam developments in Lao PDR remain both unanswered and unaddressed. The lack of press freedom and civil society tolerance reduce opportunities for local stakeholder dialogue[156] (International Rivers 2014a).

In 2020, the Lao PDR government announced that it would suspend approval of new dams, while reviewing those currently under construction.[157] Thailand, meanwhile, in the face of more active CSO opposition, is said to be reconsidering its decision to purchase hydropower from Lao PDR – not least because of its current over-supply.[158] However, in spite of this, construction of new access roads and dams continue and construction of another project, the Luang Prabang dam, the third of the Laos cascade, is indicated to be under consideration. As with Xayaburi and Don Sahong, this is in spite of the widely expressed concerns, including those by three neighbouring countries and calls for more rigorous transboundary impact assessment.

18.13.2 Thailand

Table 18.5

Name	Installed Capacity (MW)	Date	Notes
Thai-Lao PDR border			
Pak Chom/ Santhong/	1.079	Originally planned 2017	PDR Lao/Thailand Length of dam 1,200 (in both Lao PDR and Thailand) People needing to be relocated in both Lao and Thailand: about 600 Includes an irrigation area (2,707ha)
Ban Koum	2,230 (1872)	Originally planned 2017	Thailand/Italy (Ital Thai Asia) (Charoen) Includes 20,000ha of irrigation scheme Dam; would require resettlement of 2,570 (now reduced to 1000) people in both Thailand and Lao Includes irrigation projects (+/- 8000ha)
Pak Mun	136	Originally planned 1994	Thailand Situated on confluence of the Mun and Mekong Fisheries concerns (estimated fish catch decreased by 60-80 per cent). A fish ladder (unsuccessful) provided and the dam was opened for a period after demonstrations on site
Lat Sua	651/800	Proposed 2023	Thailand/Italy (Charoen) Revisions changed location downriver to avoid flooding of Thai villages Feasibility and environmental assessment underway 1.300m; 27m tall dam wall; 13km2 reservoir Close to border but both reservoir and dam in Lao

156 Source: The Diplomat 2020 Sebastian Strangio. "Laos Stumbles Under Rising Chinese Debt Burden" 07/09/2020.

157 Both reports can be accessed online at http://bit.ly/paklay and http://bit.ly/pakbeng.

158 Source: China Dialogue 2020: Jirenuwat R and Roney T. "Thailand under pressure to act against the Sanakham dam project."25/09/2020.

No large-scale dams are planned by Thailand, but it is a customer and will represent (with Vietnam) 96 per cent of regional power demand until 2025 (Mekong River Commission 2010). However, Thailand now has an oversupply of electricity and, recently, the Electricity Generating Authority of Thailand announced that it will decommission old generating plants, promote power-intensive agribusiness and sell electricity to Myanmar.

It has engaged in multiple-use projects with Lao PDR, and causes concern amongst its neighbours by the amount of water it intends to abstract for irrigation purposes, for example, The Kong-Loei-Chi-Mun project, an ambitious US$ 75 billion domestic project in Thailand to divert water from the Mekong to irrigate 17 provinces.

Thailand has had EIA regulations since 1992 and SEA guidelines and regulations under development since 2018 (lead agency National Economic and Social Development Board).

18.13.3 Cambodia

Table 18.6

Name	Installed Capacity (MW)	Completion date	Status (at 2020)
Mainstream Mekong			
Sambor,	1,800-2,600	On hold	China (China Southern Power Grid who have now pulled out) Would have been largest dam on LM and would create a complete barrier to migratory fish The dam would be 16-18km wide, 56m high, reservoir 620km2 Resettlement of 19,000 people
Stung Treng	980	On hold	Russia/Vietnam (Song Da) Length of dam 10,884m, 22m high; reservoir 211km2 Would require resettlement of 9,000 people
Significant tributary dams			
Lower Sesan 2	400	Operational 2018	China (Hydrolancang) Situated at the confluence of, the Se San and the Sre Pok Southeast Asia's longest dam wall at 6km (75m high) 33,560 hectare reservoir Would require resettlement of 5,000 people (including ethnic minorities)

Due to the legacy of war, Cambodia's power supply situation is one of the poorest and most fragmented in the region. According to the International Energy Authority, Cambodia has the second lowest electrification rate in southeast Asia (Only about 15 per cent of 2 million households have access to electricity in their homes). In 2018, total electricity produced was about a third from fossil fuels and two-thirds renewable sources, mostly hydropower. Cambodia's theoretical hydropower potential is 10,000MW, with about 50 per cent of that potential on the Mekong mainstream (Xia 2020).

EIA has been a requirement in Cambodia since 1999 (Environmental Protection and Natural Resources Management Act-Sub-decree on Environmental Impact Assessment). Cambodia's Environment and Natural Resources Code (2017) added SEA

and transboundary assessment as requirements for strategic planning in many sectors (including power). A lack of public participation, limited publicly available reports and the poor quality of those that are available, indicates an implementation capacity deficit. An issue of concern is that, if the Ministry of Environment fails to respond to submitted EI reports within 30 days, their concurrence can be assumed by the authorising Ministry (Xia 2020).

Two of the planned mainstream dams of the 'Laos Cascade,' are situated in Cambodia (Stung Treng and Sambor). The Sambor, if built, would be the lowest dam of the Mekong's main river cascade and largest in Cambodia. It has been described as the "worst possible place to build a major dam" (National Heritage Institute 2017). At least 86 migratory fish species periodically exist in the Cambodian part of the Mekong and all would be adversely impacted by the Sambor dam. It would also put the remaining 80 endangered Mekong/Irrawaddy river dolphins at high risk.

In 2013, the Cambodian government invited the National Heritage Institute to undertake the "Sambor Hydropower Dam Alternatives Assessment" (National Heritage Institute 2017). It considered siting, design, operational and 'no dam' alternatives by evaluating them against a set of environmental Performance Standards, and then postulated how a major hydropower facility could be developed to achieve those standards while maintaining economic viability. The study did not employ the usual approach of defining mitigation measures to accommodate a dam, but instead established a set of standards to preserve the health of the natural and social systems and then considered how a major hydropower facility could be sited, designed and operated to maintain those standards. Ten alternatives sites, designs and operations were considered**.** The NHI recommended that Cambodia defer any commitment to the Sambor Dam while it pursues better alternatives (National Heritage Institute 2017). The Cambodian government has apparently subsequently abandoned plans to build the Sambor project.

Cambodia's controversial Lower Se San 2 project will be located on the Sesan River, 1.5km downstream from its confluence with the Srepok River and 25km from where the two rivers meet the Mekong River mainstream. The project was approved by Cambodia's government in 2012,[159] despite its EIA being sub-standard, and inadequate consultations. Se San 2 is southeast Asia's longest dam at over 6km. Although international financiers pulled out of supporting it, partly on environmental grounds, and Vietnam reduced their financial interest, the dam progressed and became operational in 2018, with inadequate consultations, lack of transparency and excessive logging outside the area defined for the reservoir. NGO complaints led to a study of best practice guidelines for compensation and resettlement by The Cambodia Rivers Coalition NGO Baird 2009).

Of further concern in Cambodia has been the threats caused by hydropower developments to the ecology of the Tonle Sap Lake (Mekong River Commission 2010b).[160] The Mekong feeds the lake via the Tonle Sap river, which reverses flow when the Mekong river floods in summer. The flooded Tonle Sap Lake increases to five times its low-water levels, creating the largest lake in southeast Asia and supplying one of the world's most intensely fished inland bodies of water. As the annual flood subsides, millions of fish swim back into the Mekong river. 2019 saw a reduction in fish yields in Tonle Sap that were reportedly 10-20 per cent lower than those of previous years. This was attributed, in part, to mainstream Mekong dam construction (Bengali 2020; Basist and Williams 2020).

159 Source: Cambodia Daily..http://www.cambodiadaily.com/news/government-approves-dam-on-lower-sesan-5159/ November 5, 2012.

160 See MRC. BDP "Assessment of basin-wide development scenarios Tech Note 4: Impacts on the Tonle Sap great lake ecosystem".

In 2020, Cambodia announced that it would postpone building new hydropower dams on the mainstream Mekong for 10 years (including the Sambor). The government is still allowing construction on tributaries to continue as a priority.[161] The temporary halt was perhaps more due to increasing power cuts and blackouts in 2019 and an emerging concern of over-reliance on hydropower, as well as the 2018 Xepian-Xe nam Noy dam collapse in PDR Lao, than environmental concerns. (Basist and Williams 2020).

As a consequence of the postponement, Cambodia has turned instead to a spate of heavy oil, natural gas and coal projects. Two large coal plants were approved in 2020 (one, Botum Sakor requiring downgrading of part of a National Park) to add to three existing facilities and two under construction. No EIA is publicly available.[162] The country has also become a destination (a coal plant near Sihanoukville) for second-hand, outdated and polluting coal technology that can no longer comply with China's environmental regulations.[163] Current planned energy projects would see Cambodia reduce its share of 'renewables' on their grid significantly.

18.14 The Mekong Delta

18.14.1 Vietnam

Vietnam is important both as a hydropower developer and importer. It is itself is a regional leader in hydropower, with its own investments in Laos and Cambodia. Domestically hydropower is the second largest source of power in Vietnam. Presently there are more than 50 hydropower stations in operation, 10 of which are on tributaries of the Mekong Basin and thus can impact water supplies in Cambodia. In 2020, Vietnam indicated that it intends to double its coal-fired powerplant capacity by 2030, while continuing to expand on the 4,000MW of solar power that it added to its energy mix by 2019 (Asian Development Bank 2018a).

Vietnam has had EIA legislation since 1994. The critical hydropower issue for Vietnam is the secondary impacts of upriver dam developments on the Mekong delta. The delta is a network of 5,000km of natural and artificial canals interconnecting settlements and markets. It is home to 20 million people and is one of the major rice and fish producing areas of southeast Asia. This productivity is dependent upon the supply of silt and nutrients from the higher reaches of the Mekong. The dynamic marine/freshwater interface adds a new dimension to the delta. Vegetation removal for fish farms, urban expansion, reduced supplies of freshwater and silt and rising sea levels associated with climate change, result in increasing coastal erosion, saline water intrusion and use of compensatory chemical fertilizers to replace nutrient losses and so on.

According to the Intergovernmental Panel on Climate Change, the Mekong delta is one of the three major delta systems in the world that are most vulnerable to climate change and associated extreme weather events. The delta's resilience to the effects of climate change depends on, inter alia, the continued replenishment of sediment. No wonder then that the Vietnamese government periodically calls for upriver dam building to be stopped. [164]

161 Source: The Guardian (U.K): "Cambodia scraps plans for Mekong hydropower dams" 20/03/2020

162 Source: China Dialogue: "Cambodia choses coal in rush for power". 2/11/ 2020

163 Source: China Dialogue: "Coal plant deemed too polluting for China heads to Cambodia". 29/08/2019 Transfer and reconstruction of a plant from Hunan. "China's shift to a greener economy – and a pollution scandal – led to the Hunan plant's closure; Formerly the Huna Chuangyuan coal plant that powered an aluminium smelter but is now getting a fresh start".

164 Source: Tuoi Tre News (2016); "Vietnam's Mekong Delta faces most serious drought, salinization in 90 years" 18/02/2016.

It has been acknowledged that delta specifics require a different approach to previous studies. In 2015 Vietnam initiated the Study on the Impacts of Mainstream Hydropower on the Mekong River (also known as the Mekong Delta Study). The approach involved analysis of the effects of river flows and inundation patterns, sediment and nutrient loading and salinity intrusions on six sectors: fisheries, biodiversity, navigation, agriculture, livelihoods and economics. The incremental effects of tributary dams on mainstream water levels were also studied. Alternatives were considered, to determine the level of relief that could be obtained from only constructing selected dams in the Laos cascade. Results were indicated according to three scenarios. Under all three, the most severe adverse impacts were anticipated to result from a combination of the dam barrier effects and the reduction in sediment/nutrient loading. Development alternatives on constructing and operating a fewer number of dams would decrease the projected impacts to varying degrees depending upon which of the 11 proposed dams are constructed (Ministry of Natural Resources and Environment 2015).[165]

SEAs have been mandatory for most strategic plans since Vietnam's 2005 Law on Environmental Protection. The power sector was identified as a key sector requiring SEAs. Capacity development has been supported by AsDB and international donors and power development planning is better aligned with national policies and priorities as a result. A pilot SEA of hydropower plans for the sixth National Power Development Plan, 2006-2015, used a methodology and guidelines developed by the Ministry of Natural Resources and Environment (MONRE 2015). This was followed, in 2012, by a SEA of the seventh National Power Development Plan, 2011- 2020 and then in 2014, by technical advice for an SEA of the revised PDP 7.

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References

Asian Development Bank (2004). *Cumulative Impact Analysis – and Nam Theun Contribution. Final Report.* (Prepared by NORPLAN and ECOLAO) AsDB, Manila, Philippines.

Asian Development Bank (2008). *Sector Assistance Evaluation Study: Reference Number: SAP: REG 2008-51. 'Energy Sector in the Greater Mekong Subregion'*. AsDB, Bangkok, Thailand.

Asian Development Bank (2018a). *Policy Brief: Integrating Strategic Environmental Assessment into Power Development Planning in Vietnam*. AsDB, Bangkok, Thailand

Asian Development Bank (2018b). *Strategic Environmental Assessment for Power Sector Planning in the Greater Mekong Sub Region.* GMS-EOC, Bangkok, Thailand.

AusAid, M-Power and CGIAR (2010). *Sustainability Assessment of Thailand's electricity planning- Using Section 1 of the 2009 Hydropower Sustainability Protocol*. Rome: CGIAR.

Baird, I. (2009). *Best Practices in Compensation and Resettlement for Large Dams: The Case of the Planned Lower Sesan 2 Hydropower Project in North Eastern Cambodia.* Phnom Penh. Cambodia: The Rivers Coalition.

165 The credibility of the report was questioned by a subsequent Oxfam Australia review who have, in turn, been criticised for their comments. For a discussion of this disagreement see: "Comments on the Final Report of the MDS-IAR and The Ripple Effect of Oxfam Australia's input" Lilliana Corredor – on behalf of Scientists for the Mekong (5 May 2016) https://www.scientists4mekong.com/wp-content/uploads/2016/05/Comments-on-Final-Report-MDS-Study-Ripple-Effect-Oxfam.

Baird, M. and Frankel, R. (2015). *Mekong Partnership for the Environment: Environmental Impact Assessment Comparative Analysis In Lower Mekong Countries.* PACT. https://www.pactworld.org/library/environmental-impact-assessment-comparative-analysis-lower-mekong-countries. Accessed 21 July 2021.

Baird, M. and Thomas, B. (2020). Greening the BRI in ASEAN. Chinese Journal of Environmental Law 4(2), 217-234.

Basist, A. and Williams, C. (2020). Monitoring the Quantity of Water Flowing Through the Upper Mekong Basin Under Natural (Unimpeded) Conditions. Vientiane, Lao PDR: MRC Secretariat.

Bengali, S. (2020). How dams and climate change are choking Asia's great lake. https://phys.org/news/2020-01-climate-asia-great-lake.html. Accessed 21 July 2021.

Best, L. (2019). China's EIA roll back. Council for Foreign Relations. https://www.cfr.org/bio/guest-blogger-asia-unbound. Accessed 2 July 2021.

Biba, S. (2018). China's 'old' and 'new' Mekong River politics: the Lancang- Mekong Cooperation from a comparative benefit-sharing perspective. Water International 43(5), 622-641.

Cameron, A. and Wei, L. (2013). An Environmental Impact Assessment for hydropower development in China. Vermont School of Law.

Chun, Z. (2016). Has China's Impact Assessment lost its teeth? https://chinadialogue.net/en/pollution/9122-has-china-s-impact-assessment-law-lost-its-teeth/. Accessed 21 July 2021.

Cronin, R. and Hamlin, T. (2010). Mekong Tipping Point: Hydropower Dams, Human Security and Regional Stability. Washington DC: The Henry L. Stimson Centre.

Deetes, P. (2020). Victory on the Upper Mekong: Thai Cabinet Terminates Rapids Blasting Project. https://www.internationalrivers.org/news/blog-victory-on-the-upper-mekong-thai-cabinet-terminates-rapids-blasting-project/. Accessed 2 July 2021.

Dore, J. (2003). The governance of increasing Mekong regionalism. In Social Challenges for the Mekong Region. Dore, J. and Kaosaard, M. (eds.). Bangkok: White Lotus.

Eyler, B. (2019). The Last Days of the Mighty Mekong. London: ZED Books.

Eyler, B. and Weatherby, C. (2020). New Evidence: How China Turned off the Tap on the Mekong River. https://www.stimson.org/2020/new-evidence-how-china-turned-off-the-mekong-tap/. Accessed 2 July 2021.

Greater Mekong Subregion Core Environment Program (Environment Operations Centre) (2018). Strategic Environmental Assessments for Power Sector Planning in the Greater Mekong Sub Region. Bangkok, Thailand: Asian Development Bank.

Heinrich Böll Stiftung, World Wide Fund for Nature and the International Institute for Sustainable Development (2008). Policy Brief: Rethinking Investments in Natural Resources: China's Emerging Role in the Mekong Region. https://www.iisd.org/publications/rethinking-investments-natural-resources-chinas-emerging-role-mekong-region-policy. Accessed 21 July 2021.

Hortle, K. (2009). Fishes of the Mekong – How many species are there? Catch and Culture 15(2), 4-12.

IAB. Independent Advisory Group to the World Bank for the NT2 Project (2001) "Third Report on the World Bank's handling of environmental and social in the proposed NT2 hydropower project Lao PDR"

International Finance Corporation (2018). Strategic Environmental Assessment of the Myanmar Hydropower Sector. Yangon: World Bank. https://openknowledge.worldbank.org/handle/10986/31256. Accessed 2 July 2021.

International Rivers (2019). Strategic Environmental Assessment of the Myanmar Hydropower Sector: Discussion Brief. Oakland, USA. https://openknowledge.worldbank.org/handle/10986/31256. Accessed 21 July 2021.

International Rivers (2014a). Independent Technical Review of Don Sahong Hydropower Project, Lao PDR Environmental Impact Assessment. January 2013. (Prepared for Mega First Corporation Berhand by National Consulting Company), Lao PDR.

International Rivers (2014b). Dam Standards: A Rights-Based Approach - A Guide-Book for Civil Society. USA. https://www.internationalrivers.org/resources/reports-and-publications/dam-standards-a-rights-based-approach/. Accessed 21 July 2021.

Jensen-Cormier, S. (2019). Watered down: How big hydropower companies adhere to social and environmental policies and best practices. International Rivers. www.internationalrivers.org. Accessed 2 July 2021.

Knox J.H. (2002). The myth and reality of transboundary environmental impact assessment. American Journal of International Law 96(2), 291-319.

Leng, T. (2019). Mekong Countries in the Context of the Connectivity Competition. Research Division Asia / BCAS 2019. German Institute for International and security Affairs. Session 6, www.swp-berlin.org. Accessed 2 July 2021.

Mekong River Commission/International Centre for Environmental Management (2010a). Strategic Environmental Assessment (SEA) of Hydropower on the Mekong Mainstream. Hanoi, Viet Nam. https://icem.com.au/portfolio-items/strategic-environmental-assessment-of-hydropower-on-the-mekong-mainstream/. Accessed 23 July 2021.

Mekong River Commission (2010b). Basin Development Plan Programme, Phase 2 Assessment of basin-wide development scenarios - Technical Note 4 : Environmental Assessment: Impacts on the Tonle Sap Great Lake Ecosystem. Vientiane Lao PDR. https://reliefweb.int/sites/reliefweb.int/files/resources/61EFA57FCBAB2D51492577D70021DE6B-Full_Report.pdf. Accessed 23 July 2021.

Mekong River Commission (2018a). The Study on the Sustainable Management and Development of the Mekong River Basin, including Impacts of Mainstream Hydropower Projects.MRC, Vientiane, Mekong River Commission.

Mekong River Commission (2018b). Guidelines for Transboundary Environmental Impact Assessment in the Lower Mekong Basin Working Paper. Vientiane, Lao PDR

Mekong River Commission (2019). Concept Note Updating of Basin Development Strategy 2021-2030. Updated 17 September 2019, Vientiane. https://www.mrcmekong.org/assets/RSF8/Final-Concept-note-for-updating-of-BDS-2021-2030_RSF.pdf. Accessed 23 July 2021.

Mekong River Commission (2020). Technical Review Report: Prior Consultation for the Proposed Luang Prabang Hydropower. https://www.mrcmekong.org/assets/Publications/TRR-of-LPHPP.pdf. Accessed 23 July 2021.

MONRE (2015). The Study on the Impacts of Mainstream Hydropower on the Mekong River- Final Report. Vietnam.

National Heritage Institute, Cambodia (2017). Sambor Hydro Power Alternatives Assessment. Final Report to Royal Government of Cambodia. USA: USAID/McArthur Foundation. https://data.opendevelopmentmekong.net/library_record/sambor-hydropower-dam-alternatives-assessment-final-report. Accessed 23 July 2021.

Normile, D. (2020). Can China, the world's biggest coal consumer, become carbon neutral by 2060? Science Journal, 6 November 2020. https://www.sciencemag.org/news/2020/09/can-china-worlds-bigger-coal-consumer-become-carbon-neutral-2060. Accessed 23 July 2021.

Organisation for Economic Co-operation and Development /Asian Development Bank/Mekong Institute (2020). Innovation for Water Infrastructure Development in the Mekong Region: The Development Dimension. Paris: OECD Publishing.

Power China/Datang (Lao) (2018). Sanakham HydroPower Project: Transboundary Environmental and Social Impact Assessment & Cumulative Impact Assessment. https://www.mrcmekong.org/assets/Consultations/Sanakham/16-TbE-SIA-and-cumulative-impact-assesst.pdf. Accessed 23 July 2021.

Schoemaker, B. and Robichaud, W. (2018). Dead in the Water: Global Lessons from the World Bank's Model Hydropower Project in Laos. Madison, Wisconsin, USA: University of Wisconsin Press.

SEATEC International (1997). Draft Final Report Nam Theun 2 Hydroelectric Project. Environmental Assessment and Management Plan. https://www.commissiemer.nl/docs/mer/diversen/pos_027-251_nam_theun_2_hydroelectric_project_environmental_assessment_and_management_plan_draft_final_report.pdf. Accessed 23 July 2021.

Singh, S. (2010). Banking on Sustainability in Nam Theun 2. (in New Mandala, Australia National University, Canberra.)

Srivastava, P. (2011). Regional Corridors Development in Regional Cooperation. ADB Economics Working Paper Series No 258. Manila: ADB.

Tang, D. (2020). Mekong dams benefit only China. The Times, London, 7 September 2020.

Tilt B., Braun, Y., He, D. (2008). Social impacts of large dam projects: A comparison of international case studies and implications for best practice. Journal of Environmental Management 90 (Suppl 3),S249-57.doi: 10.1016/j.jenvman.2008.07.030.Epub 2008

United Nations Environment Programme (2012). The UN-Water Status Report on the Application of Integrated Approaches to Water Resources Management. http://www.unwater.org/rio2012/report/index.html. Accessed 2 July 2021.

World Bank Group (2018). Good Practice Handbook – Environmental Flows for Hydropower Projects Guidance for the Private Sector in Emerging Markets. Washington DC: World Bank.

World Bank Lao- Nam Theun 2 Hydropower Project: Ninth IAG- World Bank documents, Washington D C

Yeophantong P. (2013). China in the Mekong: Building Dams for Whose Benefit? Policy Brief, University of Oxford, Blavatnik School of Government, Global Economic Governance Programme.

Xia H. (2020). The Role and Problems of Environmental Impact Assessment in Governing Hydro-Power Projects in Cambodia. Beijing Law Review 11(2), 501-518. https://doi.org/10.4236/blr.2020.112031.