

A photograph of a river scene. In the foreground, several people are in the water. One person is standing near a large, fallen tree trunk on the right bank. Another person is sitting on the sand. In the middle ground, a red boat is on the water with several people inside. The background shows a forested riverbank.

# Starving the Mekong

EXPECTED SOCIAL AND ENVIRONMENTAL IMPACTS  
FROM CONSTRUCTION AND OPERATION  
OF THE LOWER SESAN II DAM

# STARVING THE MEKONG

Expected social and environmental impacts from construction and operation of the Lower Sesan II Dam

First published in 2014 by International Rivers, 2054 University Ave. Suite 300, Berkeley, CA, 94704-2644, USA

[www.internationalrivers.org](http://www.internationalrivers.org)

An online version of this report can be accessed at: [www.internationalrivers.org](http://www.internationalrivers.org) and [www.opendevcam.net](http://www.opendevcam.net)

© 2014 International Rivers

Published in English, Khmer, and Vietnamese

Researched by: Kimberley Ogonda

Edited by: Kristin O'Connell, Mark Grimsditch and David Hindley

Cover photograph by Ham Oudom

**Disclaimer:** This report is compiled from available documentation for general informational purposes only. International Rivers cannot guarantee the accuracy, completeness or reliability of information taken from third party sources in every instance. Readers are encouraged to do additional research in support of their activities. Users understand and agree to take full responsibility for reliance they place on any information in the report and to hold harmless and waive any and all liability against individuals or entities associated with its development, form and content for any loss, harm or damage suffered as a result of its use. While the content of this report may be freely quoted and reproduced, acknowledgement would be appreciated.

**Citation (Chicago):** Ogonda, Kim. *Starving the Mekong: Expected social and environmental impacts from construction and operation of the Lower Sesan II Dam*. Berkeley: International Rivers, 2014.



# CONTENTS

---

<b>ABBREVIATIONS .....</b>	<b>4</b>
<b>UNITS OF MEASUREMENT .....</b>	<b>4</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>5</b>
<b>INTRODUCTION .....</b>	<b>7</b>
<b>A. BACKGROUND .....</b>	<b>8</b>
The area and the people .....	8
Background to the dam project .....	9
Legal framework.....	10
Other legal considerations .....	11
<b>B. POTENTIAL IMPACTS OF THE LSII.....</b>	<b>12</b>
Increased access to stable electricity .....	12
Power generation, transmission and consumption .....	13
Revenue generation .....	13
Employment creation .....	13
Social impacts.....	13
Impacts on fisheries.....	14
Changes to sedimentation .....	15
Disruption of natural hydrology and water flows.....	15
Water quality.....	16
Loss of biodiversity, deforestation and forest clearance .....	16
Risk of seismic activity .....	17
<b>CONCLUSION .....</b>	<b>18</b>
<b>REFERENCES .....</b>	<b>19</b>

## ABBREVIATIONS

Abbreviation	Meaning
3S	The Sesan, Srepok and Sekong Rivers
ADB	Asian Development Bank
BOT	build-operate-transfer
EIA	environmental impact assessment: a formal technical report forecasting a project's expected effects on the environment
EVN	Vietnam Electricity Group: Vietnam's state-owned electricity provider
EVNI	EVN International Joint Stock Company: subsidiary of EVN undertaking international projects
LMB	Lower Mekong Basin
LSII	Lower Sesan II Hydropower Dam
MIME	Cambodia's Ministry of Industry, Mines and Energy, dissolved in 2014 and replaced by the Ministry of Mines and Energy, and the Ministry of Industry and Handicrafts
MoME	Cambodia's Ministry of Mines and Energy
MoU	memorandum of understanding
MRC	Mekong River Commission: the intergovernmental agency for joint management of shared water resources in the Lower Mekong Basin
PECC1	Power Engineering Consulting Joint Stock Company 1: a subsidiary of EVN
PECC3	Power Engineering Consulting Joint Stock Company 3: a subsidiary of EVN
RGC	Royal Government of Cambodia
VAT	value added tax: a tax on consumption of goods and services

## UNITS OF MEASUREMENT

\$	United States dollars or equivalent unless otherwise specified
Ha	hectares
GWh	gigawatt hours
Km	kilometers
kV	kilovolts
kWh	kilowatt hours
MW	megawatts

# Executive summary

The Lower Sesan II Dam (LSII) is a 400 MW hydropower dam being constructed 1.5 kilometers below the confluence of the Sesan and Srepok rivers, two Mekong River tributaries, in Stung Treng province, north-east Cambodia. The dam is 25 km from the Mekong itself.

The dam is in Sesan District, which at the time the environmental impact assessment (EIA) was conducted in 2008 had a population of over 12,900 people. Upstream of the dam site there are around 78,000 people, including many indigenous peoples.<sup>1</sup> Downstream are many small villages and the provincial center of Stung Treng, with a total population of around 45,000 people.<sup>2</sup>

When the dam was first proposed, the area included a significant amount of forest with good air and water quality.<sup>3</sup> It is part of the Lower Mekong Dry Forest Eco-system, which is internationally recognized as containing valuable wildlife habitat and a range of rare and endangered species.<sup>4</sup> Some areas have been logged in recent years and replaced by rubber plantations.

The 2008 Environmental Impact Assessment Report states that the earth-fill dam will be 75 meters in height above sea-level and 8 kilometers wide<sup>5</sup> and the reservoir behind it will cover 33,560 hectares, including approximately 30,000 ha of forest land.<sup>6</sup> More than 4,800 people will need to be relocated.<sup>7</sup> Early work on the site began in 2013 with extensive logging of trees in the affected and adjacent areas. Construction of LSII was originally predicted to take around four years, requiring a workforce of approximately 3,000 workers at peak construction.<sup>8</sup> The most recent date given for completion is 2017.<sup>9</sup>

In May 2014, the chairperson of the parent company of one of the dam's joint-venture partners was reported as saying that the dam would cost \$977 million.<sup>10</sup> LSII is being built under a build-operate-transfer agreement (as all major Cambodian hydro projects have been) with a 45-year concession period, after which ownership passes to the Royal Government of Cambodia.

The project will include five 80 MW turbines, and during peak operation LSII will have an installed capacity of 400 MW, generating an anticipated average 1953.93 GWh of electricity annually.<sup>11</sup> Cambodia's state-owned electricity supplier Electricité du Cambodge (EdC) is obliged by law to purchase electricity from the dam.<sup>12</sup>

The dam's developer is Hydropower Lower Sesan 2 Company, a joint venture between 2 owners:

- Hydrolancang International Energy Co. Ltd. (a subsidiary of Chinese state-owned Huaneng Group) – the majority shareholder
- Royal Group Co. Ltd.

The extent or nature of Vietnamese involvement in the project today (if any) is unclear. Conflicting statements have been reported in the media. In a December 2012 account, an EVNI representative in Cambodia was quoted as saying that Hydrolancang had paid EVNI back its investment, while Kith Meng was quoted in the same issue as saying that EVNI maintained a 10% stake.<sup>13</sup>

## ENVIRONMENTAL AND SOCIAL IMPACTS

An environmental impact assessment was conducted in 2008 by Key Consultants (Cambodia) Ltd. The EIA and other documents from various organisations have stated that the dam will have impacts over the entire Mekong River Basin.

Significant losses of fish and changes to sediment transfer are predicted. The EIA states that “the socio-economic impact from the consequent loss of fish will be the single largest impact of the dam.”<sup>14</sup> To explain that briefly:

- The Mekong, its tributaries and delta, the Tonle Sap river and lake make up a single interconnected fish habitat system, so a dam across the Sesan River will impact not only the fisheries in the Sesan area but the fisheries in the entire system,<sup>15</sup> including the Tonle Sap and the Vietnamese delta.<sup>16</sup>

1 Baird, Ian G. *Best Practices in Compensation and Resettlement for Large Dams: The Case of the Planned Lower Sesan 2 Hydropower Project in Northeastern Cambodia*. Phnom Penh: Rivers Coalition in Cambodia, 2009, p.13

2 Key Consultants (Cambodia) Ltd. *Environmental Impact Assessment for Feasibility Study of Lower Sesan 2 Hydropower Project, Stung Treng Province Cambodia 2008* (“KCC”) p. s-4

3 KCC p.27, 30

4 KCC p.175

5 KCC p.s-2

6 KCC p.s-2,s-3

7 KCC p.s-5

8 KCC p.s-2

9 “Hun Sen attends Dinner, Presentation in China”, *The Cambodia Daily*, 22 May 2014

10 “Hun Sen attend dinner, Presentation in China”, *The Cambodia Daily*, 22 May 2014

11 KCC p.s-2 and p.15

12 Draft Law on Authorization of Payment Warranty of the Royal Government of Cambodia for the Hydro Power Lower Sesan 2 Company

13 “Vietnam confirms stake in Sesan dam bought by Chinese”, *The Cambodia Daily*, 11 December 2012

14 KCC p.S5

15 KCC p.99

16 Piman,T.,T.A. Cochrane,M.E.Arias,A. Green, and N.D.Dat. "Assessment of Flow Changes from Hydropower Development and Operations in Sekong, Sesan and Srepok Rivers of the Mekong Basin ." *Journal of Water Resources Planning and Management* (American Society of Civil Engineers)



- Research predicts a 9.3 percent drop in fish stocks across the Mekong Basin following dam construction<sup>17</sup> with 56 species becoming newly endangered and at risk of extinction.<sup>18</sup>
- Over 1 million tons of freshwater fish are caught annually in the Cambodian and Vietnamese floodplains, making the sustainability of floodplains fisheries a major food security concern in both nations.<sup>19</sup>
- The dam will completely block the upstream migration of fish.<sup>20</sup> There are at least 64, 54 and 81 migratory fish species recorded in the Sekong, Sesan and Srepok Rivers respectively. As an example of the local human impact, the 41 migratory fish species that Sesan River fishers commonly catch represent 60% of their total catch.<sup>21</sup>
- At least 78,000 people living above the dam site are expected to lose access to migratory fish.<sup>22</sup>

The dam could also reduce 6–8 % of the basin's sediments loads, which are essential to the productivity of the Mekong floodplains, riverbank gardens and delta.<sup>23</sup>

Other impacts from the dam include:

- Resettlement of over 4,800 people, many of whom are indigenous and do not wish to be moved, with substantial impacts on their livelihoods, cultures and communities.
- Loss of valuable habitat for rare and endangered animal species.<sup>24</sup>

While the EIA report outlines possible mitigation measures – for example, “Provide compensatory measures for tree loss and combating climate change by replanting trees equivalent in type and number to those lost”<sup>25</sup> – there is evidence that following the construction of other large projects, such as the Kamchay Dam, mitigation measures contained in environmental management plans have not been fully complied with.<sup>26</sup>

This track record is crucial to consider against the LSII EIA report's warning: “Any non-conformance with the mitigation measures will likely result in highly significant environmental and social impacts resulting from the dam for many years affecting the future generations of Cambodia.”<sup>27</sup>

139, no. 6 (November 2013): pp.723–732.

17 Ziv, Guy, Eric Baran, Nam So, Ignacio Rodríguez-Iturbe, and Simon A. Levin. "Trading-off fish biodiversity, food security, and hydropower in the Mekong River Basin." *Proceedings of the National Academy of Sciences* 109, no. 15 (2012): pp.5609–5614.

18 Ziv, Table 52

19 Ziv, abstract

20 Vutha, H, C Mong, O Noty, and S Seyha. *Assessment on fisheries natural resources for Lower Sesan 2 Hydropower Plant Project*. Hanoi: Power Engineering Consulting Joint Stock Company 1, 2009. p.27; KCC 2008 p.132

21 Baran, Eric. Mekong Fisheries and Mainstream Dams. Fisheries section in ICEM 2010, Mekong River Commission Strategic Environmental Assessment of hydropower on the Mekong mainstream, Hanoi: International Centre for Environmental Management, 2010, p.3

22 Baird 2009 p.13

23 International Rivers. *Cambodia's Lower Sesan 2 Dam's Draft Law Evades Costs and Concerns*. 11 February 2013.

24 KCC p.132

25 KCC p.132

26 NGO Forum 2013

27 KCC p.175

## POWER GENERATION QUESTIONS

While the dam is expected to help to meet Cambodia's growing energy demand and reduce its reliance on imported energy, it is unlikely that the dam will generate the full amount of power anticipated:

- The Sesan River fluctuates due to the Yali dam upstream in Vietnam.<sup>28</sup>
- Low water flows mean power production falls to 25% in the dry season.<sup>29</sup>
- Reduced rainfall from other than seasonal changes means electricity generation can fall to extremely low levels. In Vietnam, the Yali Falls dam water level dropped to a 50-year low in 2011 and power output halved.<sup>30</sup>
- The life expectancy of dams in tropical forests is often drastically shortened because of silt accumulating in the reservoir.<sup>31</sup> Silting can happen quickly: Manwan Dam on the Mekong in China lost 20 percent of its storage capacity to sediment deposits in the first 10 years of operation.<sup>32</sup>

Where the power will go is uncertain. Power purchase agreements have not been publicly disclosed. Early plans were for at least some of the power to be exported to Vietnam, but more recently both Prime Minister Hun Sen and Deputy Prime Minister for Economy and Finance Keat Chhon have been reported as saying that all the electricity will be used in Cambodia.<sup>33</sup> Cambodia does not yet have the high voltage network to be able to distribute the power to Phnom Penh and around the country, although there are plans for the network to be expanded.

Overall, the nature of the approval and implementation of LSII, along with the scale of expected impacts, raises serious questions about the decision-making processes surrounding hydropower development in Cambodia and the region.

There is an immediate need for regional government cooperation to ensure a balance being struck between environmental conservation, social justice and energy generation objectives. This requires reconsideration and reconfiguration of harmful dams as well as effective mechanisms to ensure that regional hydropower is undertaken in a sustainable and equitable manner for the benefit of all. Meaningful consultation with affected communities and a transparent process is vital to achieving social justice.

The LSII should not proceed as it is currently planned as the potential human and environmental costs are unacceptably high.

28 KCC p.116; Baran p.3

29 National Strategic Development Plan 2014–2018, Royal Government of Cambodia, p.47

30 Grimsditch, Mark. *3S Rivers Under Threat: Understanding new threats and challenges from hydropower development to biodiversity and community rights in the 3S River Basin*. Jointly published by 3S Rivers Protection Network and International Rivers, 2012 p.19

31 Denslow, Julie Sloan, and Padoch, Christine, *People of the tropical rain forest*, University of California Press, 1988, p.36

32 Pukinskis p.1–2

33 Grimsditch, p.47; May Titthara, Bridget Di Certo. "Chinese Sign Deal on Dam, Villagers Fear Flooding." *The Phnom Penh Post*, November 27, 2012. Accessed September 10, 2014

# Introduction

---

The 400 MW Lower Sesan II Dam (LSII) in Cambodia's Stung Treng province is arguably the most controversial hydropower project planned for the 3S Basin or any Lower Mekong tributary. It has been identified as having the most serious potential impacts on fish biomass of 27 planned tributary dams in the Lower Mekong Basin.<sup>34</sup> The LSII could significantly affect the Mekong Basin's riparian ecosystems,<sup>35</sup> impacting on food and nutritional security, livelihoods and the wider economy.

Despite the magnitude of the anticipated impacts, the Cambodian government has not required the dam's developers to undertake a transboundary impact assessment, nor is there evidence of a systematic consideration of consequences beyond the immediate area of impact in Cambodia itself.

The dam's EIA came under heavy criticism for not meeting international best practice standards and for inadequately consulting with communities.<sup>36</sup> NGO Forum on Cambodia described it as containing "fundamental deficiencies" and lacking credibility.<sup>37</sup>

At the time of this writing, with limited consultation conducted with affected communities, project development had already started with large forest clearance under way, access roads constructed and preparation work beginning on the site of the dam itself.

The nature of the approval and implementation of LSII raises questions about the decision-making processes surrounding hydropower development in Cambodia. The case also highlights the need for improved regional governance of water resources in the Lower Mekong Basin, incorporating better intergovernmental cooperation, openness to civil society engagement, and more effective mechanisms for cross-border accountability to adequately manage both the domestic and transboundary impacts of hydropower projects.

This report, based on an extensive literature review, describes the potential environmental and social impacts of LSII. It also discusses the circumstances of the dam's approval.

---

<sup>34</sup> Ziv, abstract

<sup>35</sup> KCC p.99

<sup>36</sup> Baird 2009

<sup>37</sup> NGO Forum on Cambodia. *Review and Comments on Environmental Impact Assessment (EIA) Report of Lower Sesan 2 Hydropower Project*. Phnom Penh, 2009.

# A. Background

## THE AREA AND THE PEOPLE

The Sesan and Srepok rivers originate in the Central Highlands of Vietnam and flow into Cambodia where they meet the Sekong River, which also originates in Vietnam but flows through Laos before entering Cambodia. The three form the 3S river system and, after merging, flow into the Mekong (Figure 1).

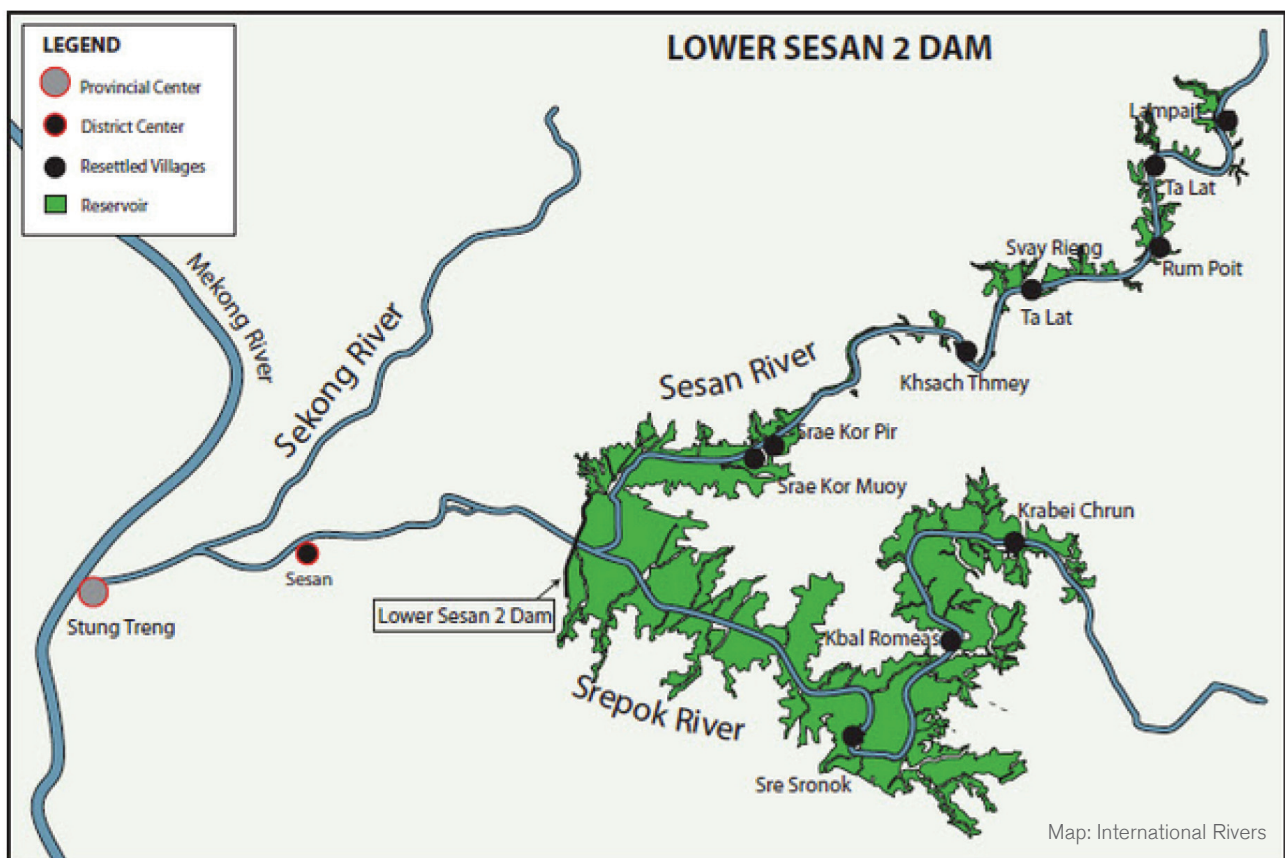


Figure 1 Location of the Lower Sesan II Dam and its reservoir

The dam will result in the inundation of 40–60km stretches of both the Sesan and Srepok Rivers, the complete flooding of four villages and partial flooding of 3 further villages.<sup>38</sup>

The dam site is located in the Lower Mekong Dry Forest Eco-Region, an internationally recognized but unprotected area of global importance for biodiversity conservation and for support of large wild animals listed as threatened with extinction in the Red Data Book of the International Union for Conservation of Nature and Natural Resources. The large mammals present include Asian elephant, banteng and kouprey (species of wild cattle), black bear, eld's deer, fishing cat, gibbons, golden cat, tiger and wild water buffalo.<sup>39</sup> At the time

the EIA was completed this was an isolated forest with only minimal degradation,<sup>40</sup> although some subsequent logging has occurred and rubber plantations have been established.

The 3S system has a high level of fish biodiversity with 329 species. Although it only represents 10% of the Mekong Basin area, it is home for 42% of all Mekong fish species. Fourteen fish species here are already endangered and 15 species are found exclusively in the Sekong River and two in the Srepok River; they are found in no other Mekong tributary and nowhere else in the world.<sup>41</sup>

38 KCC p.16

39 KCC p.52

40 KCC p.s-3

41 Baran p.3



The area also includes an Important Bird and Biodiversity Area (IBA) that supports “one of the best remaining examples of the riverine bird community that was once widespread along wide, lowland rivers in Indochina.”<sup>42</sup> The precise impact that logging and earthworks on the dam site in the last 18 months have had on the wildlife of this area is unknown.

Sesan District had a total population of over 12,900 people at the time of the EIA. The population immediately downstream, including the provincial center of Stung Treng, numbers around 45,000 people.<sup>43</sup> One academic study has suggested that upstream of the dam around 78,000 people would be affected by it.<sup>44</sup>

The area is home to many different peoples. Some are officially considered indigenous while others are ethnic minorities:

- Ethnic Lao have been living along the Sesan River for a long time, just above, below and in the projected reservoir area. Srekor village is populated by ethnic Lao people.
- The indigenous Bunong (sometimes referred to as Phnong) live in Kbal Romeas village in the reservoir area (on the Srepok River).
- Some indigenous Kreung peoples live just upstream of the reservoir.
- In Ratanakiri Province, there are Brao, Kreung, Kavet, Kachuck, Tampuon and Jarai people living along the Sesan River, as well as ethnic Lao and Chinese people, but only a few Khmer. There are, however, a handful of Khmer villages along the Sesan River in Stung Treng Province. Lao, Khmer and Tampuon people also live upstream of the reservoir along the Srepok River.<sup>45</sup>

## BACKGROUND TO THE DAM PROJECT

The LSII Hydropower Dam has been under study for more than 15 years.

1999	Funded by the Asian Development Bank (ADB), UK engineering consultancy Halcrow and Partners conduct the first feasibility study on the dam (although in a slightly different location). Conclusion: the project is financially unattractive with high social/environmental impacts. <sup>46</sup>
2006	Cambodian and Vietnamese governments discuss the possibility of building the dam.
15 June 2007	The Ministry of Industry, Mines and Energy (MIME), acting for the Royal Government of Cambodia, signs a memorandum of understanding with Vietnam's state-owned electricity supplier Vietnam Electricity (EVN) to conduct a feasibility study and environmental impact assessment (EIA) for the dam.
2007–2009	EVN's subsidiary, Power Engineering Consulting Joint-Stock Company 1 (PECC1) carries out the feasibility study. They contract Key Consultants Cambodia (KCC) to undertake the EIA.
June 2009	The EIA is criticized by civil society groups and experts who find it inadequate, failing to comply with many national and international guidelines on planning, implementation, compensation and mitigation measures.
July 2009	MoE requests additional studies on fish migration.
June 2010	The 4 <sup>th</sup> version of the EIA is approved by the MoE.
2011	Cambodian conglomerate Royal Group Cambodia joins EVNI in developing the project, with a 49 percent share in the joint venture, EVNI holding 51 percent.
2011	Hydrolancang International delegates visit Cambodia and express interest in investing in the country.
14 March 2012	Hundreds of residents from villages along the Sesan River march and boat to the dam site to protest against the project.
2 November 2012	Cambodia's Council of Ministers approves investment in the Lower Sesan II Dam.
26 November 2012	Hydrolancang International chairman Hong Guang Ming signs an investment MoU with Royal Group's chairman Kith Meng for an initial two-year financial injection into the Lower Sesan II hydropower project, along with implementation agreement, lease and power purchase agreements.
15 February 2013	The National Assembly approves the “Draft Law on Authorization of Payment Warranty of the Royal Government of Cambodia for the Hydro Power Lower Sesan 2 Company” (guaranteeing the dam's earnings and obliging Cambodia's state-owned electricity supplier to purchase electricity from it).

<sup>42</sup> Birdlife International Site Fact Sheet KH011 *Sesan River*

<sup>43</sup> KCC p.s-4

<sup>44</sup> Baird 2009 p.13

<sup>45</sup> Dr Ian Baird, Assistant Professor, Department of Geography University of Wisconsin-Madison Madison, Wisconsin. Personal correspondence

<sup>46</sup> Asian Development Bank, TA6367 Sesan, Sre Pok, and Se Kong River Basins Development Study in Kingdom of Cambodia, Lao People's Democratic Republic, and Socialist Republic of Vietnam. Available at: <http://cdm16658.contentdm.oclc.org/cdm/compoundobject/collection/p267501ccp2/id/322/rec/14>

2013	Logging work begins and trees are cleared from the reservoir area, but there are claims that trees are being illegally felled outside the designated area. Some local people say they have already been involuntarily resettled. <sup>47</sup>
January 2014	It is reported that Hydrolancang International Energy Co has acquired a 51 percent share in the joint venture. It is no longer clear if EVNI is still involved in the project.
September 2014	Villagers whose homes will be destroyed deliver a letter to Stung Treng provincial authorities saying that they refuse to be resettled. <sup>48</sup>

Hydropower Lower Sesan II Co., Ltd. will build the LSII under a 45-year build-operate-transfer agreement with the Royal Government of Cambodia. Construction is scheduled to take five years, leaving a 40-year operating period before ownership of the project is transferred to the RGC.

Hydropower Lower Sesan II Co., Ltd. is a joint venture between Cambodian conglomerate Royal Group and China's state-owned Hydrolancang International Energy Co., Ltd. Royal Group is controlled by Kith Meng, a prominent businessman, senior advisor to Cambodia's prime minister and president of the Cambodia Chamber of Commerce.

The extent or nature of Vietnamese involvement in the project today (if any) is unclear. Conflicting statements have been reported in the media. In a December 2012 account, an EVNI representative in Cambodia was quoted as saying that Hydrolancang had paid EVNI back its investment, while Kith Meng was quoted in the same issue as saying that EVNI maintained a 10% stake.<sup>49</sup>

Regardless of changes of ownership, the dam has continued to draw criticism. A number of donors to Cambodia and the Mekong River Commission consider the threat to the Lower Mekong Basin (LMB) so great that they called for the LSII to be reconsidered. On 28 June 2013 a joint statement on the LSII was released and endorsed by eight bilateral partners, including the U.S., Australia, Japan and Germany, and multilateral partners the European Union and World Bank.<sup>50</sup> This was reiterated in June 2014. It noted that, "given the potentially detrimental regional effects of the LSII in its current design (including on fish migration, sediment flow and the resettlement of local communities), Development Partners urge the Royal Government of Cambodia to reconsider the project's design." The statement also called for the RGC to voluntarily submit the project for prior consultation under the MRC Procedures for Notification, Prior Consultation and Agreement before beginning construction.

## LEGAL FRAMEWORK

The main government ministry responsible for the development of the Cambodian hydropower sector is the Ministry of Mines and Energy (MoME). Other key ministries include the Ministry of Water Resources and Meteorology (MOWRAM) and the Ministry of Environment (MoE). The State power company Electricity du Cambodge (EdC) is responsible for day-to-day aspects of management of the electricity sector and the Electricity Authority of Cambodia (EAC) for issuing generation and transmission licenses.

There is currently no specific law on hydropower in Cambodia, although there are a number of laws with relevance to the development and running of such projects, including the laws related to investment, electricity, land, forests, water resources and the environment.

The Council for the Development of Cambodia (CDC) is responsible for the evaluation and the decision-making on all rehabilitation, development and investment project activities.<sup>51</sup>

The Council of Ministers must also approve investment projects when there is a capital investment of \$50 million and above, politically sensitive issues are involved, the project is for the exploration and the exploitation of mineral and natural resources, has possible negative impact on the environment, a long-term development strategy or is a significant infrastructure project.<sup>52</sup>

The first step in developing a hydropower project is to seek a Memorandum of Understanding with MoME in order to conduct and prepare a feasibility study. (MIME was the ministry in charge at the time of LSII's feasibility study, but has since been split into two ministries.) After completion of the study a company may enter further discussion with the ministry about developing the project. In addition, under Article 12 of the Law on Water Resources Management, all hydropower projects require a water use license from MOWRAM.

EIAs are addressed in the Law on Environmental Protection and Natural Resource Management.

47 Waiting for the deluge", *Phnom Penh Post*, 24 February 2014

48 Villagers refuse relocation", *Phnom Penh Post*, 29 September 2014

49 Vietnam confirms stake in Sesan dam bought by Chinese, *The Cambodia Daily*, 11 December 2012

50 Joint Development Partner Statement: MRC Informal Donor Meeting, 28 June 2013

51 Law on the Amendment to the Law on Investment 2003, article 3

52 Sub-Decree 147 on the Organization and Functioning of the Council for the Development of Cambodia, article 11

Article 6 states that “An environmental impact assessment shall be done on every project and activity, private or public, and shall be reviewed and evaluated by the Ministry of Environment before being submitted to the Royal Government for decision...”

The Sub Decree on Environmental Impacts Assessment Process defines requirements and processes for all proposed projects in Cambodia. Under article 8 of the Sub Decree, the Ministry of Environment is responsible for reviewing all EIAs for projects that potentially have serious impact to the natural resources, ecosystem, health or public welfare, before government approval.

A law specifically covering EIAs has been drafted but has not yet been approved by the National Assembly.

The 2002 Forestry Law states (in article 4) that the law should be “implemented to ensure public participation in any government decision that has the potential for heavy impact on concerned general citizens, livelihoods of local communities and forest resources of the Kingdom of Cambodia. Consistent with the Cambodian code of forest management and the Environmental Protection and Natural Resources Law, an Environmental and Social Impact Assessment shall be prepared for any major forest ecosystem related activity that may cause adverse impact on society and environment. The Forestry Law also states that EIAs “shall be made available for public comment.” Completed EIAs must be submitted to the MoE who will consider whether or not the report is adequate and make recommendations. The findings of the EIA should be considered in the final decision whether or not to approve a project.

Key provisions of the 2001 Land Law include the protection of private ownership and the stipulation that no one may be deprived of ownership unless it is in the public interest, and only after the payment of fair and just compensation in advance (article 5).

A similar protection is set out in the Constitution of Cambodia (article 44). However, many Cambodians lack definitive recognition of ownership of their properties as they are yet to receive land ownership titles. This has in many cases left people exposed to land disputes and often puts people in a weak position when their land is targeted for development. If the occupation and/or use of the land meets a number of requirements set out in the 2001 Land Law, and if occupation began before the passing of the 2001 Land Law, people without land titles may still be regarded as legal possessors. Under the law possessors have rights similar to those of owners until such time as they are able to obtain ownership title (chapter 4).

The Constitution gives citizens the right to participate in political, economic, social and cultural life. The 2007 Law on Management of Water Resources in Cambodia states that “The Royal Government of Cambodia shall encourage the collaboration with and participation of the relevant agencies, private sectors, beneficiary groups, NGOs and International Organizations in all activities related to the management, investment, exploitation, conservation and development of the water resources” (Article 7).

On 15 February 2013, the National Assembly of Cambodia approved the Draft Law on Authorization of Payment Warranty of the Royal Government of Cambodia for the Hydro Power Lower Sesan II Company. This law, based on an implementation agreement between the RGC and Hydropower Lower Sesan II Company Ltd, aims to recover the construction costs and guarantees the dam’s earnings over the 40-year operational period. If Cambodia’s state-owned electricity supplier Electricité du Cambodge (EdC) fails in its obligation under this law to purchase electricity, or in the case that the Hydropower Lower Sesan II Company is unable to operate the project due to political force majeure events, that is, political reasons such as war, political deadlock or national chaos, the law makes the Royal Government of Cambodia liable for the cost of the electricity or the cost of the project, respectively.<sup>53</sup>

## OTHER LEGAL CONSIDERATIONS

### 1995 Mekong Agreement

The 1995 Mekong Agreement is a multilateral treaty signed by Cambodia, Laos, Thailand and Vietnam that codifies many governing principles of international environmental law and sets out rules for development of the Mekong Basin. The Mekong River Commission ensures the implementation of these provisions. The Agreement is not binding, but requires regional consultation before a dam is constructed on the Mekong River. Despite their significant transboundary impacts, article 5(a) states that the construction of tributary dams falls under national jurisdiction, only requiring a notification to Mekong River Commission member states.

### 1997 UN Watercourse Convention

This convention provides an international legal framework to ensure the fair and sustainable management of transboundary waterways and promotes multilateral cooperation in relation to shared water resources. It entered into force on 17 August 2014.

<sup>53</sup> Explanatory Note on The Draft Law on the Authorization of Payment Warranty of the Royal Government of Cambodia for the Hydro Power Lower Sesan 2 Company (point 4), Royal Government of Cambodia

# B. Potential Impacts of the LSII

This section of the report looks at the impacts of the dam, starting with benefits such as the production of electricity and the generation of revenue and employment opportunities, then the impact on communities and the environment. The potential impacts, both good and bad, are enormous. Some estimates suggest that LSII could potentially generate a fifth of the power Cambodia is likely to need by 2018; yet its physical impacts, in particular its impact on fisheries across the LMB, could threaten the food security of tens of thousands of people.

## INCREASED ACCESS TO STABLE ELECTRICITY

Due to the high cost of imported fuels and fragmented power supply systems, energy prices in Cambodia are among the highest in the region. This, along with nationwide electricity shortages and subsequent power outages, have been identified by the Royal Government of Cambodia as barriers to further economic growth and investment due to the hindrance caused to commercial activities.<sup>54</sup>

The Cambodian Government has stated that the LSII is necessary to develop the country's capacity for electricity generation, which is currently trailing demand by a significant margin. In recent years the government has prioritized increasing, stabilizing and reducing the cost of electricity supply in Cambodia, and views this as an important catalyst for increasing investment and promoting development.

The National Strategic Development Plan 2014–2018 targets include:

- more than doubling electricity generation, from 5,219 GWh in 2014 to 10,823 GWh in 2018
- almost doubling the length of electricity transmission line networks over the next four years.<sup>55</sup>

In recent decades, Cambodia has undergone rapid economic development, with GDP per capita more than tripling between 1999 and 2013.<sup>56</sup> As the population increases and industry expands, Cambodia's electricity consumption is forecast to grow annually at 9.4% until 2020.<sup>57</sup>

The National Strategic Development Plan 2014–2018 includes the goal that “by 2020, all villages in the Kingdom of Cambodia will have access to electricity supplied by the national grid and other sources.”<sup>58</sup>

The EIA report explained that a key objective of the dam is “to fulfil the medium and long term energy demand of the Kingdom of Cambodia as well as exporting any surplus energy.” The project also responds to the third mandate of the Government's Rectangular Strategy which relates to the development of the energy sector to meet the needs for low cost electricity.<sup>59</sup>

The EIA reported that the dam will generate an average 1953.93 GWh of electricity annually. In 2013, total electricity generated in Cambodia was 4349 GWh, according to the NSDP. That would suggest that LSII could potentially produce the equivalent of 45% of the current electricity production of the country, and nearly 20% of the 2018 goal of 10,823 GWh.

However, there is a substantial risk that generation could fall far below this level, chiefly because of a lack of water:

- The Sesan River already fluctuates due to the peak operations of the Yali dam upstream in Vietnam.<sup>60</sup>
- Low water flows in the dry season mean greatly reduced power production: “Electricity production from hydropower plants is only in rainy season, but in dry season, power production is only 25%.”<sup>61</sup>
- Reduced rainfall can mean electricity generation can fall significantly in the dry season. In March 2013 it was reported that Cambodia's 194 MW Kamchay Dam was operating at just 10 percent capacity due to very low rainfall.<sup>62</sup> In Vietnam, the Yali Falls Dam has struggled to reach its energy generation targets. In 2011 its reservoir water level dropped to 6 meters, a 50-year low, following an extended period of low rainfall, and its output for the first six months of the year reduced from around 2 billion kWh in previous years to less than 1.1 billion kWh.<sup>63</sup>

54 Grimsditch p.16

55 NSDP 2014–2018 viii

56 <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

57 National policy, strategy and action plan on energy efficiency in Cambodia, The Ministry of Industry, Mines and Energy 16/05/2013

58 NSDP 2014–2018 p.156

59 KCC p.s-1

60 KCC p.116; Baran p.3

61 NSDP 2014–2018 p.47

62 “EdC Appeals for Public to Unplug in Power Crisis”, *The Cambodia Daily*, 29 March 2013

63 Grimsditch p.19

Climate change adds another layer of unpredictability with changes to rainfall levels expected in different areas.

The existing cost-benefit analysis that has been published is not sufficiently detailed and remains inadequate for independent observers to assess the economic viability, benefits, and potential sharing of the benefits associated with LSII. No documents have been found that satisfactorily address the reduction of power generating capacity (and lifespan of the dam) that occurs as sediment builds up in the reservoir. This can happen quickly: the Manwan Dam on the Mekong in China lost 20 percent of its storage capacity to sediment deposits in the first 10 years of operation.<sup>64</sup>

The relative efficiency of the project has been questioned by some, including the Asian Development Bank (ADB). A 2008 study conducted by the ADB looked at various potential hydropower sites in the 3S region and rated them according to a number of criteria, one being a comparison between the installed capacity of each proposed project and the amount of land that would be inundated. The ADB ranked projects that produce more than 10 MW per km<sup>2</sup> of reservoir as “good”; 5–10 MW per km<sup>2</sup> “moderate”; and stated that dams producing less than 5 MW per km<sup>2</sup> need to be “carefully assessed.” The LSII will produce 1.2 MW per km<sup>2</sup> of reservoir.<sup>65</sup>

## POWER GENERATION, TRANSMISSION AND CONSUMPTION

Over the past four years there has been conflicting information about where the power generated by LSII will be used. Initial reports suggested that the power would be split between Cambodia and Vietnam, and EVN documents outlined proposals for connecting LSII to another dam on the border and into Vietnam,<sup>66</sup> indicating that there were serious initial plans to export power to Vietnam. However, reports that power would be exported to Vietnam have been denied by Cambodia’s prime minister who stated that 100% of the power would remain in Cambodia.<sup>67</sup>

Under the Law on Authorization of Payment Warranty, the LSII developers will construct 36 km of 230 kV power transmission lines.<sup>68</sup>

Phnom Penh consumes 90% of Cambodia’s electricity,<sup>69</sup> yet there is not currently a high voltage transmission system between Stung Treng and Phnom Penh that could deliver all the energy from LSII to the capital. The NSDP 2014–2018 indicates that over 725 km of new 230 kV transmission lines will be built across the country between 2014 and 2017,<sup>70</sup> when the dam is scheduled to begin operations, but it is not clear where these lines will be placed or who will fund them.

64 Pukinskis p.1–2

65 ADB document: ADB-RETA 40082, 3S Technical Sheets Key Topic 8 – Large scale infrastructure development in the 3Ss, 8a Hydropower Development, no date

66 Grimsditch p.46

67 Grimsditch 2012, p.46–47

68 Law on Authorization of Payment Warranty of the Royal Government of Cambodia for the Hydro Power Lower Sesan II Company

69 Grimsditch p.16

70 NSDP 2014–2018 p. viii

## REVENUE GENERATION

It is estimated that the dam will raise approximately \$29.58 million per year in revenues, or \$1.18 billion over the 40-year operating period (in today’s dollars), excluding tax revenues.

## EMPLOYMENT CREATION

The EIA states that at peak construction, around 3,000 people may be engaged in the building of the dam,<sup>71</sup> however, this figure applies for just 2 years,<sup>72</sup> and some roles requiring specialist skills or experience will be filled from outside the area, perhaps even the country. Other Chinese-built dams have employed Chinese nationals to fill technical positions. Once construction is completed, numbers employed will fall drastically, although no long-term employment numbers have been found. It is unclear what percentage of those employed will be Cambodian vs those who will be hired from China and Vietnam (such as those who are currently building the dam).

## SOCIAL IMPACTS

The dam will have a significant impact on the welfare, livelihoods and food security not only of people in the immediate area of the dam and reservoir, but potentially as far away as the delta in Vietnam, because of the impact on fish stocks and reduced sediment load in the Mekong.<sup>73</sup>

There is substantial research showing what impacts dams in the region have, based on those already in operation: “The construction and operation of existing large-scale hydropower dams in the upper reaches of the 3S rivers in Vietnam has already had severe negative impacts on downstream communities in both Vietnam and Cambodia through decreased fish stocks, erratic water fluctuations, and changes in the quantity and quality of water.”<sup>74</sup>

The dam’s EIA gives two sets of numbers for people and households who need to be resettled: 4,785 people from 1,059 families based on data from 2008, and a forecast of 6,507 people from 1,579 for the year 2011.<sup>75</sup> However, the Law on Authorization of Payment Warranty provides for the relocation and compensation of only 797 households. Energy Minister Suy Sem said the original figure of more than 1,000 families had been reduced because only three communes – not four – were affected.<sup>76</sup> However it is not clear what this change is based on, nor have local communities been consulted on the new information.

As discussed elsewhere, the project will lead to the clearing of around 30,000 ha of forest, much of which is forest reserve. Many people will have previously accessed these forests to gather non-timber forest products. The inundation of these areas will cut access to these products, impacting on the livelihoods of local people who depend on them to supplement their income and food supply.

71 KCC p.130–131

72 KCC p.131

73 Ziv; International Rivers

74 Grimsditch p.6

75 KCC p s-5

76 “Questions follow on heels of hydropower dam Sesan 2 vote”, *Phnom Penh Post*, 18 Feb 2013



Consultations were held in February and May 2008. The first set of consultations, held 1–4 February 2008, were attended by 587 people, but a consultation held in Stung Treng on 9 May 2008 was attended by only 45 people, mostly government officials. 10 people at this meeting were from affected communities.<sup>77</sup> This is inadequate for a project of this scale and with such potentially drastic consequences.

Other consultations have followed, but they too have usually been inadequate, with not enough information given, and they have typically consulted local authorities rather than the affected communities.

According to the 2008 EIA report, over 1,200 ha of agricultural land will be inundated, amounting to over 24 percent of all agricultural land in Sesan District. As well as impacting on the agricultural lands of small-holders, the project will inundate areas that have been granted to private companies as economic land concessions.<sup>78</sup>

Researchers visiting affected areas found widespread opposition to the dam. “100% of the people who participated in village meetings organised in all the communities visited clearly indicated that they are opposed to the LSII Dam. Many did not want to discuss compensation issues, instead insisting that no level of compensation would be sufficient to make up for the expected severe impacts of the dam. It also appears, based on villager reports, that the vast majority of people in other parts of Stung Treng Province are opposed to the project.”<sup>79</sup>

The social impact of existing dam projects in Cambodia can be considered as a guide to what may happen with LSII. The impact of the Kamchay Dam on communities in that area has been studied. Although people who lost fruit trees were compensated for the loss of productive assets, people who were dependent on non-timber forest products were not compensated for loss of forest access. Although they did not lose physical assets, that loss of access had drastic impacts on their income and livelihoods. They received little support from local government authorities or the project developer.<sup>80</sup>

Those in the area closest to the Dam site come from a number of different ethnic and indigenous groups. “The people in the project area are mostly made up of ethnic groups including Phnong, Kavet, Cha Rai, Krung, Prov, and Lao-Khmer. Therefore the resettlement for these people is a very major issue to be considered in the project preparation and design.”<sup>81</sup>

Many communities in the wider Sesan and Srepok Basins are populated by members of indigenous minority groups, with deep ancestral connections to the rivers and land that their lives are centered on. The exploitation and depletion of local natural resources is a threat to their fundamental rights, livelihoods, traditions, cultural practices, and identity.

While compensation has been worked out for those households that require resettlement, in early 2014 there were reports that some were being required to leave their homes before the redevelopment sites were ready. Locals say too little information has been shared with them.<sup>82</sup> Nothing is being offered to the tens of thousands upstream and much larger numbers downstream of the dam site who will be impacted by the dam due to reduced incomes and food security from the impact in fisheries.

There has been widespread opposition to the dam, formally noted in the EIA report and through a number of protests and demonstrations by affected communities.<sup>83</sup>

## IMPACTS ON FISHERIES

The Mekong River and delta, and its tributaries including the Sekong, Sesan, and Srepok, together with the Tonle Sap and the Tonle Sap lake, make up one interconnected fish habitat system.<sup>84</sup> The 3S rivers are crucial for maintaining migratory fish populations in the Mekong itself,<sup>85</sup> and some fish may migrate between this area and the Tonle Sap.<sup>86</sup>

The Mekong River is the second most biodiverse river in the world (after the Amazon) and the biggest inland fishery in the world. Researchers have identified over 877 fish species in the MRB, with up to 103 of these species migrating upstream of Kratie in Cambodia.<sup>87</sup>

Dams on the Sesan and Srepok rivers therefore impact on fish yield and fish species not only in these tributaries, but also in the Mekong River downstream, the Mekong Delta and the Tonle Sap great lake.<sup>88</sup>

Any change to fish stocks brought about by a dam could therefore have profound effects on a very large number of people. Some calculations show just how profound – according to one academic study, the dam could cause a 9.3 percent drop in fish stocks across the Mekong Basin and over 50 species threatened with extinction.<sup>89</sup> Measuring the tradeoff between production of hydropower and loss of fish biomass in 27 potential Mekong tributary dams, the study found that LSII was the most detrimental.<sup>90</sup>

It is estimated that around 66% of the fish species that occur along the Sesan and Srepok Rivers move up and down the rivers through the project site each year. There are 64, 54 and 81 migratory fish species in the Sekong, Sesan and Srepok Rivers respectively. No fish-passage structures are included in the original design of the feasibility study report. Without them, fish will not be able to migrate through the dam site.<sup>91</sup>

77 KCC p.135

78 KCC s-6

79 Baird 2009 p.13

80 NGO Forum, 2013, p.v

81 KCC p.102, spellings taken from the report.

82 “Questions follow on heels of hydropower dam Sesan 2 vote”, *Phnom Penh Post*, 18 February 2013

83 “Villagers refuse relocation”, *Phnom Penh Post*, 29 September 2014

84 KCC p.99

85 Ziv, abstract

86 Vutha p.19

87 Ziv, abstract

88 KCC p.129; Vutha 2009 p.19

89 Ziv, abstract

90 Ziv, abstract

91 KCC p.119

In any case, the efficiency of fish passages in the Mekong have been strongly questioned.<sup>92</sup>

## CHANGES TO SEDIMENTATION

Sediments are small fragments of inorganic materials created from weathering of rocks and soils. They can be carried along in river water, or roll along the riverbed. Between one and two thirds of a river's nitrogen and phosphorus content (both critical to a river's health and biodiversity) are attached to fine sediments.<sup>93</sup> Deposits of sediment determine a river's form, course and habitats, as well as those of the deltas, barrier islands, fertile floodplains, and coastal wetlands that make up the river system.

A river's flood pulse deposits highly fertile sediments on floodplains, essential to maintaining agricultural and aquatic productivity. Flooding of plains and the Tonle Sap lake underpins the Mekong's high productivity as most sediments and nutrients are retained after the water recedes.<sup>94</sup>

The physical barrier of a dam results in sediment being trapped behind dam walls.<sup>95</sup> The resultant reduction in sediment transport downriver will reduce the nutrient value of the water bodies and the abundance of fish downstream.<sup>96</sup> As an example, Cambodian communities downstream of Vietnam's Yali Falls Dams have reported dramatic declines in fish catches since the dam's construction, and this has been linked to changes in sediment loads.<sup>97</sup>

Reduced sediment loads can also lead to loss of agricultural land in inundated areas, riverside gardens and floodplains.<sup>98</sup> In the Mekong, there could be changes to river habitats, including the elimination of many fish spawning beds. The effects could reach down to the delta area in Vietnam.<sup>99</sup>

The impact associated with changes in sedimentation could be felt above the dam too. As most Mekong fish species lay eggs that attach to the riverbed, increased sedimentation and silting above the dam could bury or damage eggs.<sup>100</sup>

No sediment management techniques for the LSII have been made public. Since early 2014 there have been unofficial reports that the dam's design may have changed with the addition of radial bottom gates and the dam's height reduced in order to allow for improved sediment passage. Despite these reports, calls for full information to be made publicly available and for a new environmental impact assessment have gone unanswered.

## DISRUPTION OF NATURAL HYDROLOGY AND WATER FLOWS

The 3S Basin water flows are essential to the wellbeing of the Lower Mekong Basin, including the Tonle Sap and the Mekong Delta, providing natural flood protection, pollution control, sediment retention, wildlife habitats, and an abundance of commercial products and products that support people's subsistence. On average, the 3S rivers contribute 23 percent of the Mekong's annual water flows. (Conservation International 2013). The dam will dramatically change the natural flow of the Sesan and Srepok rivers into the Mekong.

Large storage reservoirs in downstream reaches, coupled with energy focused operations in the 3S Rivers system will significantly increase discharge flows in the dry season (December–May) and reduce flows in the wet season (June–November).<sup>101</sup>

“The narrowing of the range of flows over the year from full development in the 3S Basin is of great concern because it could impact habitat downstream by reducing wetland areas in the flood season, submerging sandbars, changing river morphology, and altering river bank vegetation. These changes, together with alteration of fish migration routes and sediment flows, could lead to a subsequent level of decrease of ecological and fish productivity in the Tonle Sap and enhance salt intrusion in the Mekong Delta.”<sup>102</sup>

This will have significant implications for both the natural fisheries and ecosystems supporting agriculture, both fundamental to the Cambodian economy and its food security.

Elsewhere in the LMB, hydroelectric dams' interference with natural river regimes has led to devastating flash floods during wet season and unusually low water levels during dry season, negatively affecting both agriculture and aquaculture. For example, the Upper Kon Tum Dam, located at the headwaters of the Sesan River in Vietnam, diverts water from the 3S Basin. The dam has reportedly reduced water flows and affected other hydropower projects within Vietnam, which have subsequently struggled to meet energy demands.<sup>103</sup>

The 720 MW Yali Falls Dam is located within the Sesan Basin in Vietnam. Since the dam's construction in 1996, water flows have altered, making farming and fishing along the river banks dangerous. From 1999 to 2001, flash floods caused by release of water from the Yali Falls Dam killed at least 39 people and destroyed valuable livestock and agricultural lands. In 2009, people living along the Sesan River again experienced flash flooding caused by large amounts of water being released from Yali Falls without warning.<sup>104</sup>

The Halcrow report, the first significant examination of the impacts of a dam in the 3S basin, noted that: “Two areas of concern, which are currently little understood and where further study should focus are: (a) the potential impact on the

92 Ziv, abstract

93 Pukinskis p.1

94 Pukinskis 2013 p.3

95 Pukinskis 2013 p.1

96 Annandale, George. Technical memorandum on options for sediment passage through Lower Se San 2 Dam, Natural Heritage Institute, 2013, p.17

97 Pukinskis 2013 p.3

98 Pukinskis 2013 p.3

99 Pukinskis 2013 p.2

100 Pukinskis 2013 p.2

101 Tom Cochrane, Mekong Flows

102 Piman 2012

103 Grimsditch p.27–28

104 Oxfam Australia

Great Lake and the Tonle Sap, and (b) impacts of schemes on changes to the situation and the flow regime processes occurring within the Delta.”<sup>105</sup>

Halcrow’s concern about how little is known about potential impacts on the great lake and the delta remain valid today. There has not yet been substantial science-based work in this area that identifies potential impacts, yet these are areas of tremendous significance: half of Vietnam’s rice is grown in the Mekong delta, for example.<sup>106</sup>

## WATER QUALITY

Following dam construction, the water quality may deteriorate “particularly during the first five years or so with a high potential to affect the health of downstream water users.”<sup>107</sup> This is largely due to decay of any vegetation that remains in the flooded reservoir area. “Low dissolved oxygen, high pollution of biological and nutrient parameters, or eutrophication phenomena (bloom of aquatic weeds) will likely occur.”<sup>108</sup> This slowly changes over several years.

Water quality degradation has been widely reported following other dam constructions in the region. “High turbidity, grey algae, and scum are already occurring downstream of the existing dams.”<sup>109</sup> Toxic blue-green algae that has been found in the Sesan River during the dry season is believed to have originated in the reservoir of Yali Falls Dam. Symptoms linked to this have been mainly gastric disorders and skin eruptions, but respiratory problems have also been reported.<sup>110</sup>

At Cambodia’s Kamchay Dam, water quality reduced drastically during the construction phase, although it did improve once the dam became operational.<sup>111</sup> As the LSII reservoir area is more than 15 times the size of the Kamchay Dam, the risk of water contamination is considerably higher.

Degraded water quality has potentially severe implications for people downstream, many of whom rely on untreated river water for their daily needs. The Sesan River supplies much of the drinking water for local communities. The LSII’s EIA noted that “The poor quality of river water in [the] construction period will affect [the] downstream domestic water supply of [the] Phluk community as well as the Stung Treng water supply ... the poor water quality will directly affect the health of people using Sesan river water without treatment, particularly in Phluk commune, where people are concerned about the health effects of using untreated water, such as skin and eye infections, diarrhea, etc.”<sup>112</sup>

To add to these concerns, LSII, like all dams, is susceptible to contamination with methylmercury, a neurotoxin produced when inorganic mercury, naturally present in soils, is broken down by bacteria when those soils are flooded. When methylmercury enters the food chain it contaminates plankton and poses risks to fish, birds, and mammals, including farm animals and humans who rely on river ecosystems. This can result in serious neurological effects in both adults and unborn children.<sup>113</sup>

Studies have shown that mercury contamination associated with dam reservoirs can last up to 30 years.<sup>114</sup>

## LOSS OF BIODIVERSITY, DEFORESTATION AND FOREST CLEARANCE

The dam site is located within the Lower Mekong Dry Forest Eco-Region, an internationally recognized but unprotected area of global importance for biodiversity conservation. The region provides important habitats for several endangered animal and plant species.<sup>115</sup> The Sekong, Sesan and Srepok tributaries and parts of the mainstream Mekong located between the Lao border and Kratie town have supported some of the most significant riverine bird communities remaining anywhere in Southeast Asia,<sup>116</sup> although the impact of logging in recent years, to prepare for rubber plantations and the dam, are likely to have already made an impact. Adverse impacts on local fisheries and water quality from the dam itself can be expected to have a knock-on effect on local bird populations as the project EIA confirmed: “...the impacts to wildlife will be notably moderate to high.”<sup>117</sup>

While much of the impact on biodiversity comes from deforestation and loss of habitat (discussed below), some may come from changes to the climate that large dams and reservoirs can bring about. “The big reservoir site (335.6km<sup>2</sup>) of the LSII may impact on the climate in the area. Forest loss and a big water surface in reservoir area of the project will lead to a change in precipitation and temperature in the area. Less precipitation and a little higher temperature may be occurred [sic] in the whole area.”<sup>118</sup>

Cambodia lost six percent of its remaining primary forest cover each year between 1990 and 2005. If deforestation continues at the 2000–2005 rate, Cambodia will have lost an additional 2.7 million hectares of forest by 2020.<sup>119</sup>

105 Halcrow p1–7

106 Halcrow p.2–1

107 KCC p.125

108 KCC p.116–117

109 KCC p.128

110 Tiodolf A. M. 2009 A limnological study in the Se San River in Cambodia during the dry season: focus on toxic cyanobacteria and coliform bacteria, Master thesis, Norwegian University of Life Sciences

111 NGO Forum on Cambodia, 2013

112 KCC p.106

113 US National Research Council report Toxicological Effects of Methylmercury (2000) (<http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=9899>)

114 Alex English, ‘A Dam Shame – Reservoirs and Elevated Mercury Levels’, in *Environmental Health*, posted 25 April 2013, (<http://wordpress.vermontlaw.edu/environmentalhealth/2013/04/25/a-dam-shame-reservoirs-and-elevated-mercury-levels/>)

115 KCC p.s–3

116 Mekong River Commission p.76

117 KCC 2008 p.119

118 KCC 2008 p.118

119 Mekong River Commission, State of the Basin Report English summary p.10–11

The 2008 EIA report states that approximately 27,500 ha of forest land is slated to be cleared for the dam's reservoir. While this is already a sizable area in itself, reports from many observers (including former governor of Stung Treng province Loy Sophat) have suggested that the logging has gone beyond the area demarcated for the reservoir.<sup>120</sup>

At the time the LSII was approved, Kith Meng's Ang & Associates Lawyer Ltd. was granted a license to fell trees to make way for the dam's reservoir. After commencing early in 2013, logging was suspended in October that year<sup>121</sup> and a commission of inquiry was ordered to investigate. There is no evidence that the commission of inquiry was ever established. Shortly after the call to investigate was made, logging was reported to have resumed.<sup>122</sup>

It is not just the area of the reservoir that is subject to logging. The resettlement areas will also be subject to forest loss, estimated in the EIA report at potentially 3,000 ha.<sup>123</sup>

## RISK OF SEISMIC ACTIVITY

The EIA report stated that the LSII is at risk from seismic/ earthquake activities "due to dam construction and a reservoir with millions of cubic meters of water storage capacity... the whole project area is affected by faults which are a negative factor for the hydropower dam construction site."<sup>124</sup>

Over 70 dams around the world have been connected to an increase in seismic activity.<sup>125</sup> Earthquakes occur as the weight of the water in a reservoir pushes down on fault lines and causes movement. This is referred to as reservoir-induced seismicity, and means that dams can potentially increase the risk of earthquakes or tremors.<sup>126</sup> For example, there have been reports of earthquakes around the Song Thanh Dam in Vietnam for a number of years. Reports from Vietnamese media quote experts as saying that the dam is responsible for having precipitated hundreds of small earthquakes, which have damaged homes and caused considerable anxiety among local residents who fear a dam breach.<sup>127</sup>

The area of LSII is known to be seismically active, and a seismic hazard assessment of the construction site found four faults.<sup>128</sup> In August 1978 a 5.2 magnitude earthquake occurred near the project site.

120 "Minister dodges illegal logging claims at National Assembly", *The Cambodia Daily*, 20 June 2014.

121 "Government suspends logging in Stung Treng Dam Concession", *The Cambodia Daily*, 25 October 2013

122 "Minister dodges illegal logging claims at National Assembly", *The Cambodia Daily*, 20 June 2014.

123 KCC p.66, p.67

124 KCC p.107–108

125 McCully, Patrick, *Silenced Rivers: The Ecology and Politics of Large Dams*, London, 1996.

126 McCully 1996

127 "Dam quakes hit Vietnam's impoverished central district, again", *Thannien News*, 7 July 2014; "Vietnam's largest hydropower dam allegedly causes more earthquakes", *Thannien News*, 4 September 2012; "Experts say Vietnam dam can cause 6.1-scale earthquakes", *Thannien News*, 4 October 2012.

128 KCC p.33–34

# Conclusion

---

The potential impacts of the LSII Dam are enormous. On the one hand, it may produce a significant amount of energy, helping to meet Cambodia's growing energy demand and reducing reliance on imported energy. On the other hand the environmental and social impacts of the dam will extend across the whole of the LMB as far as the Mekong Delta, and include significant reduction in fish stocks and reduction of sediment and nutrients entering the Mekong from the 3S rivers.

A number of reports have described LSII social and environmental assessments as inadequate.<sup>129</sup> Only a few hundred affected people were consulted about the dam, despite the vast range of its potential impacts. Consultations were limited to those in the vicinity of the dam and its reservoir. Upstream communities that rely on the rivers' fisheries were not consulted.

There has been a general lack of transparency in the process of approval and development of the project.

While the EIA outlined a number of mitigation measures, it also stated that "Any non-conformance with the mitigation measures will likely result in highly significant environmental and social impacts resulting from the dam for many years affecting the future generations of Cambodia."<sup>130</sup> Yet significant non-conformance with mitigation measures has been found after construction of the recently-built Kamchay dam, at least in part because of a lack of clearly understood delegation of responsibilities between the dam developer and the government dam.<sup>131</sup>

There is an immediate need for regional government cooperation to ensure a balance being struck between environmental conservation, social justice and energy generation objectives. This requires reconsideration and reconfiguration of harmful dams as well as effective mechanisms to ensure that regional hydropower is undertaken in a sustainable and equitable manner for the benefit of all. Meaningful consultation with affected communities and a transparent process is vital to achieving social justice.

As a country expected to suffer most severely from the transboundary impacts of cumulative hydropower development within the LMB,<sup>132</sup> it is in Cambodia's best interests to ensure good development practices at a national level, thereby gaining international credibility and standing when protecting the country against the harmful effects of other countries' hydropower development.

The LSII Dam should not proceed as it is currently planned as the potential human and environmental costs are unacceptably high.

The EIA states that "the socio-economic impact from the consequent loss of fish will be the single largest impact of the dam"<sup>133</sup> In the words of one academic, the dam as currently planned "would result in increased poverty and malnutrition over a wide area in Cambodia, thus going against the Cambodian government's development plans for the nation, including efforts to achieve UN Millennium Development Goals."<sup>134</sup>

The physical impacts of the dam potentially reach to the Tonle Sap and the Vietnamese delta,<sup>135</sup> including floodplains where over 1 million tons of fish are caught annually (Ziv). Research indicates a 9.3 percent drop in fish stocks across the Mekong Basin following dam construction,<sup>136</sup> with 56 species becoming newly endangered and at risk of extinction.<sup>137</sup> According to one study, at least 78,000 people living above the dam site are at risk of losing access to migratory fish that form a substantial part of their diet.<sup>138</sup>

The dam is therefore a major threat to the food security of a substantial number of Cambodian people.

There are more sustainable alternative energy options that can make a substantial contribution to Cambodia's growing energy needs. These alternatives should be investigated as a matter of urgency.

---

129 3S Rivers Protection Network 2009

130 KCC p.175

131 NGO Forum, 2013, p.viii

132 Baran, 2013

---

133 KCC p.S-5

134 Baird 2009 p.14

135 Piman 2012

136 Ziv

137 Ziv

138 Baird 2009 p.13



# References

- 3S Rivers Protection Network. "News from the Sesan, Srepok and Sekong Rivers in Cambodia." *Living Rivers*, October 2009.
- Annandale, George. *Technical memorandum on options for sediment passage through Lower Se San 2 Dam*. Natural Heritage Institute, 2013.
- Asia Times Online. *The rise and rise of a Cambodian capitalist*. 1 September 2007. [http://www.atimes.com/atimes/Southeast\\_Asia/II01Ae01.html](http://www.atimes.com/atimes/Southeast_Asia/II01Ae01.html) (accessed 29 May 2014).
- Asian Development Bank. "Sesan, Sre Pok, and Sekong River Basins Development Study in Kingdom of Cambodia, Lao People's Democratic Republic, and Socialist Republic of Viet Nam. Project no. 40082." 2010.
- Asian Development Bank. "TA-5697 REG: Se Kong-Se San and Nam Theun River Basins Hydropower Development Study." 1996.
- Australia, Belgium, Denmark, European Union, Finland, Germany, Japan, Sweden, Switzerland, United States, World Bank. *Joint Development Partner Statement: MRC Informal Donor Meeting*. 28 June 2013. <http://www.mrcmekong.org/news-and-events/speeches/joint-development-partner-statement-mrc-informal-donor-meeting-28-june-2013/> (accessed 29 May 2014).
- Baird, Ian G. *Best Practices in Compensation and Resettlement for Large Dams: The Case of the Planned Lower Sesan 2 Hydropower Project in Northeastern Cambodia*. Phnom Penh: Rivers Coalition in Cambodia, 2009.
- Baird, Ian G. "The Don Sahong Dam: Potential Impacts on Regional Fish Migrations, Livelihoods, and Human Health." *Critical Asian Studies* (Routledge) 42, no. 2 (June 2011): 211–235.
- Baran, Eric. *Mekong Fisheries and Mainstream Dams*. Fisheries section in ICEM 2010, Mekong River Commission Strategic Environmental Assessment of hydropower on the Mekong mainstream, Hanoi: International Centre for Environmental Management, 2010.
- Baran, Eric, and Eric Guerin. *Fish bioecology in relation to sediments in the Mekong and in tropical rivers*. Report for the Project "A Climate Resilient Mekong: Maintaining the Flows that Nourish Life" led by the Natural Heritage Institute, Phnom Penh: WorldFish Center, 2012.
- Baran, Eric, Samadee Saray, Shwu Jiau Teoh, and Thanh Cong Tran. *Fish and fisheries in the Sesan River Basin: Catchment baseline, fisheries section*. Project report, Mekong Challenge Program project MK3 "Optimizing the management of a cascade of reservoirs at the catchment level", Phnom Penh: WorldFish Center, 2011.
- Baran, Eric, So Nam, Peter Degen, Chen Xiao-Yong, and Peter Starr. "Updated information on fish and fisheries in the Mekong Basin." *Catch and Culture: Fisheries Research and Development in the Mekong Region*, December 2013.
- China Power. *Announcement regarding Huaneng's successful tender for the LSII hydropower project in Cambodia*. 26 January 2014. <http://www.chinapower.com.cn/article/1256/art1256692.asp> (accessed 29 May 2014).
- Conservation International. *Hydropower Development on the 3S Rivers*. November 2013.
- Denslow, Julie Sloan, and Padoch, Christine. *People of the tropical rain forest*. University of California Press, 1988.
- Grimsditch, Mark. *3S Rivers Under Threat: Understanding new threats and challenges from hydropower development to biodiversity and community rights in the 3S River Basin*. Jointly published by 3S Rivers Protection Network and International Rivers, 2012.
- Halcrow, Se Kong – Se San and Nam Theun River Basins Hydropower Study, Final Report Volume 1 – Main Report, July 1999.
- Higgs, Steve. *Analysis of International Environmental Laws Implicated by Decision to Approve Construction of the Xayaburi Dam*. Portland: Perkins Coie LLP, 2011.
- Hortle, Kent. *Consumption and the yield of fish and other aquatic animals from the Lower Mekong Basin*. MRC Technical Paper No. 16, Vientiane: Mekong River Commission, 2007.
- International Rivers. *Cambodia's Lower Sesan 2 Dam's Draft Law Evades Costs and Concerns*. 11 February 2013. <http://www.internationalrivers.org/resources/cambodia%E2%80%99s-lower-sesan-2-dam%E2%80%99s-draft-law-evades-costs-and-concerns-7825> (accessed 24 January 2014).
- \_\_\_\_\_. *Earthquakes Triggered by Dams*. <http://www.internationalrivers.org/earthquakes-triggered-by-dams> (accessed 29 May 2014).
- \_\_\_\_\_. *Environmental Concerns Prompt Vietnam to Cancel Two Dams*. 9 October 2013. <http://www.internationalrivers.org/blogs/259/environmental-concerns-prompt-vietnam-to-cancel-two-dams> (accessed 6 December 2013).
- \_\_\_\_\_. *Environmental Impacts of Dams*. <http://www.internationalrivers.org/environmental-impacts-of-dams> (accessed 3 December 2013).

- \_\_\_\_\_. *Lower Sesan 2 Developers Urged to Ensure Accountability for Severe Impacts*. 26 May 2014. <http://www.internationalrivers.org/node/8324> (accessed 29 May 2014).
- \_\_\_\_\_. "The Cambodian Fishery Coalition Calls for Cancellation of the Lower Sesan 2 Dam." 30 March 2012. <http://www.internationalrivers.org/resources/the-cambodian-fishery-coalition-calls-for-cancellation-of-the-lower-sesan-2-dam-3680> (accessed 3 December 2013).
- \_\_\_\_\_. "The Lower Mekong Dams: A Transboundary Water Crisis." *International Rivers*. 25 March 2013. <http://www.internationalrivers.org/resources/the-lower-mekong-dams-a-transboundary-water-crisis-7900> (accessed 21 March 2014).
- Key Consultants (Cambodia) Ltd. *Environmental Impact Assessment for Feasibility Study of Lower Sesan 2 Hydropower Project, Stung Treng Province Cambodia*. Phnom Penh: Key Consultants (Cambodia) Ltd., 2008.
- Kim, Sangha, and Bunnarath Tep. "Lessons learned but not learned: Water Governance in the 3S Rivers Region." Vientiane, 2006.
- Kummu, M., X.X. Lu, J.J. Wang, and O. Varis. "Basin-wide sediment trapping efficiency of emerging reservoirs along the Mekong." *Geomorphology* (Elsevier) 119, no. 3–4 (July 2010): 181–197.
- Licadho. *Concerns on eviction of 168 families in Preah Monivong Hospital*. 29 June 2006. <http://www.licadho-cambodia.org/pressrelease.php?perm=120> (accessed 29 May 2014).
- McAllister, Don E., John F. Craig, Nick Davidson, Simon Delany, and Mary Seddon. *Biodiversity Impacts of Large Dams: Background Paper No. 1*. International Union for Conservation of Nature and Natural Resources and United Nations Environmental Programme, 2001.
- McCallum, W. 'Before the Dam' *A Study of Environmental Impacts And Community Rights Associated with the Construction and Operation Of the Approved Kirirom III Hydropower Scheme, Sre Ambel District, southwest Cambodia*. Phnom Penh : American Friends Service Committee and the Rivers Coalition in Cambodia, 2008.
- McCully, Patrick, *Silenced Rivers: The Ecology and Politics of Large Dams*, London, 1996.
- Mekong River Commission. *State of the Basin Report 2010*. Vientiane: Mekong River Commission, 2010.
- Mekong Watch. "Fact sheet of the Lower Sesan II hydropower dam project, northeastern Cambodia." *3S Rivers Protection Network*. Jointly published by Mekong Watch and 3S Rivers Protection Network. 5 August 2013. <http://www.3spn.org/fact-sheets/> (accessed 26 May 2014).
- NGO Forum on Cambodia. "Review and Comments on Environmental Impact Assessment (EIA) Report of Lower Sesan 2 Hydropower Project." Phnom Penh, 2009.
- NGO Forum on Cambodia. "The Kamchay Hydropower Dam: An assessment of the dam's impact on local communities and the environment", Phnom Penh, 2013.
- Oil Seed Crops Food & Energy. *Myanmar getting 15% power from Shweli Hydropower Project - See more at: <http://www.oilseedcrops.org/2012/12/26/myanmar-getting-15-power-from-shweli-hydropower-project/#sthash.YFGnMkgu.dpuf>*. 26 December 2012. <http://www.oilseedcrops.org/2012/12/26/myanmar-getting-15-power-from-shweli-hydropower-project/> (accessed 29 May 2014).
- Oxfam Australia. *Yali Falls Dam*. <https://www.oxfam.org.au/explore/infrastructure-people-and-environment/save-the-mekong/3s-critical-environmental-zone/yali-falls-dam/> (accessed 27 November 2013).
- Piman, T., T.A. Cochrane, M. E. Arias, A. Green, and N. D. Dat. "Assessment of Flow Changes from Hydropower Development and Operations in Sekong, Sesan and Srepok Rivers of the Mekong Basin ." *Journal of Water Resources Planning and Management* (American Society of Civil Engineers) 139, no. 6 (November 2013): 723–732.
- Power Engineering Consulting Joint Stock Company 3. *The performance of environmental impact assessment and compensation, resettlement*. 25 September 2009. [http://www.pecc3.com.vn/en/index.php?option=com\\_content&view=article&id=95:the-performance-of-environmental-impact-assessment-and-compensation-resettlement&catid=85:environment&Itemid=267](http://www.pecc3.com.vn/en/index.php?option=com_content&view=article&id=95:the-performance-of-environmental-impact-assessment-and-compensation-resettlement&catid=85:environment&Itemid=267) (accessed 14 July 2014).
- Probe International. *Probe International Special Report: Skyscraper dams in Yunnan*. 12 May 2006. <http://journal.probeinternational.org/2006/05/12/probe-international-special-report-skyscraper-dams-yunnan/> (accessed 29 May 2014).
- Pukinskis, Ilse. *State of Knowledge Series 2: Mekong Sediment Basics*. Vientiane: CGIAR Challenge Program on Water and Food, 2013.
- Pukinskis, Ilse, and Kim Geheb. *State of Knowledge Series 1: The Impacts of Dams on the Fisheries of the Mekong*. Vientiane: CGIAR Challenge Program on Water and Food, 2012.
- Royal Government of Cambodia. "Draft Law on Authorization of Payment Warranty of the Royal Government of Cambodia for the Hydro Power Lower Sesan 2 Company." Phnom Penh, 10 January 2013.
- Saigon GP Daily. *Vietnam to face power shortfalls in dry season, EVN says*. 18 January 2011. <http://www.saigon-gpdaily.com.vn/business/2011/1/88994/> (accessed 14 July 2014).

- The Cambodia Daily. *Electricity Vietnam No Longer Involved in Lower Sesan 2 Dam*. 28 November 2012. <http://www.cambodiadaily.com/archives/electricity-vietnam-no-longer-involved-in-lower-sesan-2-dam-6363/> (accessed 6 February 2014).
- \_\_\_\_\_. *Government Suspends Logging in Stung Treng Dam Concession*. 25 October 2013. <http://www.cambodiadaily.com/archives/government-suspends-logging-in-stung-treng-dam-concession-45878/> (accessed 29 May 2014).
- \_\_\_\_\_. *Hun Sen Attends Dinner, Presentation in China*. 22 May 2014. <http://www.cambodiadaily.com/news/hun-sen-attends-dinner-presentation-in-china-59355/> (accessed 29 May 2014).
- \_\_\_\_\_. *Officials Criticize Laos Over Don Sahong Dam*. 11 October 2013. <http://www.cambodiadaily.com/archives/officials-criticize-laos-over-don-sahong-dam-44888/> (accessed 29 May 2014).
- \_\_\_\_\_. *Powerless Phnom Penh Struggles With Hot Season*. 25 March 2013. <http://www.cambodiadaily.com/archives/powerless-phnom-penh-struggles-with-hot-season-15655/> (accessed 12 July 2014).
- The Phnom Penh Post. *Chinese sign deal on dam, villagers fear flooding*. 27 November 2012. <http://www.phnompenhpost.com/national/chinese-sign-deal-dam-villagers-fear-flooding> (accessed 6 January 2014).
- \_\_\_\_\_. *Dam firm violated law*. 5 June 2013. <http://www.phnompenhpost.com/national/dam-firm-violated-law> (accessed 6 January 2014).
- \_\_\_\_\_. *Electricity for Vietnam*. 1 June 2011. <http://www.phnompenhpost.com/national/electricity-vietnam> (accessed 6 December 2013).
- \_\_\_\_\_. *Yunnan's yuan China firms eye Kingdom*. 23 June 2011. <http://www.phnompenhpost.com/business/yunnan%E2%80%99s-yuan-china-firms-eye-kingdom> (accessed 6 January 2014).
- Tiodolf A. M. 2009 *A limnological study in the Se San River in Cambodia during the dry season: focus on toxic cyanobacteria and coliform bacteria*, Master thesis, Norwegian University of Life Sciences (In Swedish with abstract in English and Khmer).
- UN Watercourses Convention Online User's Guide. *UN Watercourses Convention Enters Into Force*. 21 May 2014. <http://www.unwatercoursesconvention.org/news/un-watercourses-convention-enters-into-force/> (accessed 29 May 2014).
- Voice of America. *Dam in Northeast Built on Earthquake Site, Study Finds*. 30 January 2013. <http://www.voacambodia.com/content/dam-in-northeast-built-on-earthquakes-site-study-finds/1593070.html> (accessed 29 May 2014).
- Vutha, H, C Mong, O Noty, and S Seyha. *Assessment on fisheries natural resources for Lower Sesan 2 Hydropower Plant Project*. Hanoi: Power Engineering Consulting Joint Stock Company 1, 2009.
- Ziv, Guy, Eric Baran, Nam So, Ignacio Rodríguez-Iturbe, and Simon A. Levin. "Trading-off fish biodiversity, food security, and hydropower in the Mekong River Basin." *Proceedings of the National Academy of Sciences* 109, no. 15 (2012): 5609–5614.

