RIVERS WITHOUT BOUNDARIES

WORLD HERITAGE WATCH

WFN SUPPORTING CONSERVATION LEADERS

HERITAGE DAMMED

Water Infrastructure Impacts on World Heritage Sites and Free Flowing Rivers

June 2019

Many civil society groups and individuals contributed to this report, including:

- ✓ **Rivers without Boundaries (int.)**
- ✓ **BROB -Buryat Regional Organization for Baikal (Russia)**
- ✓ **Greenpeace (Russia)**
- ✓ **International Rivers (USA)**
- ✓ **Save the Tigris Campaign (Iraq)**
- ✓ **Affected Citizens of Teesta (India)**
- ✓ **CEE Bankwatch Network (Georgia)**
- ✓ **Save the Blue Heart of Europe Campaign (Balkans, EU)**
- ✓ **Friends of the Earth US**
- ✓ **WALHI Wahana Lingkungan Hidup Indonesia**
- ✓ **Karnali Expedition 2018 (Nepal)**
- ✓ **Ohrid SOS (North Macedonia)**
- ✓ **Fundación Ambiente y Recursos Naturales - FARN (Argentina)**
- ✓ **Stimson Center (USA)**
- ✓ **China Dialogue (UK, China)**
- ✓ **The Third Pole (UK)**
- ✓ **Daursky Biosphere Reserve (Russia)**
- ✓ **WWF (Russia)**
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Some local collaborators in several countries chose to remain anonymous.

Front cover: *Image of the Glen Canyon Dam on Colorado River by Christian Mehlführer/Chmehl @Wikimedia, uploaded from https://upload.wikimedia.org/wikipedia/commons/4/4f/Glen_Canyon_Dam_MC.jpg*

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Civil Society Report to the UNESCO World Heritage Committee and Parties of the World Heritage Convention

Compiled by the Rivers without Boundaries International Coalition and World Heritage Watch with contributions from 30 civil society organizations and affected local communities around the world. This publication and underlying research by the RwB have been supported by Whitley Fund for Nature (UK).

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Annotation: The «Heritage Dammed» Report, dedicated to protection of natural freshwater ecosystems, contains contributions from 30 civil society organizations (CSOs), experts and dam-affected communities around the world. The Report documents how water infrastructure plays key role in degrading aquatic ecosystems based on examples from more than 50 World Heritage properties, of which 42 sites are threatened by hydropower. Fourteen in-depth case studies illustrate and analyze the global threat to the rivers, lakes and World Heritage, in various regions ranging from the Selous Game reserve in Tanzania to the Los Glaciares National Park in Argentina, from the Tropical Rainforest Heritage of Sumatra to the Upper Svaneti in Georgia. Urgent need for conservation of intact freshwater ecosystems is illustrated by six examples of still wild rivers: the Congo, Mekong, Vjosa, Greater Zab, Amur and Karnali. The Report contains recommendations set forth by CSOs on how to protect the natural and cultural values of freshwater ecosystems in the context of the World Heritage Convention and beyond its scope. Last chapters present most recent evidence on broader spectrum of problems associated with unsustainable hydropower development. The intended audience of the document includes officials of the UN and other international organizations, expert community, financiers of development projects, water management and energy system planners, civil society leaders and university students.

Key words: World Heritage, Aquatic Ecosystems, Freshwater Biodiversity, Indigenous Peoples, Hydropower.

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Table of Contents

Introduction

Free-flowing Amur River forming the Sino-Russian border (Taipinggou National Nature Reserve)

We compiled this volume to share information on the immense values of free flowing rivers, as well as our concerns about a difficult relationship between this natural and cultural heritage of humankind and unsustainable water infrastructure. As our world rapidly loses its natural wonders and riches, rivers and other freshwater ecosystems become the most threatened elements of the Planet's natural (and cultural) diversity. Water infrastructures: dams, dykes, canals, etc. are the most powerful human-induced factors in degrading river ecosystems because their development forever changes the morphological character and hydrological patterns of natural rivers and lakes. We are in the middle of a great crisis and should undertake urgent efforts for protection of our freshwater heritage.

Fresh water is literally the source of life on Earth: despite occupying 1% of terrestrial surface it hosts up to 10% of known animals and about one-third of all known vertebrate species. By today scientists have identified at least 125 000 species associated with freshwater habitats and this number grows rapidly, due to new discoveries[1]. The Lake Baikal alone hosts over 2500 species of aquatic life, despite being situated in a harsh boreal region[2].

Natural freshwater ecosystem processes sustain our lives on earth: transport and purify water, shape and nurture fertile floodplains, ensure multiplication and migration of the enormous fish stocks we feed upon, produce a multitude of other crucial ecosystem services. River valleys carved by watercourses are the favorite habitats of the *Homo sapiens*, where most of our civilizations evolved. Many people still revere moving waters as sacred, some of us entrust to rivers the remains of their dead, most of us bathe in sacred waters to celebrate religious rebirth.

The encroachment on freshwater conservation values increases at the highest rate because natural rivers are an increasingly scarce resource with many values and interests competing for them. The remaining few free-flowing river ecosystems are being rapidly clogged by new dams and other infrastructure projects, polluted and diverted by growing cities and spreading agriculture, overfished and overhunted by growing populations, who are rapidly forgetting the land ethics that helped in the past to live in harmony with nature. Climate change as a common denominator exacerbates almost every river-related problem.

The world is losing freshwater biodiversity at a rate twice faster than that of terrestrial or marine species. According to the Zoological Society of London and the WWF International, in less than half a century, from 1970 to 2014, the average abundance of 3,358 freshwater populations representing

880 species monitored across the globe declined by 83%.[3] Recent research shows that from 1889 to 2010 in North America alone at least 57 species of freshwater fish went extinct which is a rate at least 877 times faster than what could be considered a natural evolutionary phenomenon (one extinction in 3 million years).[4] A further 37% of freshwater fish that have been assessed by the International Union for the Conservation of Nature are also classified as being under threat of extinction and decline.

Infrastructure development, especially dams, has caused a dramatic decline in the number of connected, free-flowing rivers; currently, there are more than 60,000 large dams worldwide, which cause a diverse array of negative impacts such as disruption of the natural flow regime, disconnection of the single river ecosystem, change in habitats of species, methane greenhouse gas emissions from decomposing plant matter in reservoirs, changes in sediment flow and channel processes, changes of microclimate, transformation of biological and chemical properties of the water body, etc.

Best known consequence of dams is that they permanently block and fragment river ecosystems forever halting migration of species: 50% of the 397 freshwater ecoregions of the world are obstructed by large- and medium-size dams, and approximately 30% more face additional downstream obstruction according to published plans[5]. Dams are the most common element among multiple factors that drive aquatic species to extinction in the US and elsewhere[6]. A study of the Yellow River in China has shown that from 1960 to 2010, as many as 32 large and a thousand small dams fragmented the river basin, the number of native fish species decreased from 163 to 80, while creation of reservoirs facilitated the introduction of 25 exotic species[7]. The authors emphasize the leading role of dams in causal relationships leading to 50% decline in native fish diversity just in 50 years. In other basins species extinctions are being caused with direct assistance of newly built dams, with two Yantze River species: the Baji, the first dolphin to go extinct due to human activities, and the Chinese paddlefish, a monster more ancient than dinosaurs, topping the list of recent losses in aquatic megafauna[8]. Many smaller species disappear unnoticed even before they are described by scientists.

Humans as terrestrial creatures are late to discern and react to degradation happening in the aquatic realm. However much of the degradation caused by water infrastructure occurs in terrestrial landscapes: forests are forever submerged, dynamic floodplains permanently filled by water or desiccated, critical habitat of wetland species is destroyed, while mammal migratory routes are obstructed by artificial water bodies. Lately in Asia and Africa new hydropower has severely threatened even our closest relatives – the great apes[9].

Ultimately, water infrastructure unwisely designed in the wrong places threatens our cultures, spiritual values and the livelihoods of local communities. «Mother River», a sacred symbol common for many peoples of the world, is routinely dammed and desecrated, but its replacement by reverence for «Mother Reservoir» is highly unlikely to emerge in any part of society, other than corporate culture of dam-construction companies, as well as politicians and financiers supporting them. Most large dams are built with violation of local indigenous communities' rights for free, prior and informed consent (FPIC), because only oppressed and deceived people could voluntarily give away historic habitat where their cultures have been formed and nurtured. Nehru's slogan about dams as «the temples of modern times» failed to change humans' cultural matrix: peoples are adapted to their rivers and continue to sing songs[10] about them long after those rivers are destroyed in the name of «progress».

Destruction of human cultures by damming goes on now, recent examples include the flooding of the 10,000 year old historical town of Hasankeyf by the Ilisu dam of on the Tigris River in Turkey scheduled for October 2019, and the destruction of the 'Sete Quedas' waterfalls on the Teles Pires River of the Brazilian Amazon – a sacred place of enormous spiritual importance for the Munduruku, Apiaka and Kayabi indigenous peoples.

The 10000 years old Town of Hasankeyf on the Tigris River before execution by damming (Nevit Dilmen, Wikimedia)[11]

The sacred waterfalls on the Teles Pires River, Brazil (Christopher Borges, Wikimedia)[12]

The first part of this report presents a general review and collection of case-studies on the impacts of water infrastructure on World Heritage areas world-wide. We have chosen to examine the World Heritage List, because it is a relatively short collection of areas epitomizing the most important cultural and natural values recognized by the humankind, and thus, it is a convenient small subset representing diversity of natural-cultural landscapes most cherished by humans. Therefore, by exploring the impacts of water infrastructure on the World Heritage we can discern the general patterns of such impacts on biodiversity, ecosystem services and cultural values associated with freshwater ecosystems. Since World Heritage sites, presumably, have the best possible level of protection, we assume that, on average, in all other protected and unprotected areas such impacts are likely to be more severe than the encroachment on similar values at World Heritage sites. One quarter (!) of natural World Heritage properties has on-going or recently documented conflicts with water infrastructure[13]. The absolute majority of conflicts observed at World Heritage Sites are the impacts from one particular brand of water infrastructure - hydropower. Our main findings are that despite the drastic decrease in hydropower development in recent years, the number of conflicts between water infrastructure and World Heritage values has been steadily increasing.

Next Victim: Selous Game Reserve World Heritage Site,Tanzania (Greg Armfield)

Analyzing case studies from all continents, we came to the conclusion that the values of river ecosystems, although widely recognized by science and indigenous cultures alike, so far have not been adequately taken into account during implementation of the World Heritage Convention. Looking at the list of natural properties you find only one explicit mentioning of a «river»: the «Three Parallel Rivers of Yunnan Protected Areas» in China, but the actual river ecosystems are deliberately excluded from that protected area[14]. Among all the great and still wild rivers of the world only the Amazon is partially protected by the Convention. In addition the List covers several deltas of smaller free-flowing rivers, such as the Selenge in Asia and Okavango in Africa. Only a few World Heritage Sites contain complete watersheds or sizeable upper river catchments, including Kakadu National Park (Australia), Lorentz National Park (Indonesia), Manú National Park (Peru), Central Sikhote-Alin (Russia). Many free-flowing rivers are adjacent to existing World Heritage sites, but their values are not recognized and protected[15]. In our opinion, part of the problem is habitual underestimation of the riverine values in the process of identification of candidate heritage properties. More challenging, however, is the lack of reliable legal tools and conceptual approaches how to protect a free-flowing river, the conservation of which cannot be readily served by the «core-buffer» design of most protected areas and requires a basin-wide approach. To demonstrate the potential and urgency for conservation of free-flowing rivers we collected several case studies on wild rivers representing the key world heritage values in need of immediate protection.

We doubt that social and economic objectives pursued by water infrastructure and hydropower development should be achieved at such a high cost for nature and culture. Many less-destructive technological alternatives are available today to serve any given societal need (e.g. «clean energy» production). Besides, the overall development path based on energy and infrastructure megaprojects may slow down real societal progress in countries choosing it. To illustrate that phenomenon we included a short essay on the «hydropower curse» hypothesis. We also republish excerpts from a research paper comparing different sources of renewable energy and demonstrating that hydropower has the greatest environmental impacts.

The Last Glance. Los Galciares National Park, Argentina (Turba Contenidos)

The last section of this volume contains our recommendations how to protect natural and cultural values of freshwater ecosystems in the context of the World Heritage Convention and beyond. The draft of this report was presented at the World Hydropower Forum in May 2019. On that occasion more than 250 CSOs protecting natural and heritage and defending human rights issued a joint statement on hydropower industry, which concludes this volume[16].

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1 Freshwater ecosystems provide habitat for at least 126,000, or around 1 in 10, known species of fishes, mollusks, reptiles, insects, plants and mammals. WWF 2018. Living Planet Report - 2018: Aiming Higher.

2 See the paper on Lake Baikal in this volume.

3 WWF. 2018. Living Planet Report - 2018: Aiming Higher. Grooten, M. and Almond, R.E.A.(Eds.). WWF, Gland, Switzerland.

4 (Noel M. Burkhead, Extinction Rates in North American Freshwater Fishes, 1900–2010 https://academic.oup.com/bioscience/article/62/9/798/231282

5 C.Reidy Liermann et al. Implications of Dam Obstruction for Global Freshwater Fish Diversity June 2012 / Vol. 62 No. 6, BioScience

6 (John S. Kominoski et al. Patterns and drivers of fish extirpations in rivers of the American Southwest and Southeast. November 2017 https://doi.org/10.1111/gcb.13940)

7 (Xie JY, Tang WJ, Yang YH. Fish assemblage changes over half a century in the Yellow River, China. Ecol Evol. 2018;00:1–10. https://doi.org/10.1002/ece3.3890)

8 Fengzhi He et al. Disappearing giants: a review of threats to freshwater megafauna, Wiley Interdisciplinary Reviews: Water (2017). DOI: 10.1002/wat2.1208

9 See the paper on Tropical Rainforest Heritage of Sumatra in this volume, or recent example from Africa here:

10 Several folk-songs of Angara river old believers whose villages were drowned by Boguchanskaya Hydro (belongs to USC Rusal and Rushydro) recorded here https://www.sibreal.org/a/29288249.html

11 Creative Commons Attribution-Share Alike 3.0 license.

12 https://commons.wikimedia.org/wiki/File:Rio_Teles_Pires.JPG under the Creative Commons Attribution-Share Alike 3.0 Unported license.

13 SoC Report by world heritage center 2018

14 See the paper by G. Lafitte.

15 See the papers on Upper Engury River, Chitwan National park, rivers of Sikkim, and Los Galciares NP in Argentina.

16 "False Promises of Hydropower" Statement signed by 250 CSOs.May 13, Paris. http://bit.ly/2YyrCz7

Part I. DAMS' DAMAGE

Irkutskaya Hydro Dam alters the level of Lake Baikal (Zhang Yadong)

Water Infrastructure Impacts on the World Heritage Sites — Growing Problems

Eugene Simonov
Rivers without Boundaries International Coalition (RwB)[1]

At the its 42nd Session in 2018, the Committee belatedly inscribed on the List of World Heritage in Danger the Lake Turkana Parks in Kenya severely impacted by the Gibe III dam in Ethiopia[2], and expressed grave concern regarding the Stiegler's Gorge (now Rufiji) hydropower project on Rufiji River, which is incompatible with the World Heritage status of the Selous Game Reserve. It asked Tanzania "to conduct SEA and consider alternative options to meet its power generation needs[3]. By the time of the decision the Lake Turkana had already been irreversibly damaged by declining water levels, while the Tanzania neglected the WH concerns by proceeding with bidding for dam construction and completing preparatory works. These are just 2 of the most outrageous examples from two dozen in the 2018 State of Conservation reports[4].

At the same time hydropower, which is the primary purpose for most large dams to be built, is in sharp decline for the 5th year in a row (Figure 1) due to growing governance, financial, environmental and social obstacles[5].

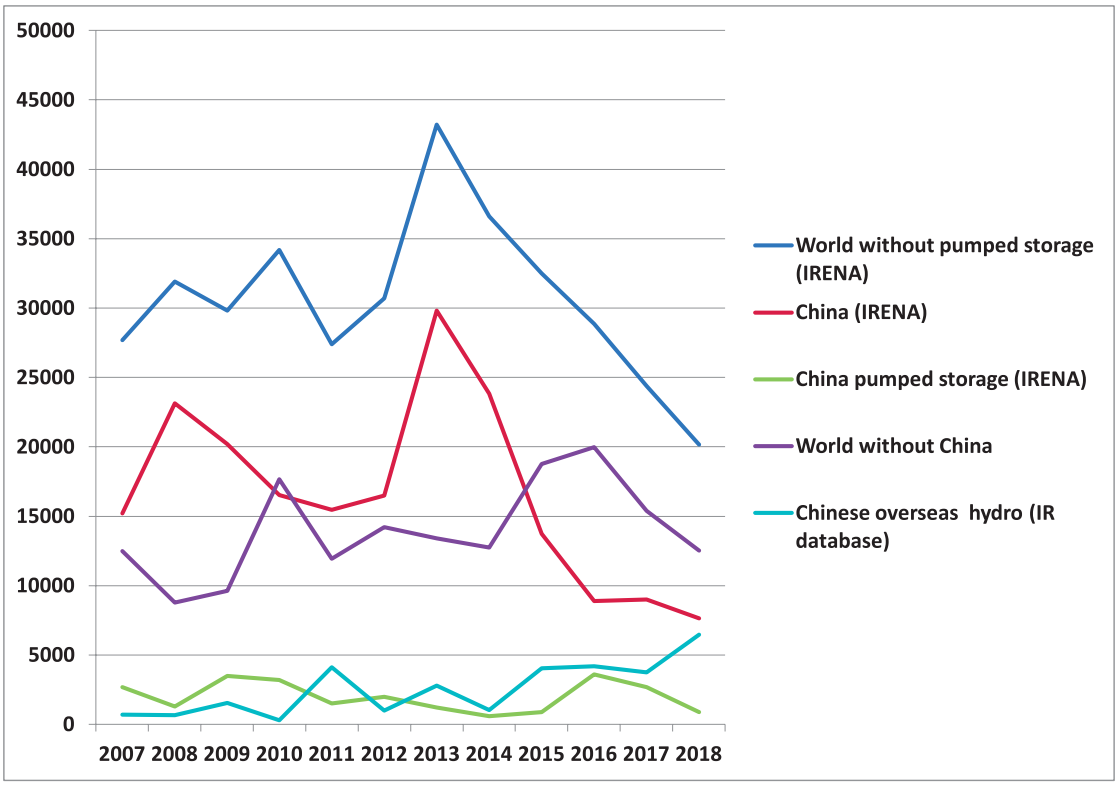

Figure 1. *Annual installation of conventional hydropower in MW in the last decade (Graph by the RwB with data from IRENA, IR and China NHA)*

Other renewable energy alternatives pushed dams aside by attracting most of new investment into wind and solar energy generation (Figure 2).

Most of hydropower capacity world-wide has been installed in China, creating considerable threats to some World Heritage properties (e.g. at Three Parallel Rivers of Yunnan). However since 2013 hydropower construction in China decreased substantially and the most harmful dams are being removed,

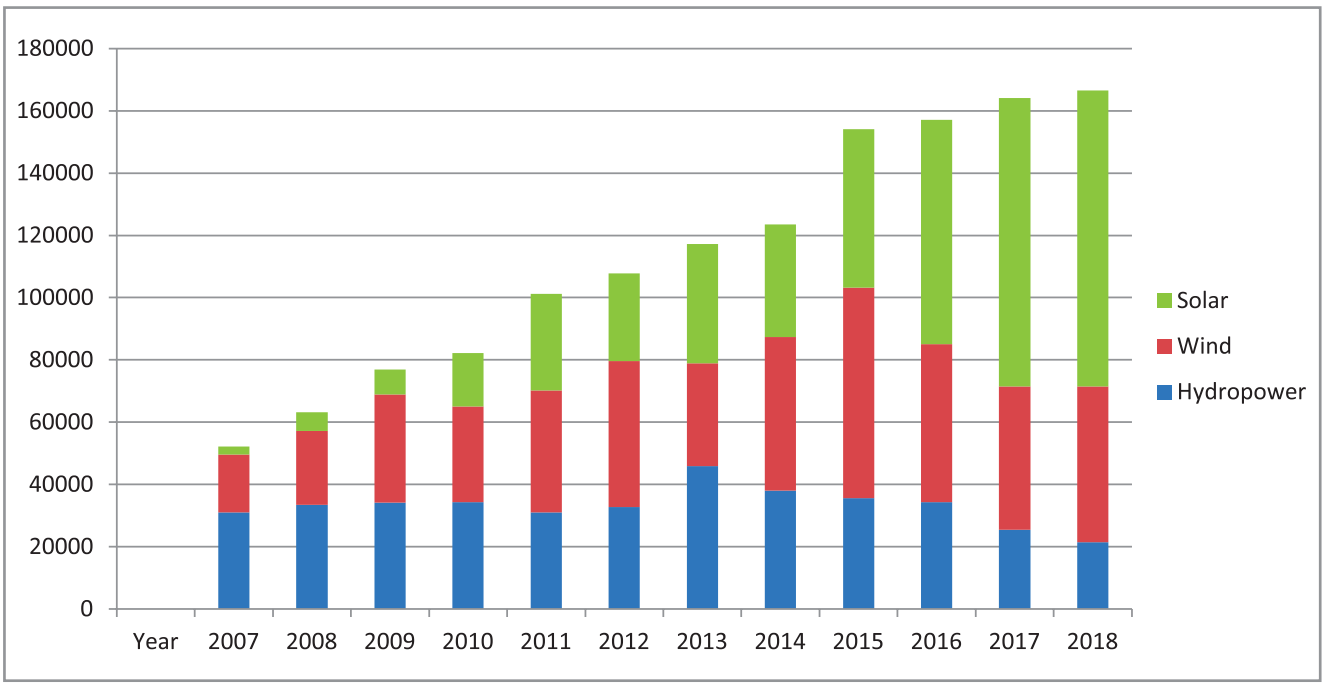

Figure 2. *Annual installation of all non-fossil fuel sources in MW (IRENA Database).*

including those at some World Heritage properties (e.g. Dujiangyan Irrigation) and other important natural areas[6]. Chinese state-owned engineering firms and banks seek hydropower opportunities overseas and are still involved in 70%[7] of hydropower projects completed globally, while China's state banks provided 75% of global hydropower financing in 2017. This makes China, a member of the current World Heritage Committee, uniquely positioned to take a lead in making sure that hydropower does not negatively affect World Heritage world-wide[8].

Most worrying though, is the fact that the decline in hydropower does not translate into the decline of threats to most important biodiversity hotspots. Thus, in the same 5 years, when hydropower declined dramatically, the share of natural World Heritage sites threatened by dams increased from 21% to 24%[9] (Table 1). The same holds for other important "no-go areas" such as Ramsar wetlands, migratory pathways of endangered and economically important aquatic species, and legally protected areas, etc.

According to the 2013-2018 State of Conservation Reports, at least 30 World Heritage sites in 25 countries are affected or threatened by impacts from hydropower and water infrastructure.

Dam impacts are usually irreversible and the expansion of traditional industrial development relies on power and water sources, explaining why 30% of natural sites listed as Heritage in Danger are those impacted by dams and many of those cannot be rehabilitated.

Table 1. *Percentage of natural heritage sites affected by selected impacts*

Impact type	1979-2013 Review	2018 42.COM/7[10]	TREND
Mining and Oil & Gas	49	49	same
Water infrastructure	21	24	UP
Livestock farming	22	22	same
Ground transportation	29	20	down
Land Conversion	22	20	down
Major visitor accommodation and associated infrastructure	18	16	down

However, if one digs an inch deeper, looking into individual files of particular properties at the UNESCO web-site and various independent sources, the number of World Heritage areas affected and threatened by water infrastructure increases even further. In documentation dating from 2012 we have been able to discern such conflicts involving at least 50 World Heritage properties.

Table 2. *Water Infrastructure and its risks as represented in SoC Database for 2013-18*[11]

Impact type	Records in SoC DB	Number of World Heritage sites	Number of countries	Comment
Water infrastructure (WI)	93	30	25	SoC DB incomplete
Renewable energy	26	11	10	most frequent impact from geothermal projects
Linear utilities	20	9	8	some hydropower driven
Water withdrawal	20	8	7	overlap with WI by half
Non-RE energy	12	4	4	2 sites overlap with WI

Our inquiry has been far from exhaustive, for we did not read each state of conservation report on each natural site, our review of cultural sites was even more superficial, mainly relying on SoC databases and known complaints from the CSOs. Besides, we did not undertake geospatial analysis relating large water infrastructure seen on maps and satellite images with rivers and lakes spanning World Heritage Sites. At some sites the inevitable influence of dams located upstream or downstream, especially predating World Heritage nomination, is often not considered a threat, but rather a part of the "semi-natural condition" (e.g. Danube Delta). While in some outstanding cases it is considered an encroachment and efforts are made to mitigate those impacts[12].

From 51 sites threatened by water infrastructure (see Table 3), conflicts at 42 properties involved hydropower impacts, which occurred at 5 cultural, 4 mixed and 33 natural heritage properties. In 26 cases the hydropower impacts were real and likely irreversible, while only in 6 cases the risk was fully avoided or mitigated. For all other cases we found no information from which to judge about the outcome of the conflict. In addition, in pre-2012 documentation on the World Heritage Center web-site, which is much less comprehensive, we identified 10 more properties threatened by hydropower. Of these, at 4 properties the hydropower impacts are likely to persist until now (Srebarna Nature Reserve, Sichuan Giant Panda Sanctuaries, Danube Delta, Canaima National Park) but we lack documented evidence to prove it. Some hydropower plants threaten several heritage sites (e.g. Gibe III and IV in Ethiopia), while many heritage sites are threatened by multiple hydropower dams (e.g. Ahwar of Southern Iraq) or by a combination of hydropower and non-hydropower water infrastructure (e.g. Lake Orhid, Lake Turkana, Chitwan National Park, etc.)

Recent conflicts with primarily non-hydropower water infrastructure occurred at only 10 World Heritage sites. Of these cases, at four sites (Sundarbans, Dong Phayayen, Donana, Landscapes of Dauria) the impacts had strong chances to persist, while at four other sites they have been avoided or mitigated. Among 7 "historic" pre 2013 "non-hydro" cases, three conflicts likely caused irreversible impacts (Studenica Monastery, Djoudj National Bird Sanctuary, Route of Santiago de Compostela), while we lack information on the outcomes of the other four conflicts. For more detail see the Table 3.

We conclude that the absolute majority of known conflicts with water infrastructure observed at World Heritage Sites are related to the impacts from hydropower. It is also very noticeable that impacts from large dams developed for hydropower are practically impossible to mitigate once they are built.

One would wonder why today, when viable renewable energy alternatives are plentiful and hydropower (along with nuclear) is the most expensive generation type to build, there are no adequate world-wide measures to protect remaining freshwater biodiversity from its impacts?

Partly, support for hydropower and large water infrastructure is rooted in the political preference given

to mega-projects, often associated with corruption and other problems of governing institutions[13]. But another root cause is the distorted development planning process, where assessments and decisions on environmental aspects are made in the last stages of the planning process, when little can be changed. The third possible cause is lack of holistic thinking at institutions coordinating global environmental governance, so that each of them addresses its own subset of 2030 SDGs, exacerbating competition between key societal needs and objectives. Continuing support to hydropower by UN institutions on the grounds that it is "green energy" is an example of this alarming trend.

Impacts from water infrastructure in the basins where World Heritage properties are located appear to be the most serious and irreversible factor in their degradation, exacerbating the long-term effects of climate change. Before it is too late, Parties of the Convention need to develop systemic measures to ensure that World Heritage properties do not fall victim to the growing competition for water, power and international investment (WHW 2018). In Decision 40 COM 7 (2016) the Committee "*considers that the construction of dams with large reservoirs within the boundaries of World Heritage properties is incompatible with their World Heritage status, and urges States Parties to ensure that the impacts from dams that could affect properties located upstream or downstream within the same river basin are rigorously assessed in order to avoid impacts on the Outstanding Universal Value (OUV)*[14]".

The UNESCO World Heritage Convention discussed the problem again in 2018 and recognized that World Heritage is threatened by "large-scale development projects including dams, extractive industries, and transportation infrastructure, located both inside and outside their boundaries" and requested that those "are assessed through Strategic Environmental Assessments (SEAs) at an early stage in the development of the overall project, before locations/routes have been fixed and prior to any approvals being given" (Decision 42 COM 7)[15].

Manifestation against destruction of rivers and lives by hydropower dams during the opening of the World Hydropower Congress (RwB)

In May 2019 the World Hydropower Congress was held in Paris to promote large hydropower as a "sustainable climate-friendly development solution". The Rivers without Boundaries Coalition urged International Hydropower Association to use this Congress to make major hydropower companies, international finance institutions and the States Parties explicitly commit to robust safeguards measures to stop hydropower encroachment on World Heritage Properties and other valuable natural areas as well as assess and mitigate the impacts of existing hydropower facilities.

Relevant Decisions of the World Heritage Committtee are listed below.

Relevant Decisions of the World Heritage Committee

The World Heritage Committee, ... (Excerpts)[1]

I. State of conservation of World Heritage Properties WHC/16/40.COM/7 (2016)

...Dams

17. Notes with significant concern that an increasing number of properties are facing potential threats from major dam projects, considers that the construction of dams with large reservoirs within the boundaries of World Heritage properties is incompatible with their status, and urges States Parties to ensure that the impacts from dams that could affect properties located upstream or downstream within the same river basin are rigorously assessed in order to avoid impacts on the Outstanding Universal Value (OUV);

Extractive industries

18. Noting with significant concern that World Heritage properties are increasingly threatened by extractive industries, as confirmed by the 2014 IUCN World Heritage Outlook report, by the World Heritage Centre's analysis of issues reported in SoC reports also revealing the potential threat from extractive activities to cultural properties, and by the 2016 report by the World Wide Fund for Nature (WWF), welcomes the "No-go" commitments to World Heritage properties made by Tullow Oil plc and CEMEX in November 2015 and April 2016 respectively, and reiterates its call on other extractive industry companies and investment banks to follow these examples to further extend the "No-go" commitment;

19. Recalling Decision 37 COM 7, once again urges all States Parties to the Convention and leading industry stakeholders to respect the "No-go" commitment by not permitting extractive activities within World Heritage properties, and by making every effort to ensure that extractives companies located in their territory cause no damage to World Heritage properties, in line with Article 6 of the Convention;

Environmental Impact Assessments (EIAs)/Heritage Impact Assessments (HIAs)

20. Notes with concern that a majority of properties potentially affected by proposed development projects, proposed legal instruments, and proposed management systems have not benefited from an assessment of impacts on their Outstanding Universal Value (OUV) in line with IUCN's World Heritage Advice Note on Environmental Assessment and ICOMOS' Guidance on Heritage Impact Assessments for Cultural World Heritage Properties, and requests all States Parties to the Convention to ensure that potential direct, indirect and cumulative impacts on the OUV, including from projects located outside the boundaries of natural and/or cultural World Heritage properties, are specifically assessed within the framework of the EIA and HIA required by the applicable laws and regulations, and that reports of such assessments are submitted to the World Heritage Centre for review by the Advisory Bodies, in accordance with Paragraph 172 of the Operational Guidelines;

21. Recalls Article 6 of the Convention according to which "Each State Party to this Convention undertakes not to take any deliberate measures which might damage directly or indirectly the cultural and natural heritage [...] situated on the territory of other States Parties to this Convention", and also requests all States Parties to the Convention to ensure that EIAs and HIAs include an assessment of impacts on the OUV of World Heritage properties situated on the territory of other States Parties, as appropriate;

22. Further requests the Advisory Bodies, in consultation with the World Heritage Centre, to consider opportunities to streamline their guidance on impact assessment in order to develop one single guidance document for the assessment of impacts on both natural and cultural properties;

II. State of conservation of World Heritage Properties. Decision : 42 COM 7 (2018)

...Dialogue with civil society

13. Welcomes the continued interest of civil society organizations in the Convention, acknowledging the important contribution that can be made to the promotion and conservation of heritage on the ground and to capacity-building;

14. Also welcomes the initiative of the World Heritage Centre to open the consultation processes related to the Convention to a larger number of stakeholders, including civil society;...

16. Encourages again States Parties and civil society organizations to continue to explore possibilities to further civil society engagement in the Convention, both by contributing to enhanced conservation on the site and national level and by providing input to the heritage related debate at the global level; ...

Heritage Impact Assessments/Environmental Impact Assessments (HIAs/EIAs)

37. Stresses the necessity for HIAs and Environmental Impact Assessments (EIAs) to be proportionate to the scope and scale of projects, with simpler assessments being undertaken for smaller projects and Strategic Environmental Assessments (SEAs) for very large projects, and the necessity for assessments to be undertaken in a timely fashion and submitted to the World Heritage Centre for review by the Advisory Bodies, as part of notifications made under Paragraph 172 of the Operational Guidelines;

38. Reiterates that HIAs and EIAs should include a dedicated section examining the potential impact of the project on the OUV of the World Heritage property, in accordance with the existing ICOMOS Guidance and IUCN Advice Note;

39. Notes that HIAs cannot be assessed as stand-alone documents and requests States Parties to ensure that when HIAs are submitted to the World Heritage Centre for review by the Advisory Bodies that they are accompanied by full details of the project to which they refer; ...

Large scale development projects and Strategic Environmental Assessments

41. Noting with concern that an increasing number of properties are threatened by large-scale development projects including dams, extractive industries, and transportation infrastructure, located both inside and outside their boundaries,

42. Also noting that EIAs and Heritage Impact Assessments (HIAs) do not always allow for a broad enough assessment of the potential impact of these large-scale developments, nor an assessment of a broad enough range of options at an early enough stage in the planning process,

43. Requests States Parties to ensure that the potential impacts of such large-scale developments on the OUV of World Heritage properties directly affected or located within their zone of influence are assessed through Strategic Environmental Assessments (SEAs) at an early stage in the development of the overall project, before locations/routes have been fixed and prior to any approvals being given;

44. Recalling Article 6 of the Convention, also requests States Parties to systematically inform the World Heritage Centre, in accordance with Paragraph 172 of the Operational Guidelines, of any planned large-scale development projects in their territories that may impact on the OUV of a property, even if the property concerned is situated on the territory of other States Parties, and to ensure that these impacts are assessed as part of the SEA of the project concerned;

Dialogue with the extractive industries and the finance sector on the "No-go Commitment"

50. Takes note of the continued dialogue between the World Heritage Centre and the extractive industries on extending the "No-go" commitment to other companies;

51. Welcomes the growing interest from the investment sector for the conservation of World Heritage properties and strongly encourages all banks, investment funds, the insurance industry and other relevant private and public sector companies to integrate into their sustainability policies, provisions for ensuring that they are not financing projects that may negatively impact World Heritage properties and that the companies they are investing in subscribe to the "No-go commitment", and invites them to lodge these policies with the UNESCO World Heritage Centre;

52. Requests the World Heritage Centre, in cooperation with the Advisory Bodies, to continue the dialogue with extractive industries and investment sector, including reflections on how to make these commitments and policies available online to inspire other companies in these sectors to follow suit;...

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1 Paper is partly based on Resolutions of the 5th International NGO Forum on World Heritage at Risk Ramada City Center Hotel, Manama, 22 – 23 June 2018: https://world-heritage-watch.org/content/civil-society-forum-2018-in-bahrain/

2 See paper by International Rivers on African WH sites.

3 Decision 42 COM 7A.56

4 See Appendix 1. «Examples of World Heritage sites affected by water infrastructure in 2012-2019.

5 See the paper on « The curse of hydropower»

6 See paper on dam decommissioning

7 Report of China Hydropower Association, January 2019

8 Eugene Simonov. Silk Road project suspended over threats to Lake Baikal. China Dialogue. June 24, 2016 https://www.chinadialogue.net/article/show/single/en/9040-Silk-Road-project-suspended over-threats-to-Lake-Baikal

9 Data from draft decision 42COM/7 compared with previous UNESCO statistics on threats to WH.

10 42 COM 7 SOC 2018 . WHC Decision: 42 COM 7.STATE OF CONSERVATION OF WORLD HERITAGE PROPERTIES. http://whc.unesco.org/archive/2018/whc18-42com-18-en.pdf

11 Ibid 42 COM 7 SOC 2018 . WHC Decision: 42 COM 7.STATE OF CONSERVATION OF WORLD HERITAGE PROPERTIES. http://whc.unesco.org/archive/2018/whc18-42com-18-en.pdf

12 See the paper on dam decommissioning

13 NCEA 2017. Netherlands Commission on Env. Assessments. Better Decision-Making about Large Dams with a View to Sustainable Development. Advisory Report Ref 7199, June 1, 2017 http://dsu.eia.nl/publications/advisory-reports/7199

14 Decision : 40 COM 7 https://whc.unesco.org/en/decisions/6817/

15 See excerpts from relevant decisions of the World Heritage Committee at the end of this report.

16 Prevoius Congress was held in Addis-Abbaba in 2017 and promoted Give-III Dam as a major step to achieving the SDGs (See the case-study on Lake Turkana).

17 Sources: https://whc.unesco.org/en/decisions/6817/ and https://whc.unesco.org/en/decisions/7112

The List of World Heritage Properties Threatened by Water Infrastructure

Table 3. *Threats from Water Infrastructure Documented in 2012-2019*

Indices in the "Status" column:

"p" - infrastructures which predate WH nomination and likely have negative impact

"new" - planned new project(s)

"b" - projects have been built or started construction and likely have impact

"n" - dam project plans scrapped during debate with WH bodies,

"d" - dams decommissioned or problem resolved,

"?" - insufficient or outdated information in reports\debate in process\outcome unclear from available documents.

Cases with potential transboundary impacts in bold font.

Cases covered by this volume in blue.

WH Properties I.HYDROPOWER (some sites also have other water infrastructure)	States Parties	Sources: State of conservation reports or other?	Status	On Danger List?	Natural, Mixed or Cultural	(potential) investors and contractors from other countries
Dja Faunal Reserve	Cameroon	SoC 2018	b?	No	N	?
Lake Turkana National Parks	Kenya	SoC 2012- 2019	b +new	Yes	N	China,Italy
Lower Valley of the Omo	Ethiopia	WI SoC 2018	b+n	No	C	China,Italy
Selous Game Reserve	United Republic of Tanzania	WI SoC 2018\19	b	Yes	N	Egypt, China, Ethiopia
Serengeti National Park	United Republic of Tanzania	SoC 2018?	new?	No	N	?
Kenya Lake System in the Great Rift Valley	Kenya	mentioned in 2018 Serengeti report, SoC 2019	new?	No	N	?
Rwenzori Mountains National Park	Uganda	report from management	b +new	No	N	?
Niokolo-Koba National Park	Senegal	SoC 2012 (last)	new?	Yes	N	France, Austria Germany,
Mosi-oa-Tunya / Victoria Falls	Zambia Zimbabwe	SoC 1992 SoC 2019	b?	No	N	China, US
Virunga National Park	DRC	other source	b +new?	Yes	N	EU, US
Okavango Delta	Botswana	SoC 2016, 2018	new?	No	N	?
Tasmania Wilderness	Australia	SoC 1984, 2019 other source	p+n +new?	No	N	no
Tropical Rainforest Heritage of Sumatra	Indonesia	SoC 2017, other	b +new	Yes	N	China
Rice terraces of the Philippine Cordilleras (Ifugao Landscape)	Philippines	WHW Report	b +new	No	C	?

Three Parallel Rivers of Yunnan PAs	China	SoC 2019	new	No	N	no
Dujiangyan Irrigation	China	other	b+d	No	C	no
Chitwan National Park	Nepal	other sources	b+ new	No	N	China, EIB, WB-IFC, etc.
Sagarmatha National Park	Nepal	SoC	p?	No	N	?
Great Himalayan National Park Conservation Area	India	SoC 2016	?	No	N	?
Keoladeo National Park	India	SoC 2018	b?	No	N	?
Manas Wildlife Sanctuary	India	SoC 2019	b+ new?	No	N	India, Bhutan
Kanchendzonga National Park	India	other WHW, ICIMOD 2016	b+n +new	no	M	?
Volcanoes of Kamchatka	Russia	other	n+new	No	N	China
Lena Pillars	Russia	other: GEIDCO NEA report	new	No	N	China
Lake Baikal	Russia	SoC 2018	b +new	No	N	China, WB, France, Kuwait
Golden Mountains of Altai	Russian Federation	SoC 2013, other: 2018	n + new?	No	N	China, Kazakhstan, Czech
The Ahwar of Southern Iraq	Iraq	SoC 2019	p+b + new	No	M	Turkey, Iran, Japan, China
Ashur (Qal'at Sherqat)	Iraq	SoC 2017	b	Yes	C	?
Upper Svaneti	Georgia	other: CEE Bankwatch report	new?	No	C	EIB, EBRD, ADB, Korea, Austria, Italy
Lake Ohrid	North Macedonia	other	p+b	No	M	?
Alto Douro Wine Region	Portugal	SoC 2013	b	no	C	no
Historic Centre of the City of Salzburg	Austria	SoC 2017	d	no	C	no
Wood Buffalo Natonal Park	Canada	SoC 2017	p+b	No	N	no
Olympic National Park	USA	Retrospective SoC	d	No	N	no
Grand Canyon National Park	United States of America	II Periodic Reporting cycle	p?	No	N	no
Iguaçu National Park	Brazil	SoC 2018	b?	No	N	?
Iguazu National Park	Argentina	SoC 2018	b?	No	N	?
Río Plátano Biosphere Reserve	Honduras	WI SoC 2018	b + new?	Yes	N	China
Precolumbian Chiefdom Settlements	Costa Rica	WI SoC 2018	new?	No	C	?
Talamanca Range-La Amistad Reserves / La Amistad National Park	Costa Rica, Panama	SoC 2017	n	No	N	no
Los Katíos National Park (transmission)	Colombia	SoC 2015	?	Yes	N	IADB,

Los Glaciares National Park	Argentina	SoC 1986 other: FARN report	b?	No	N	China
II.NON- HYDROPOWER						
Greater Blue Mountains Area	Australia	Other sources 2018, 2019	p + new	No	N	no
Shiretoko	Japan	SoC 2017	d	No	N	no
Dong Phayayen-Khao Yai Forest Complex	Thailand	SoC 2016	b	No	N	?
Landscapes of Dauria	Mongolia-Russia	Nomination, Decision 2017, other 2019.	new?	No	N	China
Sundarbans	Bangladesh	other	p+b	No	N	India, China
Rock Art in the Hail Region	Saudi Arabia	SoC 2019	?	No	c	no
Plitvice Lakes National Park	Croatia	SoC 2018	d	No	N	?
Donana	Spain	SoC 2019	p+n+ new	No	N	no
Mammoth Cave National Park	USA	Retrospective SoC	p+d	No	N	no
Everglades National Park	USA	SoC	p+d	Yes	N	no

African Countries Are Yet to Learn the Lessons from the Lake Turkana Destruction

By International Rivers

Lake Turkana. A Yellow line marks border between Kenya(south) and Ethiopia (north)

On June 27, 2018, the UNESCO World Heritage Committee took the decision to officially inscribe Lake Turkana as a World Heritage site "in danger" because of severe impacts caused by the Gibe 3 Dam, constructed upstream on Ethiopia's Omo River. The dam and associated sugar plantations have severely restricted flows into Kenya's Lake Turkana, the world's largest desert lake. The UNESCO decision represents a serious indictment of the government of Ethiopia, which has for years attempted to downplay the risks and used delaying tactics to prevent what amounts to an official reprimand for its conduct.

"We applaud the decision taken by the World Heritage Committee," states Dr. Rudo Sanyanga, the Africa Director at the non-profit International Rivers, which advocates for the protection of rivers and the rights of people who depend on them. "Ethiopia has knowingly and deliberately jeopardized the viability of Lake Turkana, which serves as a critical lifeline for half a million people in Kenya. This decision is long overdue."

Kenyan campaigners have led the opposition over the past decade to Ethiopia's Gibe 3 Dam, which began producing power in 2016. Since then, lake levels have dropped precipitously as Ethiopia fills the dam's reservoir and diverts the river's flows toward newly established sugar plantations that require substantial water resources. This has led to significant hardship for the hundreds of thousands of people who subsist off of Lake Turkana and Lower Omo River Valley, as they have seen fish catches plummet and are facing food insecurity. Further developments upstream could lead to the collapse of local livelihoods. The most comprehensive existing analyses suggest that the vast majority of the Basin's population stands to be negatively affected by ongoing hydrological and land-use changes (Hodbod et al.20119).

Lake Turkana was previously proposed by UNESCO to be added as a site in danger in 2011, but Ethiopia has repeatedly avoided inscription by promising to conduct a Strategic Environmental Assessment of the Gibe scheme's impacts. That study has still not begun as of January 2019, even while dam construction has been completed and sugar plantations expanded. Meanwhile, Ethiopia is aggressively pursuing further dam de-

velopment on the river, having signed a contract with Italian construction firm Salini Impregilo to build an additional Gibe IV and V hydropower dams downstream of the Gibe III and upstream of the two World Heritage properties: Lower Valley of the Omo and the Lake Turkana National Parks. The two properties are already experiencing low water levels due to the Gibe III dam. Development of Gibe IV and V will aggravate these impacts. Construction of Gibe IV (since renamed Koysha Hydro), which will have an installed electricity generating capacity of 2,160 megawatts, was reportedly over 20% complete by September 2018.

The World Heritage Committee must request, and ensure an increased burden of transparency and accountability on all the plans related to dams built on the Omo River. The WHC must also require that no further dams be built on the river, especially in consideration of the devastating effects on Lake Turkana as recognized by the World Heritage Committee(WHC/18/42.COM/7B, Paris of 14 May 2018).To provide stronger protections we recommend that the Lower Valley of the Omo also should be inscribed as a property in danger. So far the Government of Kenya in its January 2019 State of Conservation Report failed to show any progress on developing with Ethiopia its plan to salvage the Lake Turkana World Heritage Site. According to the Report, the two parties plan "to meet in February 2019 to discuss" such cooperation, but we are yet to learn whether they finally met and what was decided.

Lake Turkana joins a long and growing list of World Heritage sites threatened by dam construction. "*While Lake Turkana is a glaring example of the impacts that dams have wrought on some of the world's irreplaceable cultural and biodiversity sites, it has unfortunately become all too common,*" *says Dr. Eugene Simonov, Coordinator of the Rivers Without Boundaries Coalition. "Despite the precipitous decline in new hydropower globally, nearly a quarter of all natural heritage sites in danger are threatened by water infrastructure such as dams – and this share is rising.*"

This concerning trend prompted the World Heritage Committee to pass a resolution in 2016 calling for a ban on dam construction within the boundaries of World Heritage sites, and for proposed dams that may impact World Heritage sites outside their boundaries to be "rigorously assessed." Africa has emerged as particularly affected, with at least 8 World Heritage sites impacted or threatened by dams, with most notorious examples being Niokolo-Koba NP, Serengeti NP and Selous Game Reserve.

The **Niokolo-Koba National Park** was listed a World Heritage site in danger in 2013 yet the governments of Guinea, Gambia and Senegal are planning to build the Sambangalou hydropower dam upstream of the park that will cause irreversible damage to biodiversity and ecosystems. According to the Environmental Impact Study, the Sambangalou dam will have major impacts on the river regime, it will reduce the quantity and quality of water downstream, and also cause the loss of soils, vegetation, and faunal habitats – all impacts that cannot be mitigated. We note the draft decision of the committee in 2019, requesting a detailed Environmental and Social Impact Study of the dam in conformity with international standards applied to World Heritage sites and we hope that this request is followed through and pressure exerted on the State Parties to meet their obligations.

Meanwhile, Tanzania's plans to construct the Stiegler's Gorge Dam in the **Selous Game Reserve**, a biodiversity hotspot for African wildlife, has prompted outcry from conservationists over threats to endangered species. See a separate case-study dedicated to the Selous World Heritage site.

The **Serengeti National Park in Tanzania** is threatened by the planned cascade of dams that will disrupt the flow of the Mara River. Under the framework of the Nile Equatorial Lakes Subsidiary Action Programme, and with the technical support of UNESCO-IHE, the Kenya Water Resource Management Authority has developed a water allocation plan for the Kenyan side of the basin with at least 8 dams for hydropower and irrigation, which may disrupt key ecosystem processes. The Kenya dams pose a direct threat to the World Heritage: for example, the Norera dam 30 km upstream of the Serengeti would release a minimum environmental flow (MEF) of 100 liters per second, only one third of the Mara River MEF recommended by the Lake Victoria Basin Commission of the East African Community. We call on the WHC to insist that the state parties of Tanzania and Kenya provide adequate protection to the Mara River basin and the Serengeti Park in line with its "Outstanding Universal Value".

We further urge, the WHC to explore ways of encouraging and endorsing legal personality for rivers and lakes in Africa, especially those that form part of World Heritage sites. This will provide bottom-up best practices in dealing with World Heritage properties, through the active involvement of communities in the legal personality process. More so, this process will award legal rights to rivers and lakes through legal precedent and national legislation of state parties, by recognizing the representation of rivers and lakes in court processes and negotiations. This approach will uphold and promote, enhanced methods of protection of World Heritage sites affected by water infrastructure.

At the 42nd session of the UNESCO World Heritage Committee, civil society groups requested that the delegates pass a resolution calling for the protection of all World Heritage sites threatened by dams and other infrastructure so that current and future generations can benefit from the valuable natural inheritance upon which we all depend.

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Stiegler's Gorge Dam, Tanzania

Dr. Barnaby Joseph Dye

The Selous Game Reserve UNESCO World Heritage Site (Greg Armfield)

With a history stretching to the start of the 20th century, the Stiegler's Gorge Dam has become a flagship development project in Tanzania. A 131m high and 700m wide dam is planned for the top of the Stiegler's Gorge ravine[13]. Holding back the waters of the Rufiji River, the dam will create a vast reservoir, projected to be the 6th largest in Africa[8]. The latest design claims that the hydropower facility will have a maximum generation capacity of 2,115 megawatts (MW). Planned to be completed by 2021, Stiegler's Gorge Dam would therefore be Africa's largest dam by installed hydropower alongside Egypt's Aswan High Dam (2100MW), while marginally outstripping Mozambique's Cahora Bassa Dam (2075MW) and Angola's Lauca Dam (2069.5MW); or second largest if Ethiopia's Grand Renaissance Dam is completed.

However, this striking engineering proposal is controversial because the Stiegler's Gorge is in the middle of a UNESCO World Heritage Site, the Selous Game Reserve. The Selous is lauded for its outstanding ecological value, as a place of significant biodiversity and unique landscapes, fauna and flora. The dam lies just above an area known as the heart of the Selous, a large flat landscape of shifting river beds, marshes and lakes that stretch beyond the reserve to the Rufiji River Delta. The delta is also protected by the highest international protocol for wetlands, the Ramsar convention. As yet, only two of the Rufiji's tributaries are dammed, making this river essentially the last major relatively free-flowing river in East Africa.

As this discussion demonstrates, this project presents Tanzania with a hugely significant choice: Build a mega-hydropower plant, or protect this globally-outstanding environment and the livelihoods of over 200,000 people who depend on it. Such a choice requires well-informed analysis of what Tanzania's developmental needs are, what the alternatives to the project might be and what impacts it may have. This analysis briefly lays these issues out.

The history and status of Stiegler's Gorge Dam within Tanzania

The dam's origins lie in German colonial expeditions around the turn of the 20th century. In mapping prospective development projects they came across the Stiegler's Gorge, noting it as a potential dam site. More systematic surveys followed under the auspices of British and then United Nations authorities. Many engineers over the years have praised the gorge's hydropower potential, justifying the dam's construction.

Whilst conceived under colonialism, the project was then supported under the socialist modernising vision of President Julius Nyerere, Tanzania's Baba wa Tifa (Father of the Nation). Despite concerted efforts from the 1960s through to the 1980s to build Stiegler's Dam, it wasn't built. By the time the necessary feasibility, design and environmental studies were prepared, Tanzania was in a worsening debt crisis, Nyerere had left office and, in line with growing global interests in protecting the environment, the World Bank had rejected the project. The dam remained shelved until President Kikwete's government, riding on a wave of economic growth, resurrected the dam in 2006. The project was now conceived as a public-private partnership, whereby a company would raise finance on the international markets and then own it with the Rufiji Basin Development Agency, Rubada. After failed deals with a number of companies, high-level diplomacy brought Brazilian Odebrecht on board. They undertook a new round of feasibility and design assessments, as well as financing an initial Environmental Impact Assessment (EIA).

However, this phase of planning also stalled by 2014. Hydropower in Tanzania became something of a public debate, with consistent droughts leading to regular, debilitating power cuts in most dry seasons from 2004. With Tanzania's discovery of large volumes of off-shore gas in 2012, focus shifted to exploiting these reserves for electricity. Moreover, the Tanzanian state did not prove adept at facilitating a private-sector led project, in joining-up government decision-making to the extent necessary for companies to secure international finance. Obtaining such finance also proved a challenge for Odebrecht: the World Bank reportedly rejected financing the dam again, because of its location in a World Heritage Site. Thus, the Stiegler's appeared to be shelved again.

Latest Steps: The Implementation of the Stiegler's Gorge

This changed in 2017. The President inaugurated in late 2015, John Pombo Magufuli, announced that his government would pursued the dam. It quickly became a flagship for the new government, with the President making frequent speeches extolling Stiegler's Gorge Dam's ability to solve the country's energy issues. To advance the dams' planning President Magufuli fired Minister Muhongo in 2017, someone who was widely regarded as a hydropower-sceptic[7], and abolished Rubada, as it had insufficient capacity to deliver the dam. The President also announced that Stiegler's would be handled in house, that it would be funded by the state. He placed planning and construction under a trusted Minister, Medard Kalemani (who replaced Magufuli as MP for Chato and is reportedly a family relation), making him head of a newly-separated Ministry of Energy. This time the government plans to finance the dam itself through the national budget – boosted through more stringent domestic tax collection. Such a financing model, given that it does not depend on international funders who are frequently more sensitive to environmental concerns, overcomes the obstacles of the Selous' World Heritage designation. However, Tanzania's limited tax base strongly questions the ability for this strategy to deliver the necessary funds. Subsequent threats made against those asking questions about the project, including one by the Home Affairs Minister to arrest critical 'environmentalists'[12] [14], underlines the government's prioritisation of this dam.

Next, in late 2017, a call for bids to construct Stiegler's Gorge Dam was issued. After an unsuccessful first round, the government decided to appoint an Egyptian consortium to lead the project in October 2018. Arab Contractors, a military owned company, is heading the civils work and El Sweeny, the electromechanical. This is deeply surprising given both companies inexperience. Arab Contractors reportedly worked on Aswan Dam in the 1960s, but would only have been one of many sub-contractors on the

Russian-led project. A review of their website reveals that the company has been involved in the construction of buildings over the last decade, not on any large hydraulic or power-generation projects. Meanwhile El Sweeny appears mainly to have built transmission lines, not complex electro-mechanical systems. Whilst recruitment may be able to address some challenges, this poses a number of technical questions: Can such firms deliver complex hydropower engineering to the standard where the infrastructure can withstand the significant hydraulic pressures placed on dams? Can they project-manage construction on this scale? Employment of one of the top global hydro-engineering design firms to undertake new design and feasibility reports could ameliorate this inexperience, as could the appointment of such a company as owner's engineer, a role that involves supporting project management and ensuring standards. In neighbouring Rwanda for example, these steps ensured that the Nyabarongo Hydropower Project, was completed in 2014 to the right technical specifications.

The inexperience of the contractors also has environmental implications. Neither is likely to be familiar with dam-building mitigation practices. They are unlikely to be familiar with monitoring environmental impacts, or with the policies designed to address them, whether concerning the minimisation of river pollution or in anti-poaching. Environmental concerns about the project's latest phase are compounded by the Tanzanian government's limited efforts in assessing environmental impacts. In 2018, the government commissioned the University of Dar es Salaam to produce a new environmental impact assessment, led by Professor Raphael Mwalyosi who was involved in Norwegian-led assessments in the 1970s-1980s. Their report is problematic for numerous reasons. It starts with the premise of the dam as absolutely necessary for Tanzania's development; only 2 pages consider alternatives. The depth of research is also limited, with the assessment involving little in the way of new studies, or participative research with affected communities. More fundamentally, the report presents the dam's negative impacts as resolvable and denies the existence of trade-offs: Tanzania can build its dams without suffering the consequences, a conclusion that is in stark contrast to academic work[1]. Consequently, a number of influential international organisations rejected the environmental impact assessment, including WWF[16] and IUCN[17]. They claim that the report does not meet UNESCO standards, which require a holistic, basin-level 'strategic environmental impact assessment'. However, Magufuli found the report too critical, castigating its recommendations for mitigation practices and alleging that these would impose unacceptable restrictions on construction [14]. Consequently, it seems that there is little chance for the adoption of significant mitigation measures.

Appraising the Stiegler's Gorge Dam

Electricity

The key rationale for the Stiegler's Gorge Dam is its considerable electricity-generation capacity. Indeed, the dam's current design makes power generation the only direct benefit. It seems that the government's interest primarily stemmed from a perception that the Stiegler's Dam "is the only large-scale project that can provide over 2000MW within a relatively short time scale (<5 years)" [15]. Additionally the dam is claimed to produce Tanzania's cheapest electricity: Odebrecht's 2013 feasibility assessment stated that the dam's cost reflective tariff would be $0.0435 per kilowatt-hour (KwH), which is below Tanzania's $.065kwh national average. The dam is therefore well placed to meet President Magufuli's ambition for rapid economic development and industrialisation. These processes require cheap electricity tariffs and the ability to promise firms starting up or moving to the country, power. Additionally, if the dam is able to consistently produce its installed capacity of 2100MW, it will provide a large surplus of electricity that should address Tanzania's recurrent power cuts. Periodic electricity shortages in the country's dry season create regularly occurring load shedding that harms peoples' lives and the economy. For instance, load shedding between 2014-2015 supposedly cost between 5-7% of Tanzania's GDP[4]. However, the operation of Stiegler's Gorge Dam is unclear. Will it follow rainfall patterns and open its sluice gates to create a mitigating flood in the wet season? Or will it release a steady output of water and electricity all year-round?

The other significant question is whether the dam is economically justifiable, whether there is demand for its projected power production. The government asserts that the dam is logical given that by 2025, the country will have 5000MW of electricity demand[15], up from roughly 1500MW today[7]. Such an increase in just 7 years would be far beyond international historic electricity-demand-rate growth, for instance being above China's record-breaking 2000s economic-growth peak. A recent report by Hartmann [10] (a researcher not regarded as a dam critic), uses this argument about insufficient demand to counter the dam's economic justifications. The Stiegler's Gorge Dam therefore seems more of an act of faith than a carefully justified power plant. Without domestic demand, some claim that Tanzania could export the dam's power, but this is undermined by the lack of international transmission lines of sufficient capacity. Moreover, all countries in East Africa have similar power-export plans, making it unclear who would buy electricity. Ethiopia has gone even further, having already signed agreements with countries offering a lower tariff than Tanzania.

Further doubt on the economic justification for the Stiegler's project stems from the historic reliability of dams in the Rufiji Basin. Roughly half of Tanzania's installed capacity sits in this basin, including the hydropower plants on the Ruaha and Kihansi Rivers. However, these dam's regularly experience dry-season failure, where water often drops below operational levels. As mentioned above, this has been a significant factor behind Tanzania's debilitating power cuts. Any such failure, or a significant decrease in power production from the Stiegler's Dam will be compounded by its size relative to the national grid's generation capacity. If brought online today, a failure of the Stiegler's Gorge Hydropower Plant would reduce power production by 58.3%. This is particularly important given recent research[3] highlighting the likelihood that climate change will increase variability in rainfall, something that would undermine reliable hydropower production.

Financial Costs and Alternatives

Finally, the costs of undertaking such a project are significant. The government maintains that it will complete the dam in under the $3.6billion and in less than the 8.6 years projected by Odebrecht. However, Hartmann[10] asserts that inflation and construction-cost rises (calculated using recent comparative dams), mean that total build cost, excluding socio-environmental mitigation, will be US$7.57billion, rising to US$9.8billion if a conservative amount of overrun is factored in. Such costs are all the more pertinent given the country's growing debt, not to mention that of the energy utility Tanesco which the state has bailed out repeatedly over the last decade. Hartmann's predicted expense changes the dam's cost-reflective tariff to US$ 0.1163/kWh, nearly double Tanzania's current average electricity tariff. This new price would undermine the government's main justifications for the dam, namely its ability to support economic growth and industrialisation. In light of such costs, it is worth considering the practical alternatives:

- *Hydropower*. Relatively detailed studies exist for many dam sites, such as Ruhudji (358MW), Mnyera (670MW) and Rumakali (525MW). Given their smaller size, all are more suited to Tanzania's electricity demand needs and debt. They also have lower environmental impacts.
- *Gas and Fossil Fuels*. A number of gas plants at Kinyerezi and coal plants in Tanzania's South have existing implementation deals. All would use domestically-produced coal and gas and would be more reliable than hydropower production. However, gas, and especially coal, are large contributors to climate change.
- *Renewables: Solar & Wind*: Tanzania has conducted initial mapping demonstrating significant potential for wind and solar. With both technologies' falling costs, and given the growing array of policy options that mitigate their intermittent power production, solar and wind could form Tanzania's electricity backbone. Hartmann's report[10], reflecting wider growing body of opinion, finds solar and wind as the cheapest energy option with faster implementation. They can also produce at a large scale. Neighbouring Zambia, for instance, recently installed 100MW of solar with a tariff that matches Tanzania's average electricity price.

Socio-Environmental Impacts of ending a free-flowing river

Considering the Stiegler's Gorge Dam's environmental impacts reinforces the importance of considering such alternatives. The most obvious impact is on the Selous Game Reserve World Heritage Site. The latest EIA suggests that the dam will flood 3% of the reserve, but limited hydrology studies make this figure uncertain. More significant impacts will occur downstream. The Rufiji River's seasonal flood underpins the area just below the Stiegler's Gorge that is the most biodiverse part of the park, with the highest levels of fauna and flora. This flood irrigates and fertilises ecologically important land and rejuvenates lakes and wetland areas. This maintains a rich series of habitats, changing dryland savannah to wetland and tropical vegetation. Also vital to this area's ecological richness is the free flowing nature of the river: The dynamic of the unpredictable annual flood regularly changes the river's course, generating a landscape of ox-bow lakes and wetlands.

The same riverine processes underpin the productive agriculture and fishing livelihoods of the Warufiji people, who live just below the park. Despite particularly large floods causing the destruction of homes and crops, research suggests that many Warufiji people recognise the value of seasonal floods, seeing them as a blessing bringing agricultural productivity and the re-stocking of otherwise-isolated fishing lakes[5]. Research also demonstrates that even if the dam operated a 2,500 m^3/s mitigating flood release, the infrastructure's presence will mean that the majority of downstream lakes will be cut-off and would therefore dry-up or lose the ability to sustain fish[6]. The latest EIA maintains that in the dam's current design, a 3,455m^3/s release is possible, but there is no indication that the government is considering such mitigation practices. Rather, their statements indicate that hydropower production will trump other concerns.

The river also plays a crucial underpinning role in the Ramsar-protected Rufiji River Delta. As well as renewing fertility and providing irrigation for habitats and farmland in the delta, the annual flood also maintains its salinity balance: Without river water flowing in the same volume to the delta, salty seawater would infiltrate upstream. The river's existing balance is key to maintaining East Africa's largest mangrove forest [2]. Moreover, the river's annual flood generates seasonal algal blooms that support a rich prawn fishery and migrating animals, including whale sharks. As a WWF report concludes, blocking the Rufiji River will therefore entail significant impacts for globally-outstanding environments, as well as affecting some of Tanzania's richest agricultural land and fisheries.

The Selous Game Reserve UNESCO World Heritage Site (Greg Armfield)

The Selous Game Reserve UNESCO World Heritage Site (Greg Armfield)

Conclusion

Crucially then, the Tanzanian government faces a key decision in pursuing the Stiegler's Gorge Dam. Ending the Rufiji's free flow will entail significant trade-offs which, rather than being denied as in the recent EIA, should be acknowledged. The dam will undermine the biophysical processes that maintain the Selous Reserve and Ramsar-protected Rufiji River Delta, placing the former's World Heritage status in jeopardy. It is therefore vital to interrogate the project's benefits and carefully consider Tanzania's development needs. Will the dam deliver its promised electricity reliably? Does Tanzania need 2100MW? Will it be worth the billions of dollars? Is a project conceived at the start of the 20th century suitable today, especially given the falling cost and large-scale electricity potential of renewables like solar? The latest phases pose further challenges. Tanzania does not appear to know how it will raise the finance for the dam domestically, given its limited tax base and rising debt. Employing two unqualified contractors sparks further doubt. Can these companies deliver the dam? Although these financial and technical difficulties are likely to derail the project, with initial construction work already underway, focus must also turn to potential mitigation measures to protect the Rufiji River and those who depend on it.

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Can Tasmania Wilderness Heritage Fuel the Battery of the Nation?

Eugene Simonov, RwB

The majority of claims about "streamlining sustainable hydro", have not been so far supported by sufficient empirical evidence, since the mainstream hydropower sector continues to ruin the world's natural riches and indigenous livelihoods at an accelerating pace. The industry clearly neglects the urgency of sustainability issues, for only 1% of newly created hydropower has been subjected to "sustainability assessment" actively advertised by the International Hydropower Association, the main lobbyist organization of the sector.

However, there is always hope, that "new sustainable hydropower" - a harmless way to harness the power of water without destroying the blood system of the planet will emerge someday. Twenty years ago someone mistakenly decided that many small dams are inherently better than one large and "small hydro" got a social license to join the mainstream of "Sustainable Development". As we witness now across the globe from Nepal to the Balkans, this mistake resulted in mass-execution of many river basins, which experienced "death by a thousand cuts". Once small hydro was used not for the specific needs of the local community, but to achieve large-scale "development" and contribute to the "clean energy production" of nations at a large scale, it inevitably degraded whole rivers systems, while producing negligible economic benefits (see Vjosa River example in this volume). Now the world is busy tearing down thousands of small river-killing installations, and China, as usual, is leading the way.

A decade ago "run-of-river" hydro became the next hydropower brand promoted for "sustainability", but that largely failed, because, on the one hand any dam smaller than a mountain started to be called "RoR", and on the other hand no effective solution was found for blocked fish migration, intermittency of electricity production and other woes of dams without or with relatively small reservoirs. In 2019 the industry sources claim that one-third of the US hydropower fleet, represented by RoR, would greatly benefit from installing battery storage to solve the problem of intermittency[1]. The same solution is often used to enable solar and wind power plants, but those do not block our rivers...

Recently, as "energy storage" started to be seen as a panacea for development of "clean energy systems" a century old invention of pumped storage hydropower (PSH) has been raised to a new prominence. PSH technology does not generate energy, but it uses cheap\excess electricity to pump water uphill, to be rushed down through turbines in peak hours (or whenever most needed). Typically, such installation consists of two water bodies, upper and lower, and pumping as well as energy generating machinery in between those. Although the principle impacts on the environment are similar in nature to mainstream dam-based hydro, there are many nuances in site selection and construction, which, if realized, may make PSH the least destructive type of large hydropower known today.

By the end of 2017, the global cumulative installed capacity of PSH had reached 153 GW, i.e. 12% of total hydropower capacity, with over 80% of it located in Europe, China, Japan and the United States. In the next five years, PSH capacity was forecasted by the IEA to increase almost one-fifth (26 GW), mostly in response to greater needs for system flexibility to integrate variable renewables[2]. Actual growth as reported lately by IRENA is less spectacular with only 2-5 GW of PSH added annually.

If we want pumped storage hydropower to have a sustainable future, we should work hard to assess and prevent its existing and forecasted negative impacts. In the US, where environmental and social concerns effectively brought greenfield dam-based hydropower construction to a halt, legislators even allowed an alternative, streamlined licensing process for low-impact pumped storage hydropower, such as off-channel, modular or closed-loop projects[3]. "Closed loop" refers to installations where both upper and lower reservoirs are located outside of natural waterbodies, often utilizing old mines and quarries of other "badlands". Reconstruction of old hydropower dams by adding pumped-storage capacity is another popular theme now.

Map: *Long-term plans for pumped-storage in Tasmania. Tasmania Wilderness World Heritage Area vaguely shaded by darker green color. (Hydro Tasmania[4])*

Professor Jamie Pittock[5] from the Australia National University, who calls the PSH technology "really a game changer," in March 2019 published a research paper on the challenges in pump hydro storage development as people, particularly in rural areas, might not want to live near such industrial projects. According to him storage relies on high-elevation areas - a number of which could not be used as they existed in national parks or other protected areas. According to the Australia National University[6], 20 big pumped hydro storage facilities are needed to back up the entire national electricity grid and more than 6 GW of PSH are already proposed on the continent, while about 22,000 physically feasible sites for pumped storage hydropower have been identified in Australia based on geographical features.

However, the sustainability of this effort is yet to be proven, with a promoted flagship project being the enlargement of the once environmentally disastrous Snowy Mountain Scheme. The next most prominent and actually larger scheme proposed by Hydro Tasmania is the so-called "**Battery of the Nation**" with fourteen sites identified in Tasmania which, if feasible, would have a capacity of 2,5-4,8 GW, thus exceeding 2GW Snowy Mountain Scheme-2.

The island is relatively small, it hosts large World Heritage Property and more than 50 old impactful hydropower dams, the development of which once destroyed many natural and cultural values. The three proposals identified as a short-term priority will probably have comparatively low impact on the World Heritage Area. Most proposed reservoirs are largely artificial lakes created by old hydro schemes constructed between 1950 and 1990. An exception is the Great Lake, a natural lake artificially raised by a hydro scheme in the 1950s. Its shoreline forms part of the eastern boundary of the WH property. It is not on the Hydro Tasmania short list, but in long-term plans encircling the Wilderness WH.

The long-term conservation campaigner, Geoff Law, a veteran of the historic campaign to save Tasmania's Franklin River, expressed the worries of the conservation community: "*We are very concerned about the expectations raised through the slogan 'battery of the nation'. When governments and corporations believe their own inflated rhetoric, then economic and environmental problems inevitably follow. While the three proposals identified for development so far might not have any significant impacts on the World Heritage property, we need to scrutinize the detail when more is available. We certainly would be very disturbed if these proposals were followed by a 'flood' of other developments in the wild country surrounding the Tasmanian Wilderness. There could be significant impacts on proposed extensions to the property, on river flows below the developments, and on the viewfields from within the property.*"

Hydro Tasmania is a company seasoned in battles with environmentalists and one of the most progressive and innovative hydropower entities worldwide. According to the company's on-line material the scheme has straightforward criteria for site selection to minimize harm and highlight potential impacts. They will likely implement the majority of the proposed environmental safeguards. So far I am tempted to call this "good practice", and a "positive example" of industry behavior.

On the other hand, the "Battery of the Nation" sounds threatening and potentially destructive, simply because Tasmania has only this many sites suitable for low-impact construction while industry appetites are insatiable. The conservationists and the HEC (Hydro-Tasmania predecessor) in the 1980s acknowledged that there were a limited range of options for further power development schemes on the island. New development is likely to worsen the condition of already affected freshwater ecosystems and any new development measures should be coupled with efforts to mitigate past mistakes. For example, re-regulating reservoirs will have a new impact on wildlife (as already recognized by the Company), so an environmental flow scheme improving overall conditions in each water-body may be part of the solution.

Finally, large-scale industrial development occurring along the perimeter of the World Heritage Site cannot go on absolutely without consequence for its integrity. Therefore it is highly advisable to develop Strategic Environmental Assessment for all of the energy-storage development scenarios, including the full extent of the "Battery of the Nation" Scheme. Such SEA should be undertaken in cooperation with UNESCO World Heritage Bodies and the civil society of Australia.

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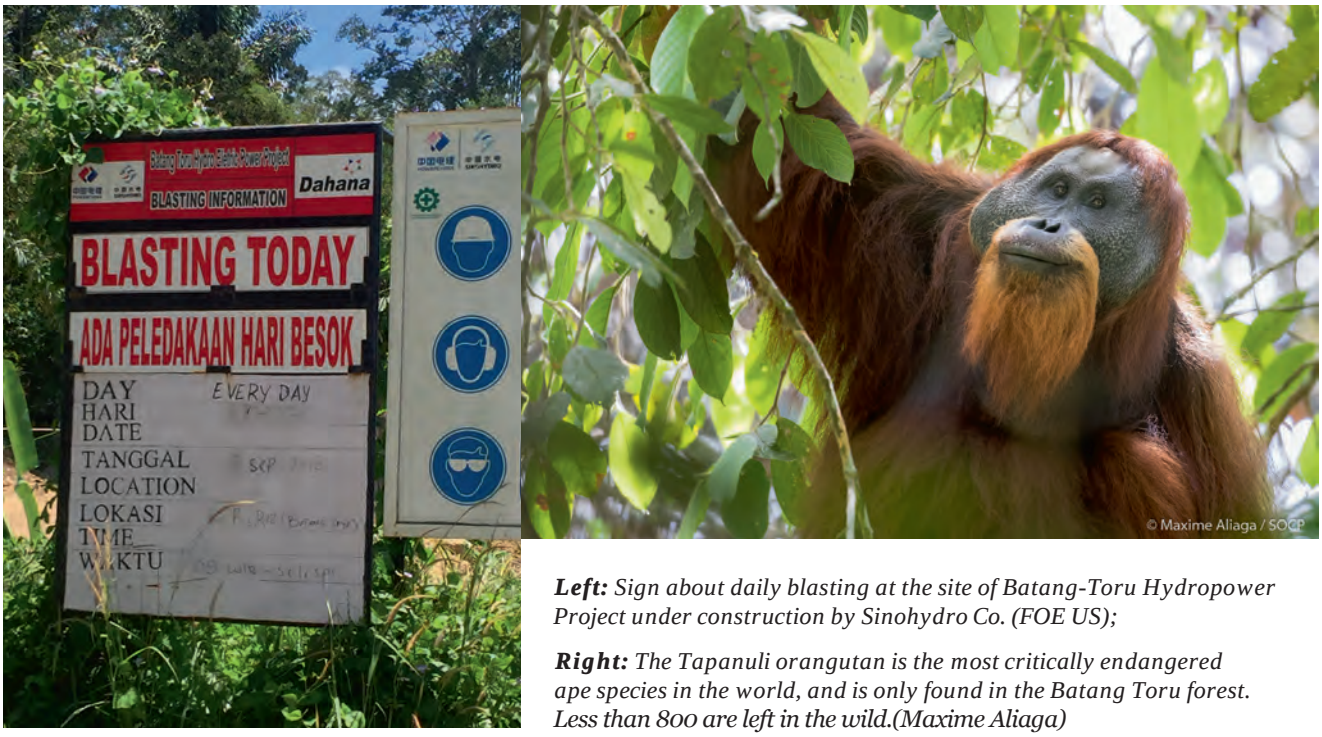
Sumatra's Last Jungles: Protecting and Enhancing the Tropical Rainforest Heritage of Sumatra

Friends of the Earth Indonesia/ Wahana Lingkungan Hidup Indonesia (WALHI) and Friends of the Earth US



Left: *Sign about daily blasting at the site of Batang-Toru Hydropower Project under construction by Sinohydro Co. (FOE US);*

Right: *The Tapanuli orangutan is the most critically endangered ape species in the world, and is only found in the Batang Toru forest. Less than 800 are left in the wild.(Maxime Aliaga)*

In 2004, the Tropical Rainforest Heritage of Sumatra (TRHS) was inscribed as a site of outstanding universal value (OUV) in terms of diverse habitat and exceptional biodiversity. Located along the impressive Bukit Barisan mountain chain, the 2.5 million hectare site consists of three separate parks on Sumatra: Gunung Leuser National Park, Kerinci Seblat National Park, and Bukit Barisan Selatan National Park. Harmful activities which take place just outside the TRHS, or within unclearly marked boundaries or buffer zones, continue to pose a significant direct, indirect, or cumulative negative impact on the OUV of the site, an observation reiterated by the World Heritage Committee's Decision in 2018.

In addition to supporting the ongoing efforts to protect the TRHS, we wish to propose that Batang Toru, an ecosystem also located along the Bukit Barisan Mountains, be considered as an extension of the TRHS. TRHS was inscribed based on criteria vii (representing major stages of Earth's history), ix (representing ongoing ecological and biological processes), and x (containing most important habitats for in-situ conservation). If the goal of World Heritage sites is to "encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity", then Batang Toru should warrant immediate attention and intervention in its inclusion into TRHS[1]. The Batang Toru ecosystem boasts superlative natural scenery of waterfalls, mountains, and dense jungle, and contains the only known habitat for some of the most endangered species in the world, all of which are features which fully align with the rationale for recognizing the TRHS as an OUV site. Batang Toru is a stronghold for the Sumatran orangutan, sun bear, gibbons, rhino, and pangolin; it is also the only known habitat for the critically endangered Tapanuli orangutan, (Pongo tapanuliensis) of which less than 800 are left in the wild[2]. There are also at least 311 bird species, 28 bat

species, 80 reptile species, and 64 species of frogs and toads. Batang Toru also boasts over 1000 tree species and hundreds of orchid species, some of which were just discovered[3]. However, Batang Toru faces immediate, existential threats from a proposed hydropower dam; if the dam proceeds, the ecosystem's outstanding value in terms of superlative scenery and critical in-situ conservation site will be lost forever. In light of these threats, we strongly urge the Indonesian government and international community to protect the Batang Toru ecosystem by including it into TRHS as a minor boundary modification, as doing so would immediately stop the ongoing dam construction, as well as safeguard the region from other harmful activities in the future.

Protecting TRHS by Recognizing the Rights of Local and Indigenous Communities

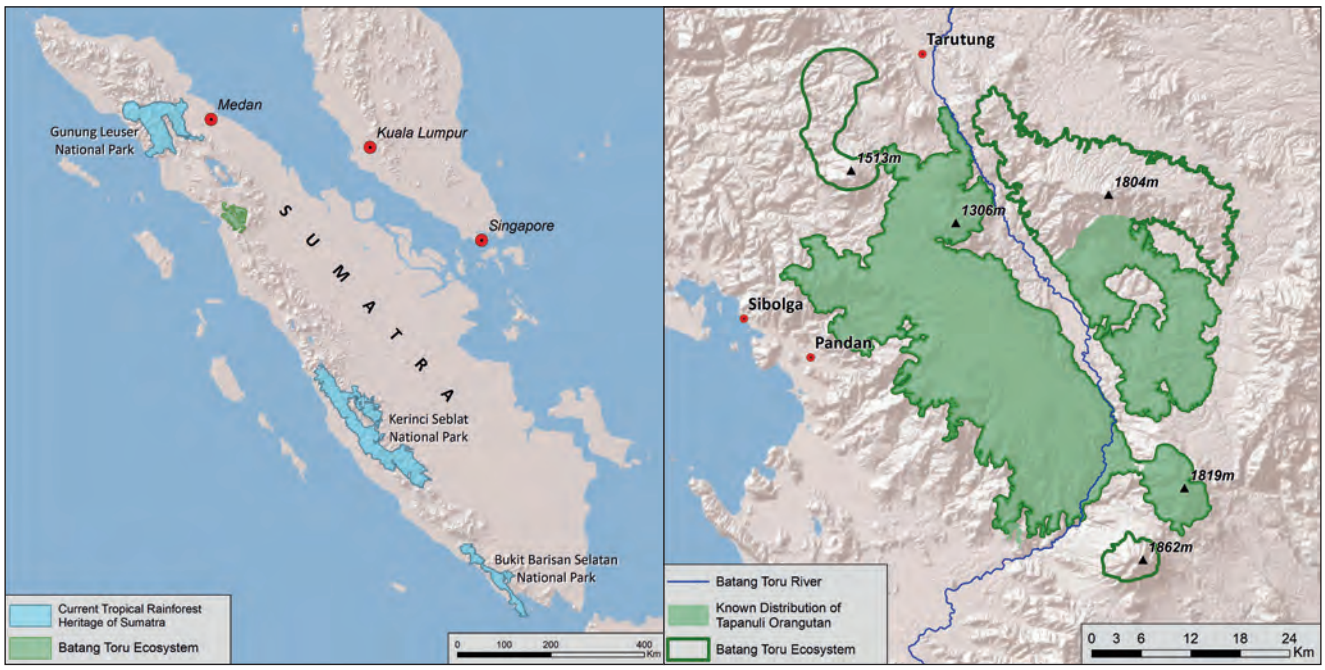
In an effort to address encroachment, in 2018, Decision 42 COM 7A.40 requested that Environmental Impact Assessments (EIAs) be "rigorous". However, requiring "rigorous" EIAs, particularly those surrounding Gunung Leuser National Park, is proving insufficient in preserving the integrity of TRHS due to weak law enforcement, and the continued failure of the local and central government to actually ensure "rigorous" environmental impact assessments.

EIAs will continue to be insufficient tools in protecting TRHS unless the Indonesian government addresses the root drivers of encroachment and other threats. The expansion of corporate activities, the limited ability of the Indonesian government to effectively conserve and protect these fragile ecosystems, in addition to forcing out local communities who have long owned and used their land[4], is producing conditions for constant conflict and the erosion of TRHS boundaries and buffer zones. This is because environmental and social protections are more easily ignored (by both government and corporate actors) when local communities are forced out; once communities are gone, they forfeit their rights over their community management area[5], which essentially creates ripe conditions for legalizing environmentally harmful activities in TRHS buffer zones such as monoculture plantations, mining, hydropower dams, and others. At present, the number of local communities are gradually decreasing due to the aggressive expansion of extractive industries, which have affected at least 33,000 villages to date. In other words, the presence of local communities makes possible stronger environmental and social accountability of both government and corporate actors, as once communities may be forced out, government and corporate actors face less scrutiny for their actions.

By recognizing and protecting the rights of local communities in THRS, local communities can serve as guardians of the heritage site, especially in fragile buffer zones. Their very presence can help prevent or deter harmful impacts of extractive industries. In promoting better protections for the heritage site, we strongly encourage the World Heritage Committee to recognize and emphasize the rights and indigenous knowledge of local communities with customary ties to land in or near TRHS. Viewing the conservation of the TRHS as part of a broader effort to incorporate the value of local communities as "local guardians" of the forest should be considered critical in ensuring long-term sustainability and success for the mutual well-being of the forest, endangered species, and communities. We ask the World Heritage Committee to consider acknowledging and encouraging this rights-based approach in strengthening conservation efforts as a recommendation to the Indonesian government.

Nominating Batang Toru as an Extension of TRHS

Consisting of three (West, East, and Sibual-Buali primary forest blocks, the Batang Toru ecosystem spans across 1420 square kilometers in the South Tapanuli highlands of North Sumatra. The region includes highland swamps, which researchers have yet to fully survey, and also contains eight different water catchments. The Batang Toru ecosystem spans across 142,000 ha, which would expand the 2.6 million ha TRHS by just about 5%. Furthermore, the area is ill-suited for major infrastructure development; it contains steep forest slopes with highly erodible soils, and is located very close to the earthquake-prone Sumatran Rift Valley.



Map: *The Tropical Rainforest Heritage of Sumatra consists of three national parks: Gunung Leuser, Kerinci Seblat, and Bukit Barisan. Given its unique values in same biogeographic realm, in addition to being the only known habitat for the endangered Tapanuli orangutan, the Batang Toru Ecosystem (highlighted in green above) should be urgently considered as an extension of the TRHS World Heritage site.*

Currently, Batang Toru does not enjoy the highest level of environmental protection under Indonesian law. As a result, the Tapanuli orangutan population is at a tipping point due to threats from the Batang Toru Dam and gold mining. In particular, road clearance and tunnel blasting for the Batang Toru Dam has already begun, and if the project proceeds, the species' small habitat will ultimately be permanently fragmented into three separate forest blocks. Previously, the West and East forest blocks were naturally connected until the early 2000s; this connectivity allowed for migration among the small pockets of Tapanuli orangutan populations. However, because the dam is located in the West forest block, which currently contains the highest number of orangutans, the dam will inherently impact the species for the worse. Scientists caution that even the loss of a few individuals will be disastrous given their already extremely small population, their slow reproductive cycle, as well as the fact that females tend not to migrate beyond their natural home range. Scientists are also calling for the West and East forest blocks to be reconnected. Ensuring and reconnecting forest canopy is particularly critical as Tapanuli orangutans are strictly arboreal, meaning they never touch the ground, and so the loss of further forest canopy would essentially trap the orangutans into unviable populations, and thus jeopardize the survival of the species.

The Batang Toru Dam is being developed by PT North Sumatra Hydro Energy (PT NSHE), who have contracted Sinohydro Co. for engineering, procurement, and construction services. The projects being financed by Bank of China. Due to the urgent threats facing the Tapanuli orangutan, WALHI has communicated environmental and social concerns to Bank of China, but to date, it has failed to publicly demonstrate that it might withdraw financing in response to environmental and social issues, such as those regarding the survival of the Tapanuli orangutan. The project has also triggered a number of protests at the Chinese Embassy in Jakarta and internationally due to local opposition to the Batang Toru Dam. Although Bank of China has promised to evaluate the project, it remains unclear what action the bank will take, if any, in response to public concerns[6].

The PT North Sumatra Hydro Energy is clearing the project site (FoE US 2019)

As reflected in the 2018 IUCN Monitoring Mission Update, the Indonesian government has already been asked to review and clarify the official boundaries of the TRHS, in addition to its buffer zones. Adding Batang Toru to the TRHS as a minor boundary modification would be consistent with the World Heritage Committee's 2018 recommendation that "changes to existing boundaries and buffer zones should have the primary objective of strengthening the protection of OUV"[7]. Adding Batang Toru would clearly enhance and strengthen the TRHS' value as a World Heritage site given its superlative natural scenery and rich biodiversity, fulfilling criteria vii, ix, and x.

According to the Operational Guidelines of the World Heritage Convention (UNESCO 2018a), a minor boundary modification would require no change to the Statement of Outstanding Universal Value for the TRHS and could be approved within six months upon submission by the Indonesian government.

Recommendations on Protecting the Tropical Heritage Rainforest of Sumatra and Enhancing and Extending the World Heritage Property to Include Batang Toru

- Require the Indonesian government to report on progress in clarifying the buffer zones and boundaries of the TRHS.
- Call on the Indonesian government to apply equally strong conservation protections to TRHS buffer zones and TRHS core conservation areas.
- Urge the Indonesian government to cancel or suspend any energy, plantation, logging, and mining concessions nearby and within buffer zones of the TRHS.

- Acknowledge the benefits of a rights-based approach towards conservation, especially in the context of ongoing conservation efforts for the TRHS.
- Retain the THRS as "in danger" until further progress has been made in clearly delineating and protecting TRHS borders and buffer zones.
- Conceptualize and establish protections for TRHS as a singular ecological system, which includes TRHS and local communities.
- Conduct an inventory of local communities with customary rights to land in or near TRHS, and initiate efforts to preserve indigenous knowledge and local wisdom.
- Recognize the Outstanding Universal Value of the Batang Toru ecosystem.
- Urge the Indonesian government to include Batang Toru in the TRHS as a minor boundary modification.
- Express urgent concern regarding the Indonesian government's failure to fully protect the Tapanuli orangutan.
- **Call on financial and corporate actors to qualify the TRHS, Batang Toru, and their respective buffer zones as a "no go" area.**

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3 Ibid.

4 Friends of the Earth Indonesia/WALHI is the country's oldest and largest grassroots environmental network.

5 Wilayah Kelola Rakyat (WKR) tranlates to Community Management Area, which is an integrative and participatory management system related to the governance, production, distribution, and consumption of local resources. This management system recognizes natural environmental functions as the basis and source of local values and knowledge, which thus promotes and enables prosperity, justice and sustainability for all. https://walhisumsel.or.id/wilayah-kelola-rakyat/

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Great Leaping Tiger Dammed

UNESCO World Heritage Three Parallel Rivers Protected Area Under Threat

Gabriel Lafitte. Rukor

This 2019 moment uncannily echoes 2004, when Chinese environmentalists and an investigative newspaper revealed Tiger Leaping Gorge, on the southeastern edge of the Tibetan Plateau, was about to be dammed, stilling a mountain river famed for its untamed wildness and spectacular gorge. That report[1] opened an official secret, that a planned cascade of dams on the Dri Chu (Jinsha in Chinese, Yangtze in English) would reach upriver as far as the untouched awesome beauty of Tiger Leaping Gorge.

Environmentalists mobilized support, scientists investigated the technical obstacles. By 2007 their advocacy achieved a result. The state owned dam building corporations backed off, an iconic landscape had been spared. This was a historic win for citizen initiatives.

Fast forward 15 years to 2019. That crusading investigative newspaper, Southern Weekend is long closed by orders from above. Damming of Tiger Leaping Gorge is back, and environmentalists are aghast. So certain these days are arrest, detention, torture and public confession, for publicly questioning official policy, they dare not speak directly. This is their plea.

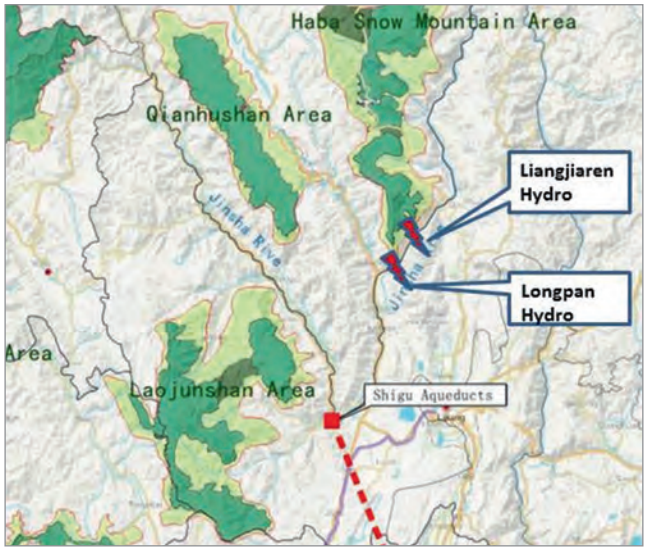


Figure 1. *Map adopted from 2018 China's State of Conservation Report with the World Heritage site and interbasin water transfer aqueduct. Two proposed hydropower plants added by editors*

Of the 25 dams on the Jinsha, already built or planned, Tiger Leaping Gorge/ Longpan is planned to generate 6000 megwatts of electricity, a huge amount, though 4 of the 25 Jinsha dams are even bigger.

The entire right bank in Lijiang Naxi Autonomous County is so loose that many Chinese scientists have wondered whether it can hold, if the Tiger Leaping Gorge/Longpan hydro dam is built. There has been serious investigation of the likelihood of a massive landslide collapse of the right bank, lubricated by the impounding of water behind a dam wall hundreds of metres high[2]. To add complexity, the river valley here has rich unconsolidated layer of sediment is in places 250 metres thick, yet the Longpan dam is to sit atop it, a hazard unfamiliar to dam builders.

Given the cumulative impact of water diversion aqueducts, hydro dams, tourism infrastructure, road expressway and high speed rail bridges, UNESCO has responded, in 2017 expressing alarm: *"Pressure on the property primarily stems from infrastructure development. Spatially separating conservation and development is not, in and of itself, an effective strategy to 'harmonize the coexistence and relationship between development and the nature', as the State Party puts it in one of its fundamental objectives. The highly significant modification of the river systems, which gave the property its name, amounts to a profound landscape change, with additional threats from large-scale water diversion programmes. While the projects may be located outside of the "commitment area", the effects of disturbance, loss of connectivity, improved road access facilitating illicit activities and species invasions inevitably accompany large infrastructure projects beyond their spatial footprint. Besides, there are linkages between freshwater biodiversity and processes affected by dams and terrestrial ecosystems. Although located outside the property, the massive hydropower projects and the*

associated infrastructure objectively change the natural beauty and aesthetic importance of the valleys and their numerous important views, which contribute to the property's OUV [outstanding universal value] under criterion (vii), and cannot be restricted to selected elements of a landscape. Therefore, the visual impact of these infrastructure projects is considered to exert a direct negative impact on the OUV."[3] State of conservation of properties inscribed on the World Heritage List.

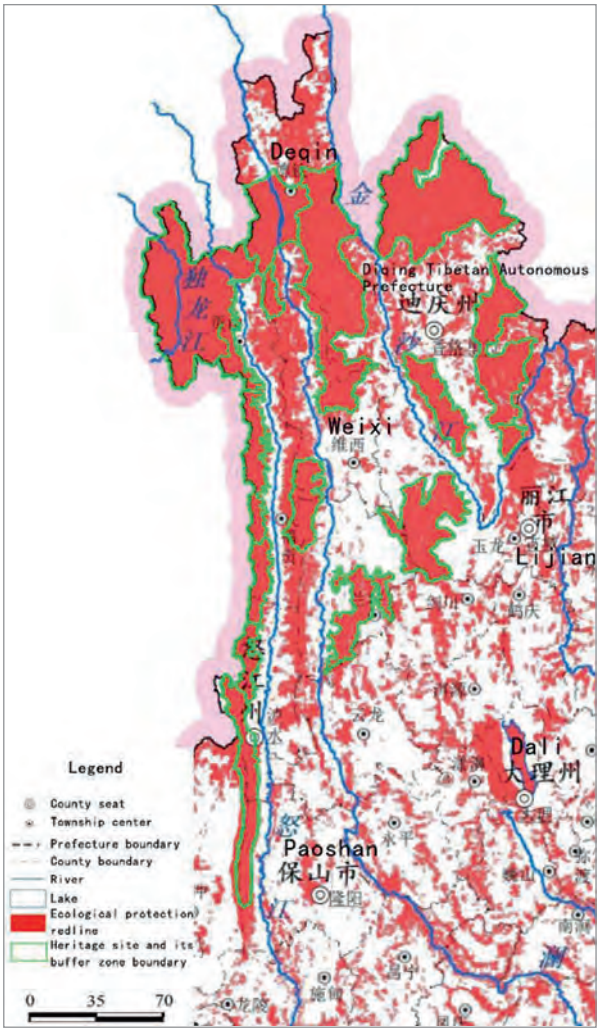


Figure 2. *Map featuring borders of the fragmented World Heritage Site on the backdrop of «ecological redline areas» allegedly closed to development by Yunnan Provincial Government. (China's SoC, 2018)*[4]

However, separating conservation and development is China's strategy, supported by a zoning system that makes all territory either economic or ecological. This rigid separation is acute in the UNESCO Three Parallel Rivers World Heritage site, where China, from the beginning of the nomination process, excluded the actual rivers from the protected area, including only extremely fragmented steep valley landscapes and peaks, between the three rivers.

This is a nonsense, and UNESCO let China succeed, while knowing the dam plans had accumulated for decades, awaiting construction. A landscape is a landscape, especially where mountain rivers incise deep valleys and microclimates conducive to the abundance of medicinal herbs found on the steep slopes above the three parallel riverbeds, precious to Tibetan and Chinese traditional medicine alike. China's partitioning of the valleys and gorges from the rivers is instructive: the valleys are too steep for farming or other economic purposes, and are thus classified as waste land suited to World Heritage status; whereas the rivers rushing the gorges are economic, primarily for their hydropower, flood control and water diversion potential, long measured and assessed by Chinese engineers. A further reason the Dri Chu/Jinsha is an economic asset is that dams slow the river, leading to deposition of sediment behind dam walls, thus relieving the Three Gorges Dam, farther down the Jinsha/Yangtze, of the threat of silting up.

UNESCO concedes it lacks any jurisdiction over areas outside the scattered jigsaw pieces under its protection, yet expresses its concern at "*projects located outside of the 'commitment area'*". In response, in late 2018, China issued a bland State of Conservation report referring vaguely to the prospect of even more dams: "*One hydropower development project, so called one reservoir with eight cascades, along Jinsha River midstream has accomplished constructions of Liyuan, Ahai, Jiananqiao, Longkaikou, Ludila and Guanyinyan power stations. Two of planned stations, Longpan power station and Liangjiaren power stations, the Ministry of Environmental Protection states, as the aspects of ecological and environmental protection, Longpan power station and Liangjiaren power stations need to be further studied before making any decisions. The relevant construction plans and EIAs have not been completed, reported and ratified. And they are not under construction*". 2018 State of Conservation report by the State Party.[5]

UNESCO is again humiliated. Environmentalists in China are horrified to see the steady progression of the Longpan 6000 megawatt dam through the official approval process, as part of "green development", along with investments in wind power and solar power, listed as a priority for construction.[6]

Tiger Leaping Gorge (Gisling/Wikimedia)

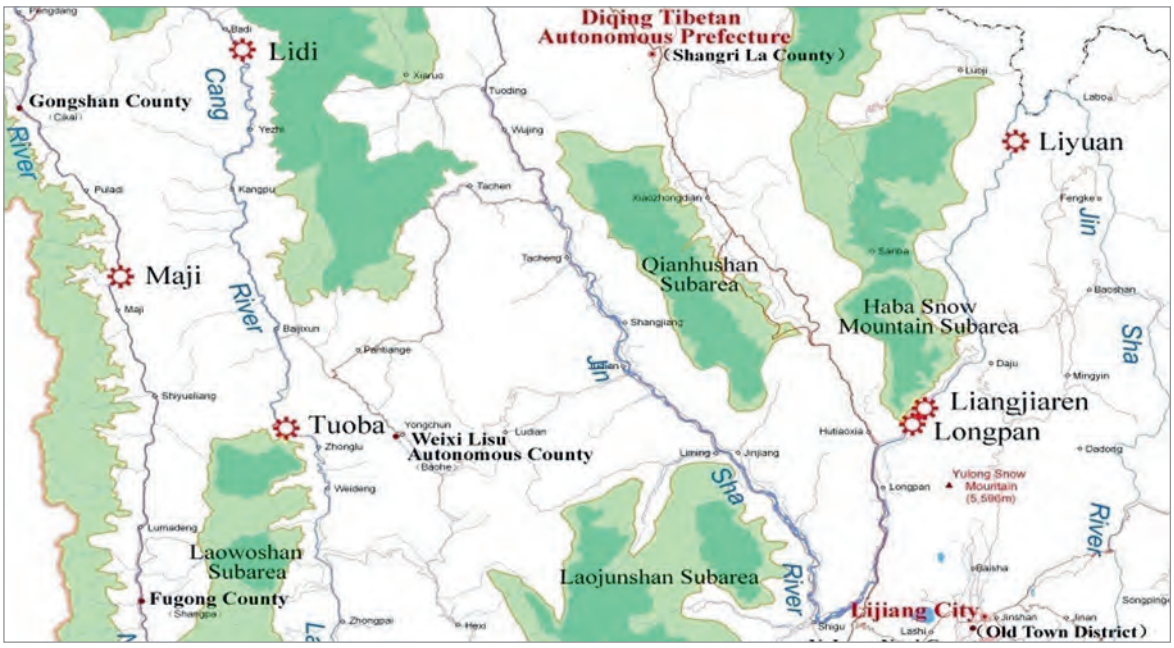
What has changed since 2007? Why are the Longpan/Tiger Leaping Gorge dam construction plans now again high on the infrastructure construction agenda? Much has changed, tilting the playing field in favor of the engineers. The economy has slowed down and an easy way to spur it is in multiplying infrastructure megaprojects executed by giant state-owned companies. Above all, the political climate has worsened, with no-one permitted to question the central leader, who firmly believes in bright future of the state-run corporations.

China's environmentalists can no longer openly express their anguish. They find themselves in the same position Tibetan environmentalists have suffered for decades: silenced by diktat. This plea, written at the urgent request of Chinese environmentalists, is their only way of alerting the world that UNESCO must not, yet again, allow its precious heritage brand equity be trashed by overdevelopment in and around its World Heritage sites.

What has also changed since 2007 is that central, lowland Yunnan has battled to cope with chronic excessive extraction of water, for heavy industry, intensive irrigation crop farming and fast growing cities. Lakes once admired for their beauty are now clogged with toxic algae, unusable. There were five years of rain deficit in central Yunnan, starting 2009, and calls grew stronger to solve all problems by channeling off the Jinsha where it makes that sharp turn back to the north.

In 2016 the planned "*average annual water diversion is 3.403 billion cubic meters, of which 2.231 billion cubic meters are supplied to urban life and industry, 500 million cubic meters for agricultural irrigation, and 67.2 to the Dianchi Lake, Wuhu Lake and Yilong Lake.*"[7]

To some, that is a modest water diversion, only 8 per cent of the Jinsha's flow. However, it will be mostly withdrawn when the river is lowest, in the drier months from September to February. Subtropical lowland Yunnan grows crops year round, if irrigated.



Hydro-electric power projects on the headwaters of the Three Parallel Rivers.
Map: http://tibetanplateau.blogspot.com

UNESCO has not remonstrated with China over this project, although it was publicly launched in 2015, with a construction phase of eight years. Officially it is the Dian(Sui) Zhong Water Diversion Project 滇中引水工程[8]. The headline for the 2015 launch: "*China initiates enormous Yangtze water diversion scheme.*" Publicity emphasizes the attractions of remediating smelly, toxic lakes, but most of the extra water is for industry and agriculture, as specialist publications acknowledge.[9]

Diversion of the Jinsha to central Yunnan and beyond, and the construction of the Tiger Leaping Gorge Longpan hydro dam go together, proponents argue: "*Call for the Yangtze River leading reservoir to be launched as soon as possible. Located in the mouth of the Tiger Leaping Gorge in Yunnan, Longpan Reservoir is the leading reservoir of the 17 cascade hydropower stations in the Yangtze River. It is also the best water source for water diversion in the central Yunnan Province. Its comprehensive social and economic benefits are outstanding and irreplaceable. It is necessary to resettle 100,000 people. The Suizhong water transfer plan is closely related to the Longpan hydropower station. The article studies show that the Longpan hydropower station is the best solution for efficient water transfer.*"[10] Pumping a lot of water uphill takes a lot of energy, so what better than to have a massive hydropower dam close by?

Other industries, within UNESCO's World Heritage protected area, have drawn expressions of concern from UNESCO, notably mining. Yunnan is known for its copper deposits, for which demand grows as the power grids sending hydropower far to coastal eastern China grow. For centuries, copper was extracted from many locations in Yunnan from open pits, damaging wide areas. Today, China is part of a global mining industry, owning modern copper mines in Africa and Latin America, largely underground. However, in spite of repeated UNESCO protests and Greenpeace exposes, open cut scratching surface mining of copper, also molybdenum, persists.

But there are further impacts: two high suspension bridges spanning Tiger Leaping Gorge, one for an expressway road, another for high speed rail[11]. The road bridge is due for completion in 2019, the rail bridge later. Because rail lines need gentle gradients, there is a lot more tunneling required. Tibet is drawn closer to China, more accessible to more people, less remote, more consumable.

China's developmentalist state is back in full strength, with simultaneous construction of hydropower dams, aqueducts and tunnels to divert much of the Dri Chu/Jinsha/Yangtze across 600 km of Yunnan farmland, expressway road bridge and high speed rail bridge, all concentrated in a small area of deep gorge and raging mountain river far below the dam wall, 260 m below the expressway suspension bridge. The Longpan dam alone will require emigrating 100,000 people, mostly belonging to minority groups, to be relocated elsewhere.

Altogether, extensive tourism infrastructure spanning across the river, ongoing copper and molybdenum mining, water diversion and the Tiger Leaping Gorge dam at the head of 17 to 25 dams further down the Dri Chu/Jinsha add up to major impacts on World Heritage, which in part was predetermined by its compromising awkward design accepted by UNESCO bodies. Now its global outstanding universal values are being rapidly destroyed being converted into earthly economic values and political gains of state-driven industrial development.

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3 2017 World Heritage Committee. State of conservation of properties inscribed on the World Heritage List https://whc.unesco.org/archive/2017/whc17-41com-7B-en.pdf

4 2018 State of Conservation report by the State Party http://whc.unesco.org/en/list/1083/documents

5 2018 State of Conservation report by the State Party http://whc.unesco.org/en/list/1083/documents

6 The 2019 NDRC Catalogue of Green Development Projects lists as "green projects" names Longpan among 12 new dams on Jinsha River (Baihetan, Yebatan, Lawa, Batang, Jinsha, Changbo, Boluo, Gangtuo, Xulong, Benzilan, Yinjiang, Longpan) http://www.ndrc.gov.cn/gzdt/201903/W020190306355285916258.pdf (in Chinese) repeating the list featured in 2016 Renewable Energy Plan for the 13th 5-year period. https://policy.asiapacificenergy.org/node/2837 (In English).

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11 https://www.youtube.com/watch?v=tvjBaeUG2vo

Cumulative Dam Impacts Threaten the Chitwan National Park

Evidence collected by the RwB from local sources

The Budhi Gandaki River at planned reservoir upstream from Chitwan National Park. (RwB)

Nepal is now experiencing active hydropower development, with 100 MW of capacity being added annually over the last two years. The Government of Nepal, encouraged by the international donor community, firmly believes in the competitiveness of its expensive-to-build hydropower, despite all evidence about a worldwide decrease in dam construction and growing affordability of solar energy. Having to date only 1 GW of hydropower capacity, Nepal is planning to build 15 GW more within the next decade. Hydropower exploration and construction licenses have been issued in a haphazard manner practically for any river in Nepal, disregarding its natural or social significance. As a result, many conflicts with other natural and social values arise, including encroachment on land-use rights of indigenous and marginalized people. Several attempts to undertake strategic environmental assessments for large hydropower schemes have not properly incorporated river

ecosystem values and functions and thus did not help to improve planning. The current attempt by the World Bank to accomplish in one shot river basin management planning, hydropower master-planning and strategic environmental assessments for all major basins of the country is destined to fail due to inherent bias, built-in conflict of interest and lack of meaningful public participation[1]. As the number of sizeable hydropower projects increases, cumulative impacts of multiple dams built on the same river will start having detrimental effects on downstream freshwater ecosystems, unless consciously addressed by planners.

There is an acute need to assess the impacts of existing and proposed water infrastructure on Chitwan National Park inscribed as natural World Heritage in 1984. The Chitwan National Park (CNP) is renowned for its unique diversity of habitats, flora and fauna and outstanding natural features. The park is home to several endangered species of wildlife including the One-horned Rhinoceros, Royal Bengal Tiger, Asiatic Elephant, Gangetic Dolphin, Gaur, Great Hornbill, Bengal Florican, and Gharial. The Beeshazori and Associated Lake, a Ramsar Site in the buffer zone, add to the significance of the park. Climate change has been one of the most serious challenges for biodiversity conservation and the main potential impact of climate change to CNP is related to the invasion of alien species, degradation of habitats such as grasslands, wetlands and shrinkage of riverine mixed forests, as stated in SoC Report submitted for consideration in 2019. Those impacts can also be greatly exacerbated by flow regulation effects from multiple dams built upstream of the CNP.

The Narayani (Gandaki) River Basin is experiencing the fastest rate of development of water infrastructure in Nepal with at least 17 hydropower projects and many water diversions already built upstream of Chitwan National Park. Approximately 30 additional projects are at advanced stages of development, while overall number of licenses for hydropower prospecting and construction in upstream areas, likely, exceeds 100. The ADB in 2018 published a report "*The Impact of Dams on Fish in the Rivers of Nepal*"[2] which suggests "that the fish population in Nepal's river basins with dams are in sharp decline".

A most recent example is a project for water diversion (inter-basin water transfer) from Kali-Gandaki River to Butwal municipality in Tinau River Basin, which is being designed now at the request of the Government of Nepal. The project is designed to divert 82 cubic meters per second to generate 140 MW at two hydropower stations and then use water for irrigation in another river basin. The municipality of Rampur and another 9 municipalities are located downstream of the diversion point and upstream of Chitwan World Heritage Property. Those areas are already experiencing the effects of hydropeaking from previously built hydropower projects, which affect lifestyles of locals and economic activities, for example, conditions for ecotourism rafting along the river. If this diversion project proceeds without all necessary safeguards local municipalities should expect downstream areas along the Kali-Gandaki river to experience up to 75% decrease in water flow, which will degrade natural ecosystems and livelihoods of local people. The heavily modified flow of Kali-Gandaki will likely lead to negative impacts on riparian ecosystems of Chitwan National Park downstream, as well as on the well-being of local communities.

Narayani (Gandaki) River is formed by the confluence of Kali-Gandaki and Trishuli River and one may argue that unnatural modifications at one river, Kali-Gandaki, could be offset by natural flow regime of another tributary - Trishuli. However, the real situation is just the opposite. Trishuli river basin is the most heavily modified by hydropower from among all basins in Nepal as documented by a hydropower cumulative impact assessment undertaken under supervision of the IFC. Somehow not covered by that assessment the Trishuli's major tributary Budhi-Gandaki is now targeted for development of the largest hydropower storage project in the country. The ready to start construction 1200 MW project, designed by Tractebel Engineering and now offered for development to China Gezhouba Co., has several cubic kilometers of water retention capacity and is intended to provide maneuvering power to the national grid of Nepal, and specifically to the nearby capital - Kathmandu. Development of such hydropower will inevitably result in severe modification of the natural flow regime affecting all areas downstream, including Chitwan National Park and transboundary impacts on the Indian part of the basin. The high arch dam of Budhi-Gandaki Project is designed just within 45 kilometers of the epicenter of the 2015 earthquake that devastated World Heritage monuments and the economy of Nepal, increasing risks for downstream properties in the case of dam failure during the next large earthquake.

Children run across Budhi-Gandaki River in Town of Arughat, sentenced to be drowned by hydropower reservoir (RwB)

In 2019 the World Heritage Committee Session will review a State of Conservation report submitted by the Government of Nepal. Unfortunately, this document does not present an assessment of impacts and risks related to upstream water infrastructure existing and planned. We believe that all the above mentioned large water infrastructure\energy projects should not proceed until their individual and cumulative impacts have been assessed and consulted with affected stakeholders including the World Heritage Center and the IUCN.

Therefore, the World Heritage Committee should request the following from the State Party of Nepal:

- Undertake a strategic environmental assessment of water infrastructure\hydropower development in the Narayani (Gandaki) River basin with the aim to assess current impacts and establish requirements for water withdrawal limits and an environmental flow regime that safeguards the outstanding universal values of the World Heritage property and livelihood of communities around it.
- Undertake and consult with stakeholders EIAs of Kali-Gandaki interbasin water diversion, Bhudi-Gandaki Hydro and other large water infrastructure projects with the result to be reviewed by the World Heritage Convention bodies.
- Undertake a cumulative impact assessment of all existing and planned water infrastructure and hydropower development projects in Narayani (Gandaki) River basin on the OUVs of the Chitwan National Park and submit CIA Report to be reviewed by the World Heritage Convention bodies.
- To abstain from approving and starting construction of any large water infrastructure\hydropower development projects in the Narayani (Gandaki) River basin upstream from Chitwan National Park until the results of all the above listed assessments are finalized, consulted with local stakeholders and reviewed by the World Heritage Convention bodies.

1 http://english.onlinekhabar.com/nepals-hydropower-boom-needs-strategic-assessment-and-public-oversight.html

2 https://www.adb.org/publications/impact-dams-fish-rivers-nepal

Sikkim's Vanishing Rivers: Ongoing Destruction and Impending Threats

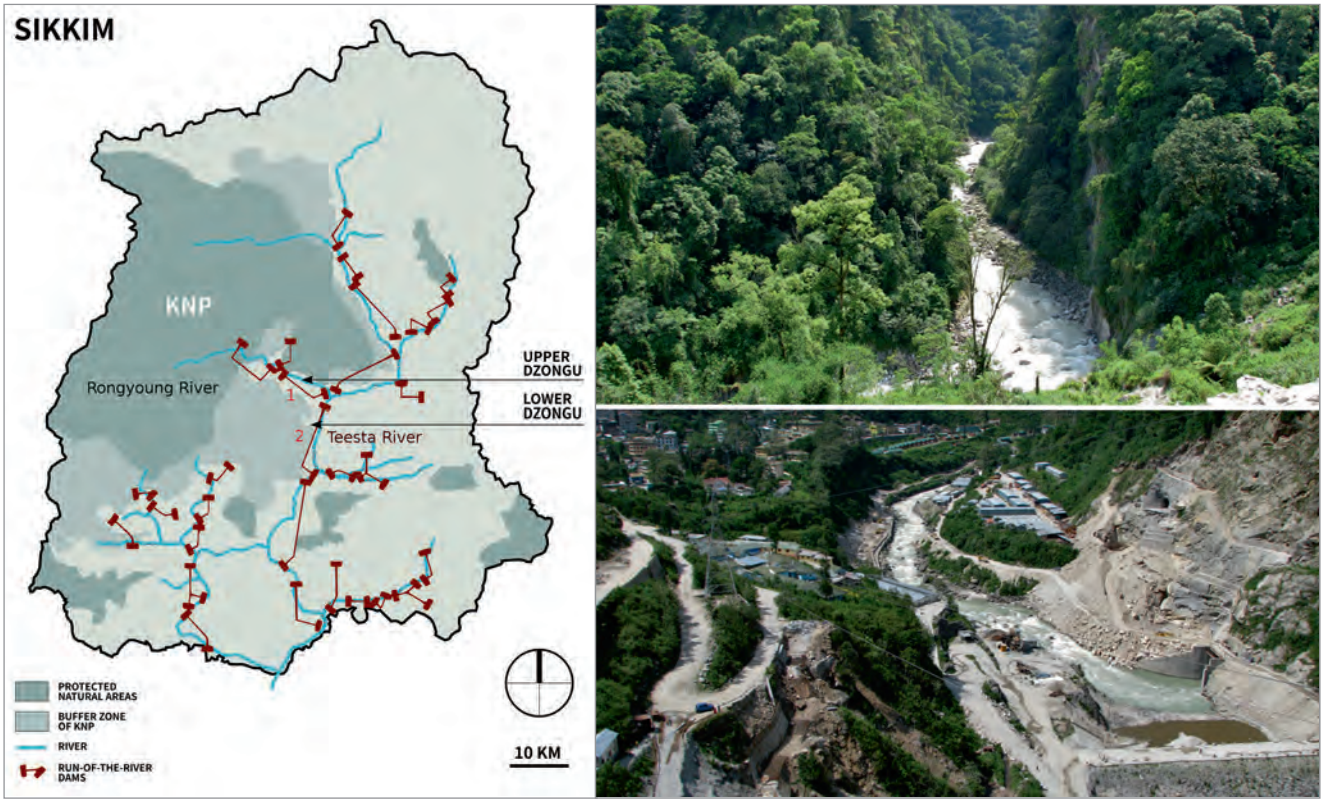
Tseten Lepcha & Gyatso Lepcha,
Affected Citizens of Teesta, with Shweta Wagh

Khangchendzonga: the sacred summit as seen from Sikkim (Helena India Travels)

The Khangchendzonga National Park (KNP) in 2016 was inscribed on the UNESCO World Heritage list as a Mixed site which recognises both its natural and associative cultural values. As the indigenous people of the region, we Lepchas have initially welcomed the nomination since we believed that the inscription would empower local communities in the region, provide international acknowledgement and recognition to our sacred landscape and cultural practices, strengthen our rights over forests and landscapes that we inhabit, prevent destructive development activity and the ongoing desecration of our sacred sites.

The core area of the Kanchenjunga Biosphere Reserve, designated in 2000, coincides with the protected area of the KNP. Its buffer and transition zones include human inhabited landscapes and settlements at lower elevations that lie outside the protected natural core. These The physical landscape spans across four altitudinal regions, including the trans-Himalayan, alpine, temperate and the subtropical, and consists of a diversity of landscapes and habitats ranging from snowfields, glacial lakes, alpine forests and meadows to deep gorges and densely vegetated valleys, which contain the tributaries and basins of the Rangit and Teesta rivers. Agrarian landscapes and indigenous settlements are sustained through traditional practices of communities making the region a repository of bio-cultural diversity..

Mount Khangchendzonga is revered by inhabitants of the region as their guardian deity, and a mythical sacred landscape encompasses the sacred summit and its adjacencies. The Lepchas have a cosmology intricately interwoven with the land. Practices and rituals that involve the dedication of sacred groves, rivers, caves, lakes, springs, forests and landscapes to ancestral spirits or deities, embody the culture and identities of our communities (Aurora 2006, p. 65).



Left: *Layout of the KNP and series of run-of-the-river dams proposed along the river Teesta and its tributaries. Map by Tseten Lepcha, Gyatso Lepcha, Shweta Wagh.*

Right: *Dams have had a devastating and irreversible impact on rivers and the fragile mountain ecology. Photo: Shweta Wagh*

During the past decade, our region has been faced with an onslaught of destructive development as the Sikkim State Government has proposed and attempted to execute a series of 27 dams over the river Teesta in order to harness the hydro-power potential of the river and its tributaries (Parvaiz, 2017). Since we consider the river as our lifeline and an indispensable part of our sacred landscape, we have been at the forefront of the struggle to prevent the destruction and desecration of our sacred river. Our sustained resistance along with other Buddhist communities in the region eventually led to the scrapping of four dams which had been proposed within the National Park and on its peripheries.

Dzongu, the Lepcha indigenous reserve, is a steep mountainous forested terrain where less than 40% of the land is human habitat. It occupies the buffer and transition zones of the Biosphere Reserve. Here we practice sustainable agro-forestry and mountain based farming, share an intimate relation and have a history of coexistence with nature. Dzongu has been described by experts as one of the richest landscapes among the 'Himalayan biodiversity hotspots', besides being designated as an 'Important Bird Area.' It is home to approximately 287 species of birds and about 312 species of butterflies. The rivers in the area form a rich ecosystem, a lifeline for a range of terrestrial and aquatic fauna. A local resident pointed out that when he scanned through the Nomination Dossier, he realised that although lakes have been listed as sacred sites, rivers, as a part of the sacred landscape, have barely been mentioned. This is surprising to him, as Sikkim's sacred rivers play a significant role in both Shamanic and Buddhist ritual practices and ceremonies. One cannot help but wonder if this deliberate omission has something to do with the dams.

Although the dams in Sikkim were presented to the people as a harbinger of development and progress, they have had an irreversible and devastating impact on the mountain ecology, made the landscape more precarious and vulnerable to landslides and flash floods, resulted in migrant influx to remote areas and also severed social relations within communities.

Of the two hydel power projects proposed within the Lepcha reserve that lie in the Transition Zone, one is barely half a kilometre away from the Buffer Zone of the Park. The sacred river Rongyoung originates in the Khanchendzonga range and flows through the deep gorges and densely forested valleys of Dzongu before it meets the Teesta. We are striving to keep the river flowing free as after death our souls will travel all the way up the Rongyoung to their final resting place in the mountains.

After WH inscription the situation in Dzongu seems to have worsened. Despite unanimous resolutions against dams in Dzongu being passed by local villagers, these projects still remain on the government's agenda. A recent case of dynamite explosion at the work site of the 300 MW Panan hydro power project in Dzongu led to the erosion of a hillside, the destruction of houses in an upstream village, and the formation of an artificial dam blocking the course of a free flowing river at Mamtam in upper Dzongu. Since then the people living above the lake have been facing a humanitarian crisis as no vehicle can pass through. Even though the High Court has ordered for the draining of the lake, the State Government wants to keep the lake for tourism purposes. This reflects the State's agenda to commodify and commercialise sacred sites without respecting for the needs or sentiments of the local people.

Protest against the Teesta IV Project Hydro Power Project in Lower Dzongu. (Gyatso Lepcha)

Contrary to our initial belief that the World Heritage Status would be a huge protection against ongoing destructive activities, confining the boundary of the property to the protected area of the National Park has made it easy for the State Government to continue with several previously planned projects. An Eco-Sensitive Zone which had been proposed around the Park would have provided legal protection to indigenous landscapes. But its extent in Dzongu has been reduced from 10 km to 25 meters from the boundary of the Park.

The World Heritage listing undermines the very values that it claims to protect. India's "first Mixed Heritage Nomination" seems to have mainly benefited government officials and the tourism industry while undermining the rights of the Lepcha communities and our role as custodians of the landscape. Unless the designation can ensure the protection of our lands, forests and rivers and safeguard our cultural beliefs and practices which are on the verge of extinction, the World Heritage Inscription as it stands today is meaningless.

The State Party is deliberately undermining critical tangible and intangible values of the landscape in order to suit its own developmental agenda. If the listing was meant to be a recognition of "deep cultural meanings and sacred significance" of the landscape as the dossier suggests, then why is it that indigenous sacred landscapes which are integral to the site have been marginalised and excluded from the core.

Recommendations:

In order to safeguard the integrity of the site, we therefore recommend that UNESCO should:

1) Ask the State Party to extend the core area of the Inscribed Property to include the buffer and transition zones of the Biosphere reserve.

2) Demand that all dams in Dzongu and the buffer and transition Zones of the Biosphere Reserve be scrapped and the destruction due to existing projects be reversed.

3) Insist that the boundaries of the Eco-Sensitive Zone around the National Park be increased once again to at least a distance of 10 km.

4) Make sure that the rights of Indigenous communities are safeguarded and they are involved in all decision-making processes that affect their sacred sites and landscapes.

5) Ask the State Party to mention and emphasize Sacred Rivers in the nomination dossier with recommendations for their protection and management, which includes keeping rivers free flowing and to keeping the remaining stretches of dammed rivers as free flowing.

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Landscapes of Dauria – Endangered Soon After Inscription

Vadim Kirilyuk, Daursky Biosphere Reserve;

Sukhgerel Dugersuren and Eugene Simonov, Rivers without Boundaries International Coalition

Ulz River (V.Kirilyuk)

The Dauria steppe is a highland region in the east of the Eurasian continent, and many rivers flow out across the borders. These rivers are of high ecological value and support globally important natural heritage sites: the Selenge River - the main source of Lake Baikal, the Onon – the largest tributary of the Amur River, the Kherlen flows into the Dalai Lake Ramsar Wetland, and the smallest watercourse - the Ulz River - is draining into the endorheic Torey Lakes.

The trilateral Dauria International Protected Area (DIPA) was founded here at the junction of the borders of Russia, Mongolia and China in 1994 through the combination of four separate protected nature areas. The creation of this trilateral protected area, consisting of functionally connected wetland and steppe habitats, is of high importance for biodiversity conservation in Dauria, in particular for the protection of migratory birds and mammals. Besides biodiversity and ecosystem conservation, an important function of the international protected area is monitoring and scientific study of natural processes and phenomena in the Dauria steppe ecosystem. (Kirilyuk et al, 2013)

Russian and Mongolian components of DIPA formed the basis for the World Heritage property "Landscapes of Dauria" inscribed in 2017. Cyclic climate changes with distinct wet and dry periods lead to high species and ecosystem diversity which is globally significant and offers outstanding examples of ongoing ecological and evolutionary processes. (World Heritage Committee, 2017).

Although the natural ecosystems of the area have experienced relatively little human impact, the World Heritage nomination documents still identify many problems to be resolved such as overgrazing, frequent fires, hunting of birds, poaching, and fences blocking the migration routes of the Mongolian gazelle. However in the long-term the greatest challenge is competition for scarce water resources exacerbated by climate change.

The Ulz River basin in Mongolia occupies less than 9,000 square kilometers and is the main tributary of the endorheic transboundary basin of the Torey Lakes. The Ulz River has an extremely uneven flow, and in dry phases of climate cycle the river does not reach the Torey lakes for several consecutive years. Lakes go dry, and their bottom gradually turns into pasture for gazelle and horses until the next flooding, which may be delayed for 10 years and more.

The WH property is located off the main transportation routes, which helps to limit development of settlements and industries. Cattle breeding, crop farming and mining are the main economic activities. Water use in the Russian part is insignificant, comes from groundwater and is largely confined to the Solovievsk border crossing and Kulustay village. There are no known plans to increase water consumption in the Russian part of the Torey Lakes basin.

DIPA scientists work at Torey Lakes in dry year (V.Kirilyuk)

In Mongolia a recent baseline study commissioned by UNDP shows that water consumption is expected to increase 3 times in the river basin from 2011 to 2021. In 2010, consumption by mining was 3,6 million cubic meters or 71% of the total water use; and it would be up to 12 million cubic meters or 82% of total use in 2021. Studies have shown a high vulnerability of mining sector water supply to climate change. A water balance calculation of the Ulz River basin shows that 1.4 million cubic meters of water is used for livestock water supply in 2012, and will increase to 2,5 million by 2021. The remaining 2% are divided among irrigation and household use (GEF UNDP EBA Project, 2014). However, in 2016 a new water pumping station for a large irrigation project was under construction near the Dashbalbar settlement between the two core zones of the World Heritage property. Therefore total water consumption in 2021 could be higher that the UNDP forecast.

Mining is a dual threat to the quantity and quality of water flowing to the WH site. During the preparation of the nomination, Strahm and Vasilijević (2014) noted that mining operations had intensified in the areas inside and adjacent to WH buffer zones in the soums (counties) of Gurvanzagal and Dashbalbar. Two active copper-mining licenses belong to the Chinese-Malaysian BHM LLC company, which according to the Computerized Mining Cadastre System (CMCS) of the Mineral Resources Authority of Mongolia[2] has production facilities in the WH buffer zone at the junction of the Duchiyn and Ulz rivers. The CMCS database shows that since 2010 till 2018 the number of exploration licenses in the Ulz river basin decreased by half, but at least 2 exploration sites proceeded into the mining phase and ore processing plants are seen on satellite images.

In June 2015, IUCN received a letter signed by the Deputy Minister of Environment, Green Development and Tourism of Mongolia with assurances of complying with the requirements on absence of mining operations in the WH property and its buffer zone. The Mongolian State Party noted that Mongolian Law does not prohibit mining in protected areas, but that the legislation of Mongolia recognizes the priority of international agreements together with conventions and programs ratified by the country over the national legislation. This should guarantee that no mining operations would occur in the WH property (IUCN, 2017).

Presently mining is the most important water-consuming sector in the Mongolian part of the Ulz River basin. It also has been the most widespread source of river pollution in Mongolia, which resulted in widespread clashes between local herders and miners (Knox, UNHRC 2018). This is especially dangerous in the Ulz river basin where dramatic drought cycles regularly create extreme natural water deficits. Presently mining threats are manifested in many specific ways:

– Protection zones along rivers and forests and in headwaters instituted by the "Law with Long Name" (2009) are not explicitly shown on the CMCS digital map and are not fully observed.

– The Landscapes of Dauria World Heritage property and its buffer zone are not shown on the CMCS digital map;

– Many areas within the WH property are explicitly marked as "areas open to mineral exploration" on the CMCS map, thus allowing any company to start prospecting there;

– In 2017 a foreign mining company Xin Xin proposed an inter-basin water transfer to deliver water from the Onon River into the drying Ulz River to support mining, ore processing, as well as agriculture and "environmental needs".

Despite growing mining problems, the most immediate threat to the Ulz river and the WH property is overgrazing, increased by drought and movement of livestock to floodplains of rivers. Since the peatlands at headwaters and wet floodplain meadows of the Ulz are used by livestock during ever increasing drought periods, a serious loss in the water-retention capacity of natural ecosystems is expected by wetland scientists (T. Minaeva et al., 2016). Fencing was suggested as protective measure from over-

2 CMCS - Computerized Mining Cadastre System of the Mineral Resources Authority of Mongolia https://cmcs.mrpam.gov.mn/node/4?language=en

grazing sensitive wetland areas, which is yet to be implemented at necessary scale to prove its effectiveness (Simonov and Wickel, 2017). Overgrazing is not confined to headwaters and is known to occur throughout Mongolian part and near settlements in Russia causing competition and conflicts between local herder communities and Mongolian gazelle. Thus by November 2018 several large herds of gazelle (more than 100000) were forced to migrate to winter pastures across the border due to a lack of grass in the Mongolian part. Such mass migrations have not been recorded either in this or in the last century. And this testifies to the beginning of anthropogenic crowding out of the gazelle (not only overgrazing, but also intensive illegal hunting disturbing ungulates) from Mongolia to Russia.

In 2017 and 2018 at bilateral talks, the Mongolian side officially informed their Russian counterparts that in order "to protect crane habitat" and the "ecological integrity of the Torey lakes" there is a need to study the feasibility of an interbasin water transfer from the Onon to the Ulz river. Russian scientists expressed concern that an augmentation of the Ulz River flow will lead to unnatural changes in ecosystem dynamics, for exapmle, providing water flow during a dry phase when it is naturally absent. Mongolian scientists argued that in increasingly dry conditions endangered cranes and other wildlife may benefit from more even water supply if it is artificially secured. No specific plan was presented by Mongolian side for assessment of impacts. In November 2018 the topic was discussed in a meeeting of the Russian-Mongolian environmerntal cooperation commission, and the resulting document contains a clear statement: "Both parties take into consideration that maintaining a natural fluctuation of the water regime is a necessary condition to satisfy the criteria which led to UNESCO inscribing the area in the List of World Heritage Sites" (Commission on Environmental Cooperation 2018).

However in April-May 2019 Mongolian Information Agency broadcased that due to insistence of a Parliament Member N.Nombaibayar the "Onon-Ulz Water Trasfer Project" received 2.5 billion tugrugs from the state budget and construction should start in 2019 and conclude in 2020 (Monsame, 8 April 2019). On May 2 the Ministry of Environment issued a tender announcement for assessment of "Blue Horse" water storage and diversion projects on several rivers. This puts Landscapes of Dauria under immediate threat from a water infrastructure project, which has not been subject to any rigorous impact assesment.(MEGDT, May 2, 2019)

The World Heritage Committee at the 2019 Session in Baku has to request that Mongolia halts any preparations for the Onon-Ulz water transfer and subjects the project to an EIA undertaken jointly with Russian Federation and then submitted for revew to the World Heritage Center and IUCN.

We can suggest the following additional measures which if implemented in the near future would further reduce the probability of negative impacts from mining and water infrastructure:

1) Develop and enforce as a part of WH management planning science-based Environmental-Flow Norms that guarantee the delivery of a sufficient flow and sediments to the WH site in various phases of the climate cycle;

2) Regulate mining development in the Ulz-Torey basin using findings of assessment and valuation of vulnerability and risk for water resources due to climate change (GEF UNDP EBA Project, 2013);

3) Protection zones delineated according to the "Law with Long Name"(2009), as well as boundaries of the World Heritage property and its buffer zone should be shown on CMCS digital maps of the Mineral Agency of Mongolia and all other state-supported databases in both countries;

4) Russian authorities should develop a specific water monitoring and management system for their part of the Torey Lakes basin, which is practically absent in current schemes for water protection and management;

5) A Joint Mongolian-Russian Ulz River Basin Management Council should be instituted to ensure coordination in river basin management and joint management of the World Heritage property;

6) Increasing water use efficiency should become a priority for development plans in the Ulz River basin;

7) Joint management planning for the WH property and transboundary basin should be focused on ecosystem-based adaptation to climate fluctuations. A basis for this work already exists in both countries in the form of the GEF-UNDP-EBA Project completed in Mongolia, and a special research program on climatic implications for ecosystems and land-use undertaken by the Daursky Biosphere Reserve in Russia (Kiriliuk et al, 2012).

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Lake Baikal World Heritage — a Victim of Climate Change and Hydropower[1]

by the RwB and BROB

Editorial note: *Many government and industry players are marketing large hydropower as a «solution for climate change», while in reality it often exacerbates climate change impacts on the resilience of aquatic ecosystems and diminishes the adaptation capacity of local communities. Lake Baikal, threatened both by increasing climatic extremes and hydropower impacts, is a vivid example of such mismanagement and poor decision-making.*

Lake Baikal in Russia, the world's largest and deepest freshwater lake and a World Heritage site, since 1996, suffers the impact of both climate change and hydropower, and is further threatened by three reservoir projects planned in Mongolia (IUCN, 2015[2]). The Lake holding 20% of the world's unfrozen freshwater has been the major element in sustaining the stability of the regional climate systems of North Asia and the Arctic Basin. The Lake is home to over 2500 (!) aquatic species, more than half of them living nowhere else - biodiversity and endemism hardly known in any other lake on Earth. The Lake basin is divided between Mongolia and Russia, and 80% of the watershed of its main tributary the Selenge River lies in Mongolia. Mongols as well as local communities in Russia revere the Lake as the "Sacred Sea".

However, Baikal is not only a natural lake but also a hydropower reservoir for the 660 MW Irkutsk Hydro built on the outflowing Angara River in 1960. That structure has had the most profound negative effect on the Lake ecosystem and humans dependent on it. Lake Baikal has become the uppermost reservoir of the 4-dam Angara Hydropower Cascade, which displaced more than 300 communities with a combined

population of 101 500. Lake Baikal's surface expanded by 500 km^2 and water level was raised by 1 meter[3]. The integrity of the lake ecosystem was severely affected by the artificial rise and unnatural regulation of water levels that augment natural cycles. This has led to increase in erosion, losses in endemic and economically important fish, degradation of unique coastal ecosystems and historic relics, damage to coastal property of local people, conflicts between the Buryatia Republic that receives most of the negative impacts and Irkutsk Province where the dam is located. To prevent greater damage in the future, the limitation of allowable water-level change was explicitly prescribed by Government Regulations of 2001, but it did not address the unnatural timing and frequency of lake level fluctuations and had no special provisions for years of flood or extreme drought.

During 1998-2017 Lake Baikal was influenced by prolonged drought in Mongolia. In 2014, the Selenge River brought only half the water volume it normally supplied to the lake and water levels were gradually declining. Climate change results in rising water temperatures of this normally freezing-cold lake, creating a welcoming environment for invasive species and problems for endemics. Runoff from territories affected by catastrophic forest fires and sewage from the growing number of on-shore tourist camps has contributed to severe eutrophication of near-shore waters. Climatic fluctuations and human impacts have led to full-fledged ecological and a socio-economic crisis on the Baikal lakeshore with massive algae blooms, die-off of endemic sponge communities that filter lake water, decline in fisheries and increase in severe peat fires in the Selenge River Delta, which is a Ramsar wetland of international importance.

In fact, the Irkutsk Hydro, holds the keys to better climate adaptation on Lake Baikal and helping it to overcome the crisis, but its owners do not recognize such global responsibility. By regulating water flow the Irkutsk Hydro has the technical capacity to alleviate some extreme climate impacts, but in fact it is operated in a way that exacerbates the negative consequences for the ecosystem and people due to a conflicting need to continue to generate energy in the Angara River hydropower cascade and supply water to cool thermal power plants. These coal-fed thermal power plants and dams are owned by the same En+ Group, whose shares since 2017 are traded at the London Stock Exchange. The problem could be fixed by reconstruction of the old water intake structure, but the company refused to cooperate on that. Instead in 2016 the Government allowed the lake level to be lowered below the critical minimum point prescribed by the 2001 Regulations for 1 year. That not only impacted lake ecosystems, but affected lakeshore rural communities, who experienced shortages of drinking water due to dropping water levels in wells as well as a decrease in fisheries due to shrinking spawning grounds.

Since 2017 the En+Group (and its owner Oleg Deripaska) claimed that it produces "green aluminum" with the help of "clean hydropower". Responding to criticism by NGOs and an inquiry from the UK Listing Authority the Group acknowledged in its LSE Prospectus that it plans to reduce negative impacts on Lake Baikal. But the Group has not implemented this promise, as it has been busy bullying its CSO critics in press and denying that the Angara dams have any negative impact. In December 2017, The Russian Government extended permission to exceed the previously established "maximum and minimum water levels in Lake Baikal" for another 3 years, till 2021, thus subjecting the ecosystem to stress caused by hydropower impacts. Business and state agencies lack the capacity to monitor and analyze ecological changes and to create a solid comprehensive climate adaptation management system to safeguard the Lake. Repeated requests from the World Heritage Committee to the Russian Federation to assess the environmental impacts resulting from the intended changes in water regulation and upgrade the ecological monitoring system have not yet been honored by the State Party[4].

At the same time new threats for Baikal are unfolding, as the Mongolian Government is claiming its right to develop a hydropower cascade in the transboundary Selenge River basin. New dams built upstream may present the last drop that triggers an abrupt loss of resilience and degradation of the Lake Baikal ecosystem, similarly to what is happening now at Lake Turkana Parks World Heritage site in Kenya[5]. In addition, dams in Mongolia will disrupt the transport of sediments, destroy spawning habitats and block migration of economically valuable and endemic fish, such as Baikal Cisco and Baikal Sturgeon listed by the Bonn Convention on Migratory Species.

Pristine Egiin Gol River at the Dam Planning Site (Paul Robinson)

In 2015 the China EximBank prepared to lend funds[6] needed for 315 MW Egiin Gol HPP construction by Gezhouba Co., while the Engie Group's subsidiary Tractebel Engineering was designing on the Eg River the largest HPP in the Selenga basin[7]. The World Bank Group, in violation of its own safeguard policies, identified two additional hydropower dams in the Baikal Lake Basin for feasibility studies by its MINIS Project in Mongolia[8]. Mongolia has also listed large hydro as #1 request for international funding in the INDCs[9] under the Paris Agreement. Reservoirs are marketed both as mitigation and adaptation measures.

The World Heritage Committee at the 39th Session and three subsequent sessions[10] set forth requirements for EIAs of the planned Egiin Gol Hydro, Shuren Hydro and other smaller dams, as well as a basin wide bilateral SEA on hydropower water management and analysis of alternatives that should provide consistent guidance to subsequent EIAs of individual dams. The World Heritage Committee requested Mongolia not to approve any dam projects until those assessments have been completed and reviewed by the World Heritage Center and IUCN.

In addition, a complaint by local citizens and NGOs from Russia and Mongolia was filed in 2015 at the WB Inspection Panel[11]. That resulted in 2-year long scrutiny and comprehensive recommendations for WB MINIS project on strategic regional environmental assessment and meaningful public participation mechanisms[12].

It is obvious that in water-scarce Mongolia hydropower potential contributes less than 0,1% of all renewable energy resources. More than 70 000 people have signed a petition asking the Mongolia, Russia and China leaderships to use their unique capabilities to support solar and wind energy development in Mongolia instead of hydropower dams and coal thermal plants[13]. While all hydropower projects have been stalled, over the last 5 years Mongolia has connected to the grid 200 MW of wind and solar capacity and much more is in a pipeline. Even President Putin asked leaders of Mongolia and China to consider alternatives to hydropower as they plan cooperation under the Belt and Road Initiative[14].

Cognizant of previously overlooked risks, in 2016, the China EximBank backed out of the Egiin Gol Hydro project[15] and redistributed its loan to less risky needs of Mongolia, such as a wastewater plant in the capital. Despite hesitation among investors and huge external debt, Mongolia in its Mid-term Energy Program still lists Egiin Gol Hydro among projects that should start in 2019-2023. In 2019 Mongolia announced bidding for an "additional EIA" for Egiin Gol Hydro to partially fulfill the WHC

requirements. In September 2017, the Mongolian Government and the World Bank cancelled tenders for feasibility studies of two other dams and pledged to undertake a strategic regional environmental assessment (REA) of hydropower and water management in Selenge-Lake Baikal Basin, wide analysis of alternatives in energy and water sector, and ensure full participation of Russian stakeholders. However, none of those actions promised by the WB has been implemented so far. In 2017, the Rivers without Boundaries International Coalition sent a proposal on how to bridge the remaining differences and start a strategic assessment to fulfill all major World Heritage Committee requirements and thus start a comprehensive management plan for the Lake Baikal World Heritage property to all parties[16].

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1 Based on information provided by : Vladimir Tchouprov, Greenpeace Russia; Dr. Sergey Shapkhaev of BRO for Baikal, Sukhgerel Dugersuren, Rivers without Boundaries, Mongolia; Dr. Eugene Simonov, Rivers without Boundaries; For more information contact the RwB: coalition@riverswithoutboundaries.org

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7 Tractebel Engineering has participated in other 'dirty' projects causing UNESCO's concern—like Gibe III Hydro in Ethiopia on Omo River, where a dam is causing damage to Lake Turkana National Parks in Kenya.

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The Mesopotamia Marshes in Peril

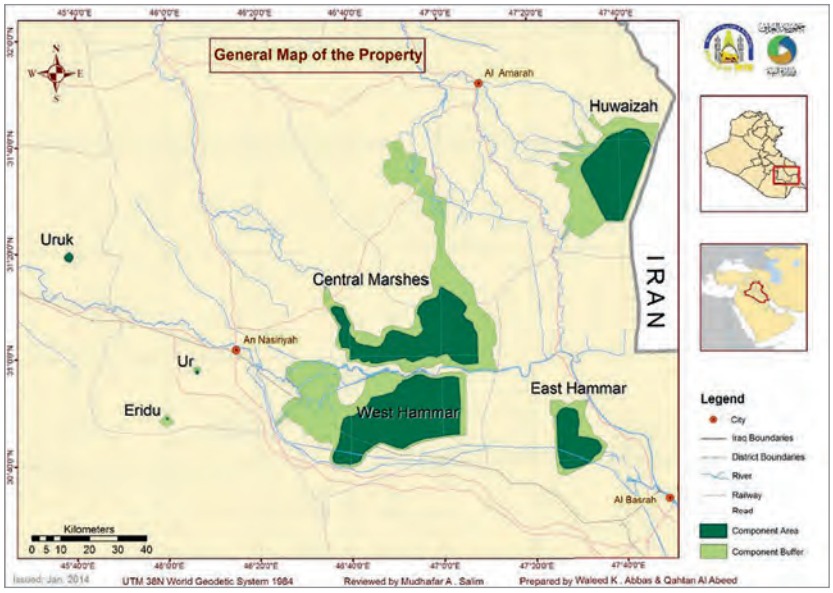
Toon Bijnens, Save the Tigris Campaign

The Iraqi Marshes (Toon Bijnens)

After partial recovery from the deliberate draining done in the second half of the 20th century, the Iraqi Marshes today face the threat of upstream dam construction. The main challenge is to ensure the minimum amount of water flows needed to sustain the Marshes, mostly from the Tigris River. The Marshes are part of the Ahwar of Iraq UNESCO World Heritage. In 2018 Iraq experienced an arid summer and suffered severely from a scarcity of water. The construction of Turkish and Iranian dams and projects on the Tigris River, shared with Iraq, exacerbated this crisis. These infrastructure projects are undertaken without studying their impact on Iraq or their environmental and biological impacts, and affect mostly the South of Iraq including the marshlands, which received low inflows. Water scarcity in Iraq has a disproportionate effect on the living conditions of Marsh Arabs, many of whom have become internally displaced after having lost their livestock or in an attempt to find water for their animals. Due to rising salinity as a result of dam construction, the fish stocks in the marshlands have also greatly decreased. Since animals do no longer always guarantee an income for those who live in the marshlands, migration from the marshes has increased. Their cultural knowledge could be lost as a result of the change in the environmental conditions, namely the lack of water.

Over the past 15 years, the Iraqi government has failed to take action to prevent negative impacts from upstream water infrastructure projects. The Ilisu Dam reservoir in Turkey is scheduled to start filling and operating this year and could protentially reduce water flows on the Tigris River by 50%. Baghdad acknowledges an agreement is needed with its upstream neighbour in order to sustain the water flows to Iraq and in particular the Marshes. The Iraqi government will have to establish water agreements and transboundary agreements not only with Turkey but with Iran as well. Construction of dams on the Karoun River, a tributary of the Tigris, have reduced water flows to the Marshes, while other dams such as Daryan and Sardasht on tributaries in the northern stretch of the Tigris have restrained water flows going to Iraq from Iran. Even though Iraqi authorities have reached out to Tehran in multiple visits and dialogue has been further fostered with the help of Ramsar, there is no agreement yet on the border and water shares in order to sustain these shared Mesopotamian marshlands.

The Government of Iraq in its 2019 State of Conservation Report to the World Heritage Committee reported that the amount of water delivered to the Ahwar in 2017 and 2018 was below the minimum flows identified for restoration by the government-adopted Strategy for Water and Land Resources in Iraq (SWLRI). The long-term future of the Marshes is threatened by lack of coherence in Iraq's water strategy. The SWLRI recommends no further dams should be built until agreements have been reached with upstream states on downstream flows. Yet the Kurdistan Regional Government (KRG) in its most recent masterplan envisions 18 large dams being built in the Kurdistan Region, and the KRG has recently announced the construction of 3 dams in the Greater Zab River basin, the last large free flowing tributary sustaining natural water regime of the Tigris River and the Marshes. Construction of large dams is intended by Turkish and Chinese construction companies: it is likely impossible that this could proceed without support from Turkish and/or Chinese state-owned banks and funds. This policy incoherence must be addressed if the State Party of Iraq is to meet the World Heritage Committee's requirement that the appropriate regime of sufficient environmental flows to the Iraqi Marshes are maintained. A basin-wide strategic environmental assessment (SEA) of existing and proposed dams on the Tigris-Euphrates Rivers and their tributaries, with a specific mandate of assessing future impact on flows to the Ahwar marshlands, is lacking. Meanwhile any new dam construction and planning should be abstained from until such an SEA has been undertaken and reviewed by the World Heritage Center and IUCN. Other countries, as parties to the Convention, should abstain from supporting\financing construction of reservoirs in the Tigris-Euphrates basin until the SEA is completed and sufficient safeguards are put in place to sustain the Ahwar of Iraq.



Map of the Ahwar of Iraq (Source: UNESCO)

There have been meetings and dialogues between Iraq and Turkey, but no engagements with Iran. Iraq is in a weak position as a downstream state; Turkey and Iran have not signed the 1997 UN Watercourses Convention which would govern transboundary waters. The 2014 "Memorandum of Understanding in the Field of Water between the Ministry of Forestry and Water Affairs of the Republic of Turkey and the Ministry of Water Resources of the Republic of Iraq" commits Iraq and Turkey to equitable shares of water, but it does not specifically address maintaining environmentally sufficient water flows to the natural sites and traditional Marsh Arab communities of the Ahwar, despite Iraq and Turkey being parties to the World Heritage Convention. Iraq, Turkey and Iran should specifically plan and implement such environmental flows, designed on the basis of ecological research, in a binding legal agreement.

In April 2019 the first Mesopotamian Water Forum took place, a gathering of civil society organizations from Iraq, Turkey, Iran, Syria. The Forum adopted a Declaration calling for collaboration on transboundary waters and protection of the marshlands[2].

1 Also see an essay on Greater Zab by Alex Kemman in the «Wild rivers» section of this volume.

2 See text of the Declaration http://www.transrivers.org/2019/2613/

Upper Svaneti — Upper Enguri River Basin under Threat

Manana Kochladze. CEE Bankwatch Network

Editorial note: *This sad example from Georgia demonstrates how massive hydropower development undermines the outstanding universal values manifested in a World Heritage site, which is too tiny to protect "landscape values" it celebrates. Landscape values and livelihoods reliant on traditional uses and tourism in Svaneti are threatened and destroyed with financial incentives purposefully provided by lead European international banks: the EIB and EBRD. Although no immediate threat has been documented for the property itself, some hydropower designs are dangerously close to it, others threaten objects identical to those protected as the World Heritage, and the hydropower master-plan is attacking the key values of this unique mountain region .*

The central artery of the Upper Svaneti - fierce and scenic Enguri River has been for long blocked by defunct Enguri Dam. (Photo by CEEBWN and RwB)

A UNESCO World Heritage site, the Upper Svaneti[1] boasts spectacular mountain scenery, mediaeval villages and tower houses fit for a fairy tale. It is one of the most beautiful and picturesque alpine regions of Georgia, situated on the southern slope of the main Caucasian range, its virgin waters cascading steeply downward from stunning mountains such as the twin peaked Ushba through glaciated highland valleys to the rivers Enguri, Kodori and Tskhenitsali.

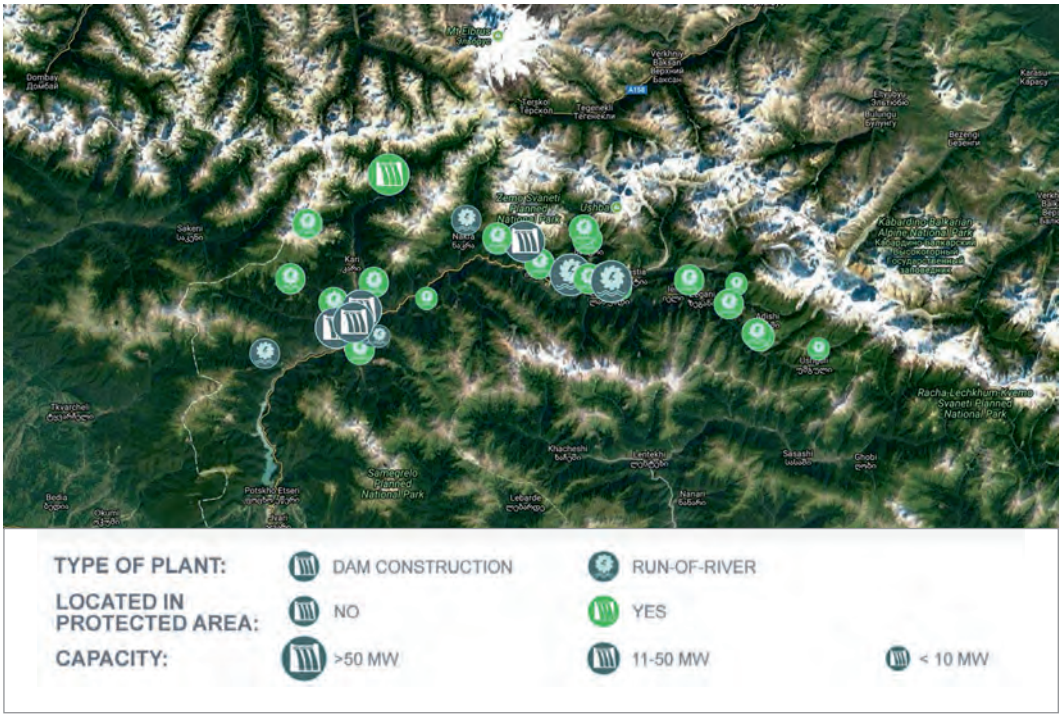
Preserved by its long isolation, the Upper Svaneti region[2] of the Caucasus is an exceptional example of mountain scenery with medieval-type villages and tower-houses, and picturesque landscapes, with a unique lifestyle. The famous Svanetian towers, erected mainly in the 9th-12th centuries, make the region's villages more attractive for visitors, while many towers remained with the dwelling houses and other facilities.

The upper part of the River Enguri basin combines sub-alpine forests and meadows, rocks and alpine tundra. The area is well known for its endemic wildlife. This includes different forest bird species, large raptors (golden eagle, griffon vulture and lammergeyer), and endemic birds including the Caucasian black grouse, the Caucasian snowcock and the Caucasian chiffchaff. Mountain goat, chamois, brown bear, wolf, lynx, roe deer, and wild boar are quite common. The area includes two proposed protected areas of pan-European importance: the Upper Svaneti National Park and the Upper Svaneti Protected Landscape at an altitude of 600 – 5.200 m above the sea level.

The Svaneti is populated by Svans, Georgian ethnic subgroup, who have maintained their own language, laws, traditions and customary ties to the land. They rely on subsistence agriculture, animal grazing and forestry. The harsh living conditions and isolation have harnessed a strong sense of community cohesion and sociocultural integrity. Tourism based on exceptional natural-cultural landscapes is a backbone of the local modern economy of the region[3].

A small part of the Upper Svaneti was inscribed by UNESCO as "Upper Svaneti" World Heritage site for the following broad values: Criterion (iv): The region of Upper Svaneti is an outstanding example of an exceptional mountain landscape composed of highly preserved villages with unique defensive tower houses, examples of ecclesiastical architecture and arts of medieval origin. Criterion (v): The region of Upper Svaneti is an outstanding landscape that has preserved to a remarkable degree its original medieval appearance notable for its fragile traditional human settlements and land-use patterns. (***The WH site occupies 1.06 ha and has 20 ha buffer zone...***)

The "outstanding universal values" of this land, once recognized by UNESCO as "exceptional mountain landscape", is now being destroyed and degraded in the name of "clean energy development" by hydropower construction companies and international finance institutions.



Map: *Hydropower Plan for Upper Svaneti (bright green - dams inside proposed protected areas)*

Georgia plans to build more than 140 large and medium sized hydropower plants. Yet with 85 percent of electricity needs satisfied and exports not being taxed, these plans will rather benefit private investors than offering sustainable development for Georgia[4]. At the moment 35 hydropower plants are slated for development in the Upper Svaneti region of Georgia. All of them are located in the Enguri River basin and 25 plants are located on the territory of the planned Upper Svaneti National Park and the Upper Svaneti Protected Landscape. The rush to build hydropower plants in Georgia is not backed by any energy strategy and without regard for the combined environmental consequences and socio-economic impacts (see map).

Meanwhile, the history of hydropower in this basin has been very problematic. In the 1961 the construction of the Enguri Dam, started on the Enguri River. In parallel, a scheme for energy use on the middle and upper parts of the river was developed to ensure the "full exploitation of the river's energy

potential". The construction of the 270 meter high arch dam on difficult geological formations along the banks of the Enguri river was challenging and led to serious deficiencies in the functioning of the first dam. Engury Hydro energy production is far below its 1320MW capacity, it breaks down almost annually causing massive country-wide blackouts and its reservoir has to be emptied regularly to excavate accumulated sediments. To alleviate sedimentation problems and decrease risks of failure another 200 meters high arched dam with an underground hydro station was slated for construction upstream in Zemo Khudoni[5]. Though initial construction on the Khudoni dam began in 1979, protests from local populations, civil society groups and the newly-christened national movement, combined with momentum from the impending dissolution of the Soviet Union, led construction to a halt ten years later[6].

Only a trained eye can recognize in this «rock» the abandoned 700 MW Khudoni Dam. (RwB)

A new attack on the Upper Enguri Basin started in 2005, when the government attempted to restart the construction of Khudoni Dam, but it was forced to give up after the fierce opposition of locals, but it is still hoping to build Khudoni in the future. However, implementation of numerous HPP projects in the Upper Svaneti area are gaining momentum as hydropower construction licenses are handed out for most watercourses of the region.

In 2016, Georgia's government decided to drastically reduce the size of the Candidate Emerald site Svaneti 1 (based on plans for the Upper Svaneti National Park and Upper Svaneti Protected Landscape) in an attempt to simplify plans, without even notification of the Bern Convention bodies. The area excluded from protection contains sites for many planned hydropower projects. Replying to the complaint from CSOs, the Bern Convention Secretariat stressed that "*the site comprises some of the most pristine nature areas in Georgia*" and expresses its concern "*over the fact that the area of the Svaneti 1 Candidate Emerald site has been drastically reduced.*[7]"

The decision to downsize the Emerald Network site unties the hands of the Government of Georgia, to justify the environmental clearance (2015) of the Nenskra Hydropower Plant project on free flowing rivers Nenskra and Nakra.

New Hydro Power Plants: Nenskra and Mestiachala

The 280 MW Nenskra project includes the construction of a 135 meter rock fill dam on the Nenskra River, which would flood up to 400 ha of forests and communal lands. Additionally, a 13 meter dam and 12.4 kilometer diversion tunnel will be built to bring water from the Nakra River to the Nenskra reservoir. The scheme will considerably reduce the natural flow of the Nakra river, leaving just 10 per cent of average annual flow downstream regardless of seasonal fluctuations. The project costs more than 1 billion Euro and is supported by EBRD, EIB, and potentially ADB and AIIB. The project is being implemented by JSC Nenskra hydro, special purpose vehicle of South Korean state-owned company K-Water and the Georgian State JSC Partnership Fund.

Left. *Hiking in Upper Svaneti. Tourist enjoy mountain landscapes with untamed rivers. (CEEBWN)*

Right. *Landslide in Nenskra Hydro reservoir area (CEEBWN)*

Svaneti is a geologically sensitive area prone to landslides and mudflows. Nakra has a history of mudflows that destroyed a local cemetery and agricultural fields. Locals who have for long called for a protection system fear that the planned works on the Nakra river could cause flooding of their village. Since July 2018 locals are even more concerned as a major flood devastated infrastructure and estates along the Nenskra in the Chuberi community[8]. One month later, the same situation occurred in nearby Lekhizer, where a glacial lake formed in 72 hours and then caused three days of flooding on the Mestiachala river in Upper Svaneti, which is at another hydro-construction site. While the creation of the lakes from stone avalanches is a well known natural process, scientists are worried about the increasing pace of the process caused by climate change[9].

The 50 MW cascade of Mestiachala HPPs is located in Svaneti region, in the north-western part of Georgia. The construction of the derivation type plant, commenced in May 2017. In April 2019, the first phase (30MW) of Mestiachala hydro power plant, was commissioned. The construction has been followed by numerous protests since late 2017, as the construction of HPP creates a danger for Mestia township safety. The blasting for construction of derivation tunnels for Mestia has a drastic impact on the Lekhizer glacier, especially coupled with climate change effects. In September 2017, the river flooding caused the destruction of the HPP construction area and also a flood in the town of Mestia due to the derivation of the streams.

From the very beginning, the hydropower projects increased tensions within and among Svan communities in the region. Numerous strikes have been organized since January, 2018 both in Svaneti and Tbilisi to protest the HPPs. Due to an incident between the company and locals in Chuberi, the Nenskra construction Company Salini Impregilo was forced to halt construction and leave the area. In most cases, the government uses police force against protestors. In the Mestiachala conflict in 2018, the Ministry of Interior was appointed as mediator and was threatening and blackmailing locals to force them to agree to the company's proposals.

The situation has worsened with licenses being given by the Georgian government for exploitation of placer gold deposits in Svaneti by dredging river beds. The Government gave a gold license to Optical System INC on 39 000 ha that includes historic villages, pastures, agricultural lands and rivers. The Company started exploration in 2016 but was stopped by locals. In 2017 conflict revived when the company again tried to complete exploration works and started dredging. The company requested the prosecutor's office to start criminal cases against local protesters.

Left: *Construction of Mestiachala HPP in 2017. Ancient Swan towers in Mestia seen on the backdrop at the foot of the mountain. (Photo by Austrian construction company Convex*[10]*).*

Right: *Ancient towers of Mestia in their natural landscape (CEEBWN 2018).*

Massive protests of Svans have burst out both against the hydro development and gold mining over the last few years. The situation escalated so much, that on March 4, 2018 a general meeting of all Svan communities (Lalkhor) was called in Mestia, and issued a joint statement on the indigenous status of Svans, demanding not to implement any HPP or extractive projects without their free, prior informed consent. The declaration stated, "*We categorically and forever prohibit construction of hydropower plants, gold mining and any other activities that harm natural livelihoods, material and non-material cultural heritage! From now on, the HPPs in Svaneti will not be constructed. As defined by international legislation, any infrastructural development project will require our consent,*" says the statement. More than 3 000 signatures were collected under the Declaration in the Upper Svaneti, where the overall censused population is only 11000 people.

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1 https://whc.unesco.org/en/list/709

2 https://bankwatch.org/svaneti

3 https://edoc.hu-berlin.de/bitstream/handle/18452/3820/224.pdf

4 https://bankwatch.org/project/hydropower-development-georgia

5 https://ejatlas.org/conflict/khudoni-dam-georgia

6 https://bankwatch.org/documents/khudoni_dam_study.pdf

7 https://bankwatch.org/wp-content/uploads/2017/11/Let_IO_GGeorgia_Svaneti_Site_Stand_by_14112017.pdf

8 Iliauni Institute, Center for Earth Studies, https://www.youtube.com/watch?reload=9&v=lhSo0plc_wY

9 http://www.ge.undp.org/content/dam/georgia/docs/publications/GE_UNDP_EE_Upper_Svaneti_adaptation_Climate_Change_Eng.pdf

10 http://www.convex.at/projekte/kw-mestiachala-1-2/

Lake Ohrid and Hydropower

Daniel Scarry, Ohrid SOS

Black Drin River at Lake Ohrid. Bridge of the Poets (Brams/ Wikimedia)

With 2,000,000 years of continuous existence, ancient Lake Ohrid lies in the centre of the Balkan Peninsula on the border of the Republics of Albania and Macedonia, cushioned between the Mokra and Galichica Mountains. It is Europe's oldest inland water and deepest by average depth. Longevity and isolation have enabled over 200 world-unique species to persist and evolve in its waters, and, when measured by surface area, it is thought to be the most biodiverse lake on Earth (Albrecht and Wilke, 2008). Related to this exceptional diversity, Lake Ohrid has become known globally as a natural laboratory for the observation of evolutionary phenomenon and a haven for research into climate and environment history over tens of thousands of years (Wagner et al, 2017). It has additionally been a World Heritage Site since 1979 on account of its outstanding natural phenomena.

In the 1960s, the River Black Drim, Lake Ohrid's only outflow, attracted attention for hydro potential and dams were constructed along its course at Globochica (1965) and Shpilje (1969). In part to increase this hydro potential and avoid siltation at Globochica Reservoir, the River Sateska was rerouted to flow directly into Lake Ohrid in 1961/62 from its original path as a tributary of the River Black Drim (UNESCO/ICOMOS/IUCN, 2017). From habitat fragmentation to changes in the composition of Lake Ohrid's unique ecosystem, several negative environmental impacts have resulted from the presence of the dams; their daily operations; and the artificial inflow.

One of the main sources of disturbance has been the River Sateska, whose detrimental influence has led to declines in water quality. Bringing up to 129 tonnes of suspended matter daily, it is the source of 39% of Lake Ohrid's phosphorous inputs from tributaries and 29% of its nitrogen (Ministry of Culture, 2018), both of which unnaturally elevate nutrient levels and drive eutrophication processes in a location where many species are adapted for low-nutrient, high-oxygen and high-clarity conditions (Matzinger, 2004). The sediment load additionally causes homogenization of the lake bed, leading to changes in the distribution of flora and fauna (GIZ, 2016), empowering cosmopolitan taxa in place of their world-unique counterparts (Matzinger, 2007). Alien species are also a risk (UNESCO/ICOMOS/IUCN 2017). Presently, the Republic of Macedonia is exploring options to revert the River Sateska to its original path, although the cost of restoration will be several millions of Euros even before attempts are made to reverse the in-lake damage that has already occurred.

Manipulation of Lake Ohrid's water levels is an additional threat. These are regulated via a sluice on the River Black Drim in the town of Struga on the lake's north coast in order to service hydropower facilities. Macedonian law states that Lake Ohrid's water level must be maintained between 693.10 and

693.75 meters above sea level, although the lower level should only be approached in extreme circumstances. Inappropriate management of the water flow has seen the level drop below the legally prescribed limits in recent years with potentially detrimental ecological and environmental consequences, particularly in shallow areas where most of the lake's ecosystem activity occurs (Ohrid SOS, 2017; IUCN, 2017).

On the one hand, sedentary bottom-dwelling fauna are unable to travel relatively large distances to access water when the level drops; on the other, the exposure of previously underwater areas to air sets off oxidization and mineralization processes, which affect water quality when larger waves subsequently wash in (Ohrid SOS, 2017). Focus on legal rather than ecological parameters creates blind-spots too: November 2018, an estimated 500 kilos of Alburnus scoranza, a Western Balkan endemic fish, suffocated after entering a canal on the lake's east coast to shelter from the winter (Prof. Dr. Trajce Talevski, Hydrobiological Institute Ohrid, personal communication). Although Lake Ohrid's water level was above the 693.10m legal minimum at the time, it was insufficient to maintain oxygen levels for the wintering fish in this localized area, resulting in their death.

Fish populations have been impacted in other ways as well. Dams on the River Black Drim have obstructed the migration of the European eel (*Anguilla anguilla*) to its breeding grounds at the Sargasso Sea. The eel is a critically endangered species, its population is now artificially restocked, a process which has been associated with the introduction of new parasites to the Lake Ohrid's ecosystems (Stojanovski, 2010).

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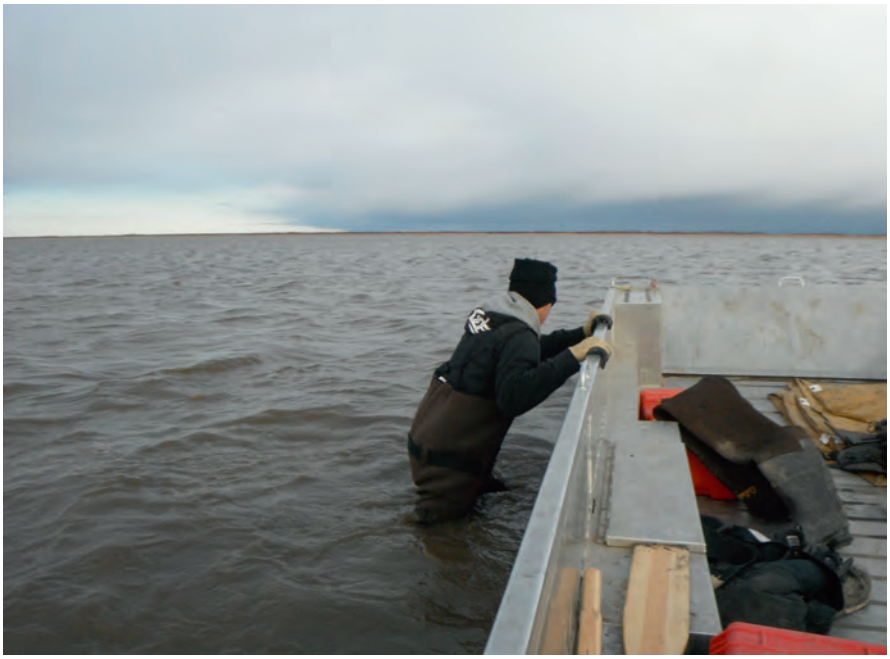
Death of a Delta: Negative impacts of hydropower projects on Canada's largest World Heritage Site

By Mikisew Cree First Nation



Community based monitoring crew pushing the boat after it got stuck due to low water levels (Mikisew Cree First Nation)

The Peace Athabasca Delta in northeastern Alberta, Canada, is one of the largest inland freshwater deltas in the world and a major feature of the Wood Buffalo National Park World Heritage Site. Because of five decades of flawed water management on the two main rivers that create the Delta, the Peace Athabasca Delta is now in a state of crisis and requires immediate corrective action. Unfortunately, instead of corrective action, jurisdictions upstream of the World Heritage Site continue to approve new hydroelectric and oil sands projects on the rivers that create the Peace Athabasca Delta, resulting in ongoing deterioration of the "heart" of this World Heritage Site.

The Peace Athabasca Delta is the heart of the Wood Buffalo World Heritage Site

The Peace Athabasca Delta is formed at the western end of Lake Athabasca. It is comprised of two separate deltas, the Peace delta and the Athabasca delta, each with its own distinct hydrologic regime. The Peace River Delta is primarily fed by flows from the Peace River basin arriving from the west, while the Athabasca Delta's main source is Athabasca River flows from the south. The Peace River is the largest of the tributaries for the Delta and the most significant for its ecological integrity.

The life of the Peace Athabasca Delta depends on a complex process that includes three hydrologic recharge mechanisms: hydraulic damming, flow reversals, and ice jam flooding in the Peace River. These mechanisms interact with the flow of the Athabasca River to yield a mosaic of recharge opportunities that have sustained the Delta's overall water budget for centuries. When these mechanisms function properly, the Peace Athabasca Delta supports more than 200 species of birds, including endangered whooping cranes and peregrine falcons, and dozens of mammals, including endangered woodland caribou and wood and plains bison.

The Peace Athabasca Delta has been called the "heart" of the Wood Buffalo National Park World Heritage Site, which is Canada's largest world heritage site. The Peace Athabasca Delta was considered a foundational element of the property's inscription as a World Heritage Site in 1983. Indeed, much of the uniqueness and richness of the Property is attributable to the Peace Athabasca Delta, which IUCN concluded has "a hydrological system that is probably unique in the world". Many elements of the Wood Buffalo World Heritage Site's Outstanding Universal Value – such as the great concentrations of migratory wildlife, free-ranging wood bison populations – depend on the Peace Athabasca Delta. A 2016 Reactive Monitoring Mission to the Wood Buffalo World Heritage Site concluded that the Peace Athabasca Delta was the "disproportionately important and disproportionately vulnerable" feature of the Wood Buffalo World Heritage Site.

The history of dams and water management upstream of the Wood Buffalo World Heritage Site

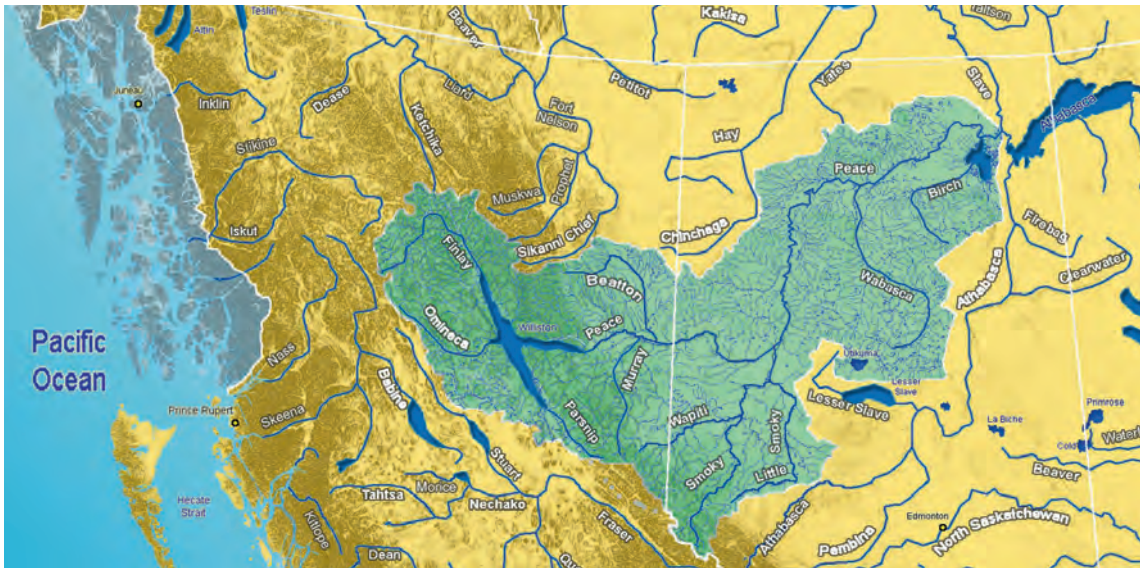


Figure 1. Map of the Peace and Birch River basins. *The largest driver of change in Peace-Athabasca Delta condition has been the development of multiple hydropower projects on the Peace River. Of the main rivers that flow into the PAD, only Birch is left free-flowing. (Wikipedia)*

The past five decades have seen a significant increase in industrial activity affecting the hydrographs of the two main rivers that converge and interact to form the Peace Athabasca Delta. The largest driver of this change has been the development of multiple hydropower projects on the Peace River. The Peace River experienced natural flow conditions until 1968, when construction of the WAC Bennett dam was completed and reservoir filling began. Since then, two additional hydro-electric projects have been constructed on the Peace River and a new hydro-electric project is currently under construction.

Five decades of hydro-regulation of the Peace River has shifted the pattern of seasonal flows on the Peace River (resulting in decreased summer flows and increased winter flows) and damped flow extremes, creating a less variable annual flow regime and, because the water is held back, the river now does not have the power to replenish water bodies in the Delta. Government scientists and Indigenous knowledge holders report that changes in the flow regime on the Peace River resulting from hydro-electric projects, in combination with climate change effects, have caused water levels and spatial extents in the Delta to decrease, resulting in the drying trend that is killing the Delta.

Industrial development on the Athabasca River, where millions of gallons of water are withdrawn to support oil sands projects, adds further pressures on the Delta. Annual, winter, and summer flow rates on the Athabasca River have declined over the past fifty years. The reported causes of the flow rate declines in the Athabasca River are water withdrawals, changes in climate, or a combination of both.

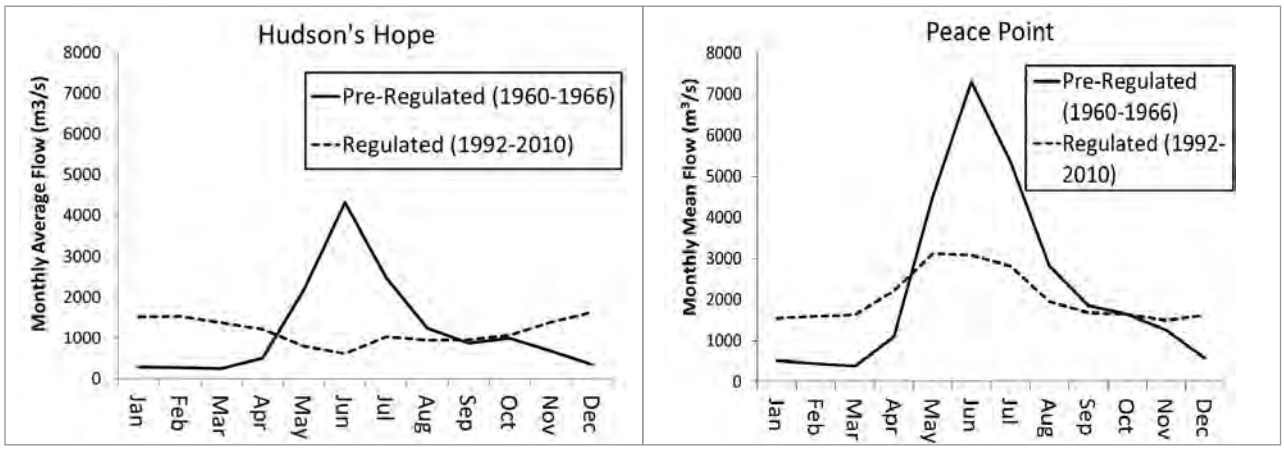


Figure 2. *Monthly mean (both regulated and unregulated) flows during 1960-1966 (wild) and 1992-2010 (regulated) for a) Hudson's Hope, BC and b) Peace Point, AB. (adopted from Carver, Martin, May 2016)*

Negative environmental consequences of river management upstream of the Wood Buffalo World Heritage Site

The 2017 report of the Reactive Monitoring Mission to the Wood Buffalo World Heritage Site concluded that "...while located outside of WBNP's boundaries, in some cases at large distance, it is undeniable that industrial development has changed the quality, quantity and flow of water of the two major rivers feeding the PAD with additional concerns about air quality."

The net effect of the decades of hydropower projects along the Peace River, in combination with oil sands project and climate change, is significant impairment of water recharge mechanisms and a critical situation for the Peace Athabasca Delta. The reductions in ice jam and open water flooding have reduced water levels in the Delta, leading to declines in water depth and resulting in a loss of resilience and function in both ecological communities.

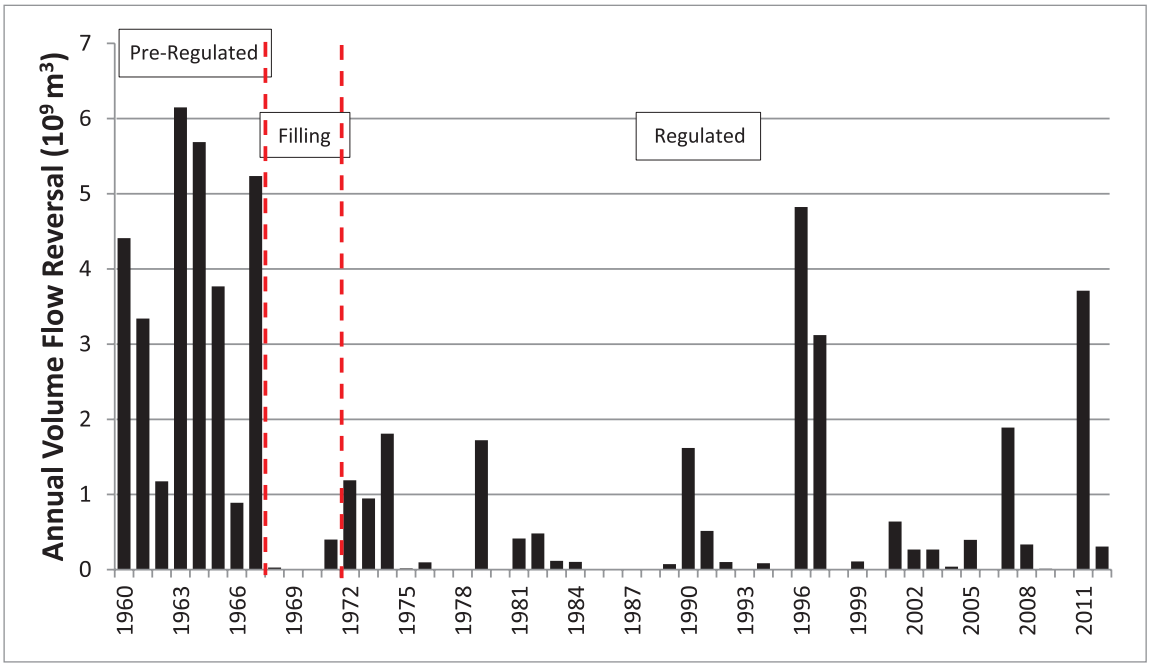


Figure 3. Effect of Peace River on the PAD's flow-reversal recharge mechanism.
Plot illustrates the annual volume of reversed flow, highlighting the sharp drop in flow reversals with regulation and the even sharper decline during the reservoir-filling period. (adopted from Carver, Martin, May 2016)

Negative social-cultural consequences of river management on indigenous peoples within the Wood Buffalo World Heritage Site

This has had devastating consequences for the indigenous communities that rely on the Wood Buffalo World Heritage Site to maintain their ways of life. The Mikisew Cree First Nation, one of those indigenous groups, has recently sought help of the international community to compel the Canadian government to do something about this devastating situation.

Recent assessments: Current approaches to river management are likely to result in the elimination of World Heritage Values

The 2017 report of the Reactive Monitoring Mission to the Wood Buffalo World Heritage Site concluded that the future of the Peace Athabasca Delta is uncertain at the very best. The report noted that "[t]he concerns coincide with the absence of effective and independent mechanisms to analyse and address these concerns at an adequate scale... The measurable changes and anticipated future changes are not only critical for the inhabitants and users of the PAD, they are also critical for the entire national park and World Heritage property."

In 2018, a strategic environmental assessment undertaken by the Canadian Government at the request of the World Heritage Committee confirmed that all ecological indicators for the Peace Athabasca Delta are declining and that hydropower projects, oil sands projects and climate change are all causes. That report concluded that: "Without immediate intervention, this trend will likely continue, and the world heritage values of the Peace Athabasca Delta will be lost."

Figure 5. *Trends and Stressors Table from 2018 Strategic Environmental Assessment of Wood Buffalo National Park*

Valued Component	Current Trends and Stressors in the PAD	Trend Direction
Peace River Seasonal Flows	Seasonal flow rates in the Peace have become much less variable due to flow regulation on the river and (past) climate change, resulting in decreased summer flows and increased winter flows.	↓
Peace River Sedimentation	Sedimentation in the Peace River is increasing due to the reduced erosional force of the river resulting from changes in flow regime	↓
Ice Jam Recharge	Increased winter flows on the Peace River have increased freeze up elevations, resulting in decreased ice jamming flooding frequency, and reduced recharge of perched water basins. Winter releases of water have resulted in poorer quality ice.	↓
Open Water Recharge	Reduced summer flows in the Peace River and reduced flows in the Athabasca, in combination with (past) climate change, have decreased open water recharge	↓
Lake Athabasca Water Levels	Reduced summer flows on the Peace and reduced seasonal flows on the Athabasca have decreased water levels in Lake Athabasca. Weir operation has increased winter water levels and produced a less variable water regime	↓
Central PAD Lake Water Levels	Reduced summer flows on the Peace and reduced seasonal flows on the Athabasca, in conjunction with (past) climate change, have decreased water levels and extents	↓
Sufficient Water for Indigenous People to Navigate Safely	Winter water releases on the Peace River have resulted in reduced quality and quantity of ice, reducing or eliminating access to areas of the PAD in winter. Lower water levels have reduced or eliminated access to the inland PAD lakes and back channels.	↓

Latest Step: New Dams, New Oil Sands Project but no corrective actions

Unfortunately, current indications are that the problems will continue to get worse. The provincial governments of British Columbia and Alberta continue to approve new industrial projects that will add further incremental and cumulative effects to this already damaged ecosystem, including new hydropower projects. Water management frameworks continue to be configured so as to avoid curtailing industrial operations. Despite many years of concerns being raised by the World Heritage Committee, there remains no indication that the Canadian government ensure that river management frameworks are revised to ensure the protection of the Wood Buffalo World Heritage Site.

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Beyond the Dams: the Impact of the Cóndor Cliff – Barrancosa Hydropower Project[1]

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Fundación Ambiente y Recursos Naturales (FARN)

(Image: Turba Contenidos)

The Cóndor Cliff-Barrancosa Hydropower Project in Patagonia will impact natural ecosystems with high preservation value, especially the Los Glaciares National Park World Heritage property, and also will threaten future generations' access to water, violating the UNESCO Declaration on the Responsibility of the Present Generations Towards Future Generations.

In 2014, the government of Argentina signed the contract to build the Cóndor Cliff-Barrancosa Hydropower Project in Santa Cruz river (previously known as "Nestor Kirchner - Jorge Cepernic dams"[2]), financed by the China Development Bank Corporation (CDB), Industrial and Commercial Bank of China Limited (ICBC) and Bank of China Limited (BoC). The project is in the facilities building phase, and is undertaken by the joint venture of Represas Patagonia, integrated by Gezhouba Group Corporation (CGGC), a Chinese state-owned company, partnered with Hidrocuyo S.A. and Electroingeniería S.A., Argentinian companies.

This project exemplifies a general trend that by 2014, as it became difficult to access international financing, Chinese banks emerged as one of the main creditors of Argentina, with a total of USD 18,200 million. Since that year, Argentina has signed more than 20 bilateral agreements with China to obtain investment for infrastructure and transport works. Agreements are based on raw materials and minerals extraction and energy productions benefiting China with direct acquisition and preferential agreement conditions. Such projects are problematic given the simplified procedures and questionable social licenses, distinguishing these investments from other kinds.

The project involves the hydroelectric utilization of Santa Cruz river, with a 1,310 MW production, i.e. up to 5% of the national energy matrix. This is the third largest hydroelectric project in the country, and the largest to be financed and built by Chinese companies in Argentina. The cost is USD 4,500 million,

almost 1% Argentina's GDP. Also, the Chinese financing imposes clearly conditions the Argentinian State, including a **cross default clause** with Belgrano Cargas Railway: if the hydroelectric project is cancelled, not only the country should pay penalties but also the financing for the transport project in the North region of Argentina would be withdrawn.

The Cóndor Cliff - Barrancosa Hydropower Project will alter the watercourse of the free flowing Santa Cruz river, will turn over 50% of it into still water bodies, will affect the river's volume and inundate 42,000 hectares of Patagonia, two times the size of Buenos Aires city. This project may generate an irreversible loss of and severe damage to the rich biodiversity and lake ecosystems.

A major concern regarding environmental impacts is the Perito Moreno Glacier which may be affected since the water level of the adjacent Argentino Lake will no longer depend on natural flow dynamics but on the country's power demand. This Patagonian glacier, known as the 'White Giant', is one of 48 glaciers fed by the Southern Patagonian Ice Field and is the one of the largest ice concentration in the world after the North and South Poles. **The glacier is the centerpiece of the UNESCO World Heritage site[3] and it is considered to be a marvelous spectacle of nature**.

Two legal actions were filed against the hydroelectric project before the Supreme Court of Justice of Argentina. These actions, filed in December 2014 by Asociación de Abogados Ambientalistas de la Patagonia[4] and in October 2015 by Fundación Banco de Bosques[5], mainly challenge the defects of the Environmental Impact Assessment processes, especially lack of the appropriate environmental impact studies. As a result, the Supreme Court decided to stop the works until new environmental studies were presented and a public hearing was held in the National Congress.

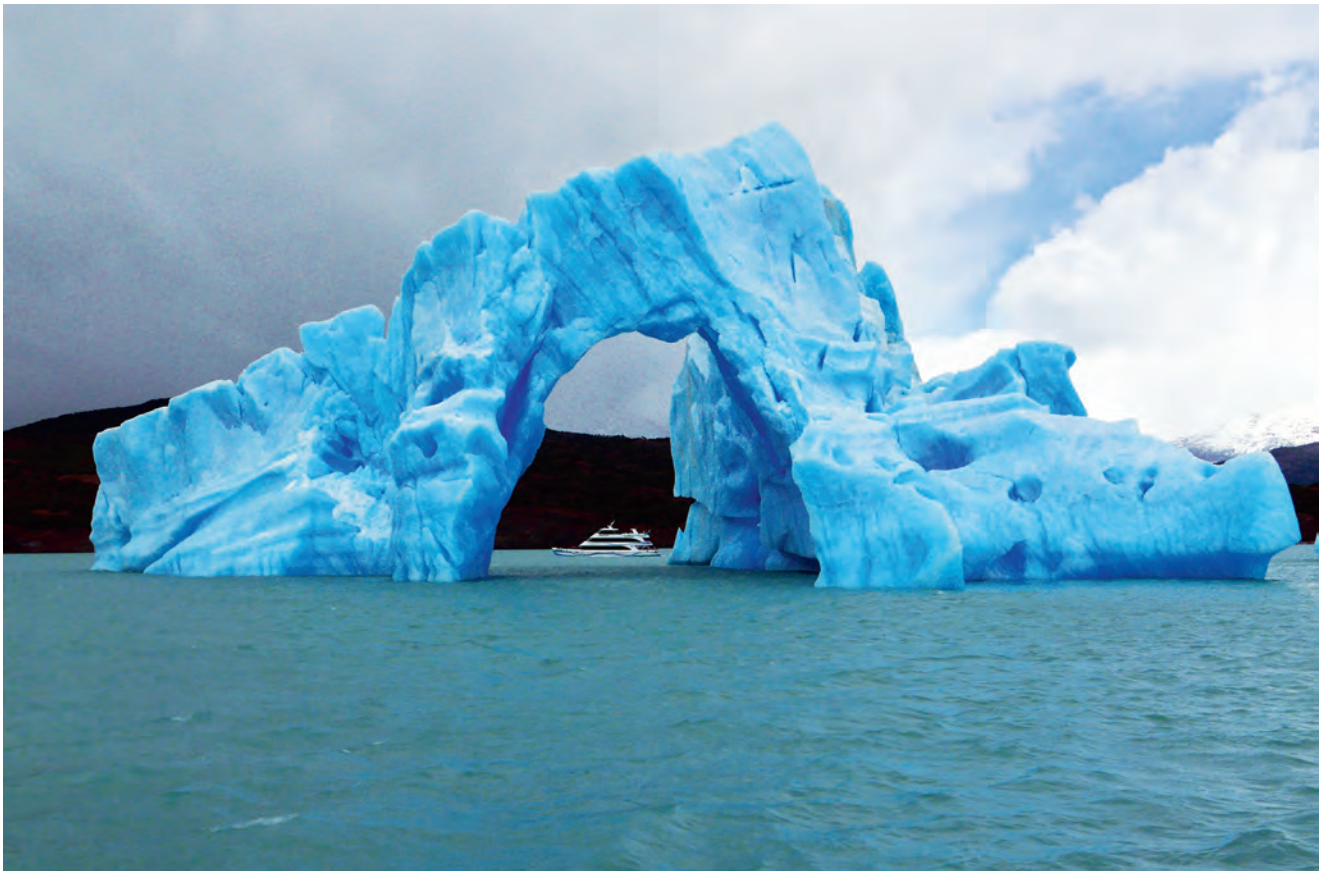
Despite, some modifications were made into the to the original project to reduce the impacts on glaciers (reducing the number of turbines), the new reservoir quota of the Condor Cliff dam does not ensure adequate decoupling of Argentino Lake, risking impacts to the Perito Moreno glacier. In addition, the Upsala and Spegazinni glaciers dependent on the Argentino Lake are also in danger.

The new Environmental Impact Study done at the request of the Supreme Court does not accurately represent the social and environmental complexities of the project, with innumerable information gaps due to the haste of its development. Emprendimientos Energéticos Binacionales Sociedad Anónima (EBISA) was in charge of it, although the company with state funding, was unauthorized by the authorizing entity, the Ministry of Environment and Sustainable Development.

Commenting on this study, presented in June, 2017 for the public hearing, other state agencies related to environmental, cultural and social issues expressed the need to make further studies and time to evaluate the impact, especially on glaciers. The Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales (IANIGLA)[6], which is part of the Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), has pointed out that "*The preliminary review of the EBISA report suggests that there are important inconsistencies and omissions in the information related to the glaciers of the Santa Cruz river basin, that we consider should be the object of a specific study*".

Also, international scientific community expressed that the EIA study does not analyze appropriately the project's impact on the South Patagonian Icefield: four renown glacier scientists[7] have expressed their concerns regarding the Santa Cruz dams, all agreeing that the study presented by EBISA has major gaps and inconsistencies and more thorough studies should be done in order to know the real negative impacts that the dams will create in the environment. They consider that the current water level planned for the Condor Cliff dam is too high to ensure the long-term stability of the Southern Patagonian Ice Field.

The International Union for Conservation of Nature (IUCN) in its World Conservation Congress declared the Santa Cruz river ecosystem as "irreplaceable". These dams will flood priority areas and irreplaceable biodiversity, affecting migratory fish, contribute to the extinction of endemic species such as the Hooded Grebe (Podiceps gallardoi).



«The overwhelming beauty of the landscape is epitomized where the Perito Moreno Glacier meets Lake Argentino The vast front of the slowly and constantly moving glacier, up to 60 metres high, regularly calves bluish icebergs into the waters of Lake Argentino, an audiovisual spectacle attracting visitors from all over the world.» UNESCO Retroactive Statement of OUV, 2014 (Steineschubser/Wikimedia)

Regarding the cultural and archaeological heritage, the Cóndor Cliff - Barrancosa will affect cave paintings and stamped petroglyphs as well as sites sacred for native communities. The technical report presented by the Comisión Nacional de Sitios y Monumentos Históricos[9] revealed that the mitigation measures contained in the EIA *"do not reflect the magnitude of the irreversible loss of archaeological heritage that the construction of the dams will cause"*.

The right to Free, Prior and Informed Consent established by International Labor Organization (ILO) 169 and ratified by Argentina (1992) has not been fulfilled despite the fact that the project will affect the territory of 13 Mapuche – Tehuelche Communities. To them, the river is a fundamental social space to these peoples' world-view, impacting their burials and community dynamics. As a result, Pueblo Lof Fem Mapu filed for a protecting order in the Federal Court of Río Gallegos in Santa Cruz Province, a yet unresolved situation, in spite of the works being initiated.

Shortcomings of the new EIA are in part due to the lack of time needed to conduct a comprehensive and detailed assessment study. This pressure was created by the Chinese government in order to rush the new EIA and resume activities on the project. Such pressure is clearly reflected in the minutes of the meeting of the 3rd China Argentine Dialogue for Economic Coordination and Cooperation (April, 2017)[10] in which the Chinese part states that *"On Santa Cruz Hydro Project Station project, the Chinese side requires the Argentine side to finish the procedures for the environment impact assessment by April 30th, finish the review and public hearing by Congress before late May, and approve full resumption of the main project by the end of May". Concern about this urgency and pressure are reflected in the reaction of the Argentinian Minister of Energy, who stated during the public hearing: "Someone asked if we would have done this if we had not had any commitment, the answer is prob-*

ably not at the speed we are doing it"[11]. However, Argentina's government is also responsible as it didn't push back against such pressure.

In October 2017 after the public hearings the FARN sent a letter to the UNESCO describing all possible impacts on the World Heritage and concerns of local CSOs and ever since has been awaiting an answer. The last document on the property available at UNESCO web-site dates back to 2014. We urge the UNESCO World Heritage Committee to examine the potential impacts on outstanding universal values of the Los Glaciares National Park World Heritage Property and ask the State Party of Argentina and Chinese state-owned institutions to halt construction before all current gaps and irregularities in environmental impact assessment and conflict on free prior and informed consent by indigenous communities have been resolved.

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1 More information on FARN's website www.farn.org.ar and also in the documentary Matar al río available in: https://www.youtube.com/watch?v=IWjZ7QbkSZ0. The author e-mail is mmdipaola@farn.org.ar

2 This 60-years old mega-project was renamed in 2011 after the former President Néstor Kirchner. In 2017, as the new national government assumed power, the name was changed again.

3 The Los Glaciares National Park at UNESCO web-site http://whc.unesco.org/en/list/145/documents/

4 CSJ 005258/2014-00 "Asociación Argentina de Abogados Ambientalistas de la Patagonia c/Santa Cruz provincia de y otro s/ amparo ambiental" [Argentina's Patagonia Environmental Lawyers' Association v. Province of Santa Cruz].

5 CSJ 004390/2015-00 "Fundación Banco de Bosques para el manejo sustentable de los recursos naturales c/Santa Cruz, provincia de y otros s/ acción declarativa de inconstitucionalidad" [Forest Bank Foundation for the sustainable management of natural resources v. Province of Santa Cruz et al on declaration of unconstitutionality].

6 IANIGLA's study and letter available at (in Spanish): http://farn.org.ar/wp-content/plugins/download-attachments/includes/download.php?id=22628 (Last visit 28.07.2017)

7 Dr. Hernán de Angelis (Argentine Antartic Institution, University of Stockholm and University of Uppsala, Sweden); Prof. Francisco Navarro (Polytechnic University of Madrid, Spain); Dr. Helmut Rott (Institute for Atmospheric and Cryospheric Sciences, University of Innsbruck, Austria); Prof. Shin Sugiyana (Institute of Low Temperature Sci., Hokkaido U. Japan).

8 2014 Retroactive Statement of OUV http://whc.unesco.org/archive/2014/whc14-38com-8E-en.pdf

9 Ministry of Culture study available at (in Spanish): http://farn.org.ar/wp-content/plugins/download-attachments/includes/download.php?id=22635 (Last visit 28.07.2017)

10 Minutes of the meeting available at: http://lt.dplract.net/aa2ae9a04be62fc5a800d066ef3f6102-44ed70d36e9914b7fd75445ccf9b7091 (Last visit 28.07.2017)

11 Words of the Energy Minister available in the Public Hearing available at (in Spanish): https://www.youtube.com/watch?v=4yEPqpZRV8c Minute: 2:45:20 (Last visit 27.07.2017)

Part II. WILD RIVERS

Argun River at Kuty Village (Oleg Goroshko, DIPA)

If We Value Free Flowing Rivers — They Should Be Protected Now

Eugene Simonov, RwB

The Jau National Park in Amazon World Heritage Property (Diego Lezama/Wikimedia)

Free-flowing rivers are the freshwater equivalent of wilderness areas: wild rivers least affected by human impacts. A free-flowing river has largely escaped human-induced changes to its flow and connectivity. Water, silt, and other natural materials can move along unobstructed. Animals, such as river dolphins and migratory fish, can swim up and down stream freely. And the river itself can swell and shrink naturally, flow at an organic volume and rate, and replenish groundwater sources[1]. Free-flowing rivers provide many ecological, economic, and cultural benefits to the communities that live alongside them and within their watersheds. Consider the mighty Mekong, which still supplies several million ton of fish annually to the people of Thailand, Lao, Cambodia and Vietnam, even after being mortally wounded by upstream dams. The following several case studies in this report are dedicated to exemplary wild rivers large and small, which may be degraded by water infrastructure construction in the coming months and years.

More than half of the key 375 river basins of the world are already fragmented by water infrastructure and 30% more are planned to be dammed in the near future. Because natural rivers are a scarce and irreplaceable resource, we cannot just watch them being exhausted by hydropower at the expense of annihilating and suppressing many other important environmental, social, cultural and economic values. Once a dam has been built, a river ecosystem and its services are changed forever from a natural process to a heavily engineered one, which often triggers further modifications. Our Planet simply has no more wild rivers we can afford to sacrifice for old-fashioned dam-based hydropower. And develop-

ment of new types of "low-impact" hydropower should not only learn from mistakes of the past, but focus on correcting them at a project and basin scale[2].

Despite the decrease in hydropower installation globally, the toll of destruction goes up, as dam builders encroach into the heart of the global wilderness, sustained up to date by indigenous land-use traditions. In recent years, while illusions of "sustainable hydropower" have been propagated to global audiences through sophisticated communications strategies, key members of the hydropower industry have dammed many of the world's most biologically diverse and socially important rivers, such as the Mekong, Xingu, Madeira, Teles Pires, Yangtze-Jinsha, and Bureya. There are active plans to dam many of the last remaining natural and free-flowing rivers of the world: including the Congo, Lena, Irrawaddy, Vjosa, Salween, Amur, Selenge, Tapajos, Shilka, Okavango and Karnali rivers, among others.

Hydropower developers waste our rivers in a haphazard inefficient manner, often inflicting lots of harm in order to produce negligible amounts of energy. In the "Water tower of South Asia"- Nepal, which has just 1 GW hydropower capacity installed at 100 power plants, only one sizeable undammed free-flowing Karnali River is left today, but at least 5 major hydropower licenses have already been issued to cut its mainstem.

Community protecting Alazani River from hydropower dams is praying before a clash with riot police, which resulted in 55 injuries and halted construction. Georgia, 21 April 2019[3] (Radio Way)

Indigenous peoples and other local communities rely on free flowing rivers to preserve their cultural identity and way of life. Many governments around the world use police force and legal persecution to protect the interests of outside investors and suppress legitimate local protests. High officials accuse citizens defending their wild rivers of being "enemies of the state" and "agents of foreigners". But this cannot stop people from speaking for their rivers, simply because they value wild rivers as an essential element of their cultures and livelihoods. Slowly, governments and corporations retreat and come to recognize at least some rivers as de-facto protected by public opinion. However, typically, as conflicts calm down, new corporations supported by new officials restart attacks on those rivers some years later[4].

Unfortunately, no road map exists presently to help governments and international institutions balance growth with the protection of free-flowing rivers. Only a handful of countries - the US, Canada, New Zealand, Mexico, Armenia and a few others - have special legal tools to recognize and protect wild rivers.

Free-flowing natural rivers are yet to be adequately represented on the World Heritage List, and are routinely overlooked when planning new nominations. On the list of 209 natural heritage properties you find only one mention of "rivers" in the properties' names: "Three Parallel Rivers of Yunnan Protected Areas"[5]. Unfortunately, the actual free-flowing river Nu-Salween, as well as the partially dammed Mekong and Jinsha rivers, are all deliberately excluded from the boundaries of this World Heritage site to give way to hydropower and other large-scale infrastructure.

This is not the only "riverside" World Heritage site explicitly excluding river ecosystems: the "Lena Pillars" in Russia protects two terrestrial plots on two sides of the greatest free flowing river of the Arctic, but leaves the actual river out. Meanwhile the Global Energy Interconnection Cooperation and Development organization (GEIDCO- a global lobbyist initiated by the China State Grid co.) has already published a preliminary plan for the North-East Asia Energy Interconnection, in which this pristine

river basin is to become an "energy base" to produce 40 GW of hydropower for consumers in Japan and Korea. The GEIDCO published similar plans for "harnessing" the Amur, Congo, Amazon and other major river systems of the world in the name of "clean energy" and is actively cooperating with many UN agencies to promote this "bright vision of the future"[6].

The first and most important measure to be undertaken now is to radically limit the number of river stretches open to greenfield hydropower development and fully stop development of large water infrastructure on still undammed free-flowing (natural and slightly modified) river systems. Many basin-wide strategic assessments of river-basin development show that conservation of natural rivers still leaves wide space for greenfield hydropower development on already affected tributaries as long as other negative impacts are fully mitigated[7].

Secondly, any biodiversity hotspots and protected areas (unless explicitly established at hydropower reservoirs), should be off-limits to large water infrastructure development and undue upstream and downstream impacts from hydropower. Sly legislation introduced in some places, like the EU, that opens the door for destruction of rivers in protected zones (e.g. NATURA 2000), should be revised, given that a wide range of alternatives in clean energy is affordable in practically any region of the world.

Thirdly, dams negatively affecting protected areas and important biodiversity zones, which can be decommissioned to ensure rehabilitation of river systems, should be decommissioned, as it is being done now in the EU, US and China. Ironically, dam decommissioning is destined to become an important part of future project portfolios implemented by the leading hydro engineering companies, which previously specialized in dam construction[8].

Fourth, hydropower management should proceed only on the basis of comprehensive river basin management plans, which focus on biodiversity conservation, natural ecosystem services, the well-being of local communities and sustainable development. Environmental justice, free prior informed consent (FPIC) and community co-management of river basins should be fully incorporated as the main principles in such a management system. Already existing hydropower should be aligned with those requirements or decommissioned.

The last, but not the least, all existing legal conservation tools should be used and new approaches designed to ensure legal protection in perpetuity for remaining free-flowing rivers. Co-management with indigenous river-guardians should be a central part of the new concept. The high-profile UNESCO World Heritage Convention is one of the most important platforms to promote conservation of free flowing rivers both by expanding existing World Heritage properties to incorporate omitted riverine values and by designing a series of new ones dedicated to the protection of free flowing rivers in each biogeographic region of the world as examples of the most important ecological processes.

Even if dam-based hydropower is now dying, its' agony is a long process, and the industry has ample potential to take into its grave most remaining free-flowing rivers of the world. There is no other way to reinvent hydropower and put it on a sustainable path, rather than to recognize the true priorities of sustainable development and preserve the key values of natural river systems.

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1 The definition of FFR was borrowed from several WWF papers

2 See the RwB case-study on pumped storage in Tasmania

3 https://civil.ge/archives/303092

4 See the paper by Manana Kochladze on Upper Enguri River in this volume.

5 See the paper by G. Lafitte Great Leaping Tiger Dammed in this volume.

6 https://www.chinadialogue.net/article/show/single/en/10722-The-risks-of-a-global-supergrid

7 See the paper on Mekong River and Tonle Sap Lake in this volume.

8 See case-studies on dam removal in this volume.

The Congo River Ecological Values under Threat from Grand Inga Hydropower Scheme

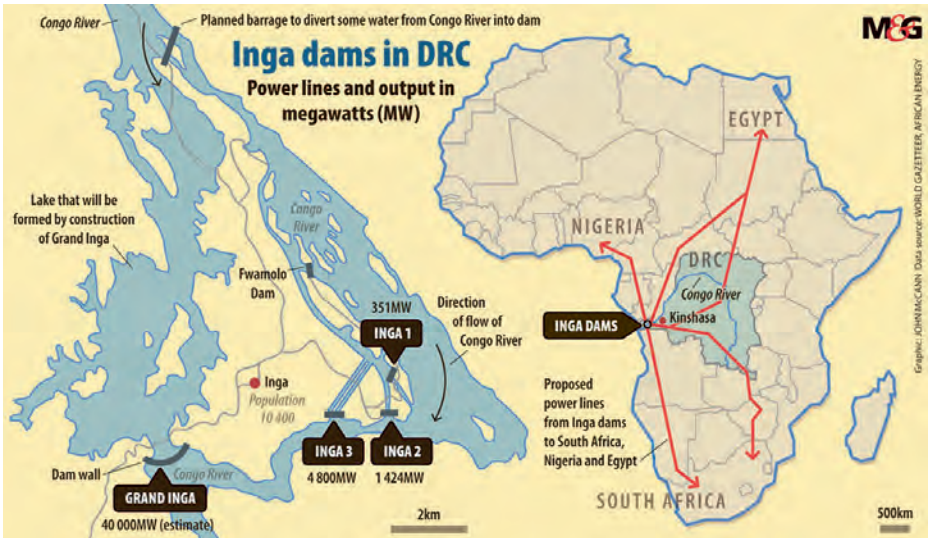
The USAID Affirmative Investigation Report for DRC Inga 3-BC[1] Hydropower Project. 2015[2]. (Excerpts)

Editorial note: *We reprint the fragments of the USAID Report, since it systemically describes irreplaceable natural values that could be lost if Grand Inga project goes ahead. The editors do not necessarily share all views and judgements expressed in this text.*

The Congo River is the fifth-longest river in the world (over 4,376 km long) and the second longest in Africa, second only to the Nile River. It is the world's deepest river—with measured depths in excess of 220 m—and the third largest river in the world by volume of water discharged. The Congo River flows through the Democratic Republic of Congo (DRC) and forms part of the border with the Republic of the Congo and Angola. The Congo River ranges in width from 0.8 to 16 km depending on the location and time of year. Since the rivers' drainage basin includes areas both north and south of the equator and experiences the alternating rainy seasons of each hemisphere, the Congo River has a relatively stable flow throughout the year. The potential of the Congo River and its tributaries to generate hydropower are considerable, particularly in the Inga Valley (Lower Congo Rapids ecoregion), due volume of regular and significant flow, a significant natural slope, natural bend in the river, and minimal human occupation. The Congo River forms a the deep-sea fan that is created by its sediment discharge into the Gulf of Guinea.

Hydropower on Lower Congo Rapids (Grand Inga)

The Inga 1 (351 MW installed capacity) and Inga 2 (1,424 MW installed capacity) were commissioned in 1972 and 1982, respectively, but by now they fell into disrepair and the World Bank leads a decade long painful and extremely expensive effort to rehabilitate them.



Inga-1 Hydro in its first year was already clogged by weeds. 1973, (Mieremet Rob / Anefo)

The Grand Inga site consists of a series of rapids over 15 km with an overall elevation drop of 102 m, making it an "ideal source for hydropower generation". The Grand Inga Hydropower Project[3], with potential outputs of 39-40 GW, has been discussed since the 1960s, but the prohibitive costs of developing it as a single-phase project have prevented it from progressing beyond the design stage. The Inga 3 BC was an attempt to apply phased approach with next phase major diversion planned to channel water through adjacent valley to generate 4800 MW. The World Bank was backing the scheme with European, South African, US and Chinese companies willing to take part in the project.

Freshwater Biodiversity which may be affected by hydropower[4]

The Congo River is the second most important site in the world for freshwater biodiversity, yet, unlike the Amazon, the Congo River is poorly studied. The Lower Congo Rapids ecoregion has exceptional species richness for fisheries (129 species) and high endemism (26 percent). It is in the highest categories of biological distinctiveness and integrity. While the river is not well researched, recent studies have revealed that there are over 300 species in the lower Congo River, and six to nine new species have been identified during the last decade.

The characteristics of the Congo River have resulted in a number of unique evolutionary conditions. Genetically distinct cichlid fishes have been found on opposite banks of the Congo River where exceptionally strong currents created a physical separation that is more commonly seen on mountain ranges. Researchers have identified species that evolved in a habitat too deep for light to penetrate: the whitish (non- pigmented) and blind Lamprologus lethops are believed to live as deep as 160 m below the surface. Another unique species is the elephant fish, whose snout is evolutionarily adapted to the character of the river floor: long and thin snouts allow fish to probe for food in deep and small-grained gravel while short and fat snouts allow them to feed on algae-caked bedrock.

The World Bank ISDS noted that endemic species of genera Micralestes and Micropanchax could be threatened by the development of Grand Inga Hydro, and more research is needed on migratory fish species, which could be impacted by the dams. Given the importance of the aquatic biodiversity, the World Bank recommends long-term scientific research that will guide efforts to mitigate these impacts in both Inga 3 and subsequent phases.

Provision of Environmental Flows

Recorded flows for the Congo River range from 21,500 m^3/s (1905) to 80,000 m^3/s (1999). Low flows are not rare in the dry season as indicated by flow measurements in Brazzaville of 24,000 m^3/s (2012) and 26,000 m^3/s (2013). The proposed diversion of part of the Oubangui River flow to Lake Chad may affect flows in the Congo River upstream of the Inga 3 /Grand Inga site.

A detailed environmental flows assessment has not been conducted for the Inga Chute area. The term "environmental flows" is defined as the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems. Scientists warn that maintaining minimum low flows is necessary but insufficient to maintain healthy river ecosystems and that a naturally variable pattern of flow is needed to sustain biodiversity and ecosystem services.

A river's flow regime exerts a major influence on nearly all the physical and biological processes within the river and shapes its ecosystem. The flow regime affects the riparian vegetation, the practice of flood recession agriculture, and aspects of water quality characteristics (e.g., temperature, nutrients and toxins).

Floods are crucial components of the natural flow regime and important for sediment transport and delivery to flood plains; sediment/detritus movement that creates/maintains a diversity of habitats and maintains a deep channel; and creation of floodplain topography. Consequences of inadequate provisions of environmental flow can include: (a) Loss of river and coastal fisheries and other important aquatic species; (b) Accelerated erosion of channels and islands due to changes in sediment transport; (c) Reduced carbon sequestration by mangroves and the carbon sink in the Congo plume in Gulf of Guinea.

Dams are usually the most significant and direct modifiers of river flows. The ability to release environmental flows is strongly influenced by dam design. Therefore, it is important to determine environmental flow requirements and integrate these flow requirements into the water management plan and dam design to maintain economically and socially valuable ecosystem services and aquatic biodiversity. Different species thrive under a range of optimal conditions, and river ecosystems are typically attuned to the seasonal and annual variability typical to that river.

Congo River Estuary/Mangroves

The Congo River Estuary comprises of two regions: 1) the shallow inner estuarine region, which is dissected into channels with associated islands and wetlands, and 2) mangrove forests bordering the outer estuary. A significant feature of the outer estuary is a deep central canyon that extends through most of the zone and drops abruptly to a depth of 100 m. The Congo River discharge forms a lens above the

canyon waters that extends 400 to 1,000 km offshore, depending on wind forcing, wind currents, and freshwater discharge.

The Mangroves National Park is located at the mouth of the Congo River, in the DRC. The park is subdivided into three different areas: a coastal strip, a riverside land area and a number of mangrove islands. The Park was designated as a wetland of international importance under Ramsar Convention in 1996. The mangrove forests merge into freshwater swamp forests, some of which are weakly tidal. Aquatic fauna include shark, barracuda, sole, capitaine, snakes, turtles, crustaceans, and oysters. Mammals include the dwarf buffalo (*Syncerus caffer nanus*), manatee (*Trichechus senegalensis*), and hippopotamus (*Hippopotamus amphibius*). Manatees and hippopotamuses are both listed as vulnerable on the IUCN Red List.

Mangroves provide many ecosystem services critical to fisheries, tourism, waste treatment, navigation, and natural disaster management including protection of coastal areas and infrastructure from storm surges and floods. Coastal ecosystems contain substantial quantities of blue carbon, and mangroves are among the most carbon-rich forests in the tropics with soils that consist of thick, tidally submerged suboxide layers (peat) supporting anaerobic decomposition and moderate to high carbon. Changes in water flows through the mangroves (and other ecosystems along the river) will likely affect carbon sequestration and storage.

Congo Plume. Deep-sea Fan in the Gulf of Guinea

The Congo River flows into the Atlantic through the world's largest and deepest river canyon, the Congo Canyon, which begins in the river's lower reaches and extends 400 km into the Atlantic Ocean to depths of over 3,000 m. This submarine canyon, channel, and sediment lobe area form the Congo deep-sea fan. The Congo River supplies a large volume of particulate and dissolved organic matter to the Atlantic Ocean, both at the surface and at the sea bottom through the Congo Canyon. The Canyon cuts deeply into the shelf and the continental slope and feeds a 1,250 km-long valley where the sediment is transported by episodic turbidity currents.

Studies indicate that both the sedimentation in the deep-sea fan and the productivity of the overlying waters are strongly influenced by the fluctuating discharges of the Congo River. Sea surface temperature (SST) and marine productivity are further affected by wind- and river-induced upwelling. A direct relation between SST, precipitation in the Congo Basin, vegetation cover, chemical weathering, and runoff can be established for the past 200 thousand years. The Congo River's massive discharge into the ocean (the surface plume) affects sea surface salinity in equatorial Atlantic and stratifies the surface layers. Taxonomy studies of the seep environment described 16 new species and two new genera. The Congo Channel is a very active system with highly energetic turbidity currents causing rapid transport of large quantities of sediment as far as the lobe area at depths of 4,800 m.

Reductions in sediment and nutrients through hydropower reservoir trapping can affect species that depend on natural flooding and deposition, and coastal fisheries that depend on the offshore nutrient plume. For example, similar hydropower projects constructed in the Central Highlands of Vietnam and the Yunnan Province of China have demonstrated a significant impact on the Mekong Delta fresh and coastal water systems due to reductions in river sediment and nutrient load.

Surface plumes transport fresh water discharged by large rivers, such as the Congo, hundreds to thousands of kilometres away from the coast, and nutrients carried by the plumes contribute to enhanced primary production and carbon sequestration of oceans. Although Congo River plume studies remain in their early stages, studies in similar ecosystems, such as the Amazon River, demonstrate evidence of plume-driven nitrogen fixation far from the river mouth and support for important pathways for atmospheric carbon dioxide sequestration in the western tropical North Atlantic. Changes to the physical, chemical, and biological characteristics of the plume could have significant impacts on associated carbon sinks, as well as management of regional carbon budgets.

Editorial Conclusion[5]:

The description above shows that the Lower Congo Rapids ecoregion, either alone or in combination with Congo Delta and Congo Plume, likely qualifies to be nominated as one of the most remarkable World Heritage sites[6] *celebrating the natural might and richness of the free-flowing river and the multitude of ecosystem services it provides. Ironically, natural values of these areas have not been sufficiently studied and the State Party of the DRC as well as a multitude of international institutions see in that region only a rich source of hydrocarbons and hydropower.*

Even baseline data are not available to evaluate the direct or cumulative effects of Inga 3 (or any other version of Grand Inga dream) in the ESIA. Inga 1 and 2 dams were constructed without ESIA, therefore there is no baseline data to be gathered from those projects and substantial data collection is necessary to establish a baseline.

However, the World Bank Group canceled its involvement in Inga 3 in September 2016 due to "the Government of DRC's decision to take the project in a different strategic direction to that agreed between the World Bank and the Government in 2014"[7]*. Many other potential investors and collaborators have subsequently distanced themselves from the project.*

By 2018 the contract to develop the Inga Project was awarded to a consortium of the China Three Gorges, Sinohydro and ACS Co. from Spain, who proposed to enlarge the next stage from 4.8 GW to 11 GW to make it "economically feasible". It will inflate the project costs far up from 14-18 billion dollars estimated earlier for Inga 3BC option. China-led Global Energy Interconnection Initiative (GEI)-initiated by China State Grid Co) promotes the Grand Inga Hydro as the major "energy base for clean electricity" to be connected to Europe, South and East Africa by high-voltage transmission lines.

No credible impact assessments have been completed so far. To please remaining investors the Government of DRC reportedly pledged to the consortium its copper and cobalt mines in exchange for investment and allowed the project to proceed before environmental and social impact assessments are undertaken.

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1 BC stands for «basse chute» - fancy French word for «low head (hydropower)».

2 http://pdf.usaid.gov/pdf_docs/PBAAH812.pdf

3 https://www.internationalrivers.org/campaigns/grand-inga-dam-dr-congo

4 Fish migration issues omitted in this review, likely, because they are yet to be studied in the basin.

5 Also see: https://www.mdpi.com/1996-1073/11/4/972/htm, https://www.mdpi.com/2073-4441/11/3/407/pdf

6 http://whc.unesco.org/en/conservation-congo-basin/

7 http://www.worldbank.org/en/news/press-release/2016/07/25/world-bank-group-suspends-financing-to-the-inga-3-basse-chute-technical-assistance-project

Sustaining the Heartbeat of the Mekong Basin

Brian Eyler and Courtney Weatherby, Stimson Center

Editorial note: *Mekong is definitely the river that merits inscription on the World Heritage List. Unfortunately many parts of the basin, including rivercourses adjacent to some heritage sites[2], are deformed by large dams and diversions. If there is one place in Mekong Basin which is absolutely unique and not yet defaced, it is the Tonle Sap Lake and Tonle Sap River demonstrating amazing riverine ecological processes at a scale unknown anywhere else in the Eastern Hemisphere. The Kingdom of Cambodia, full of natural riches, still has no natural World Heritage sites inscribed. The paper[1] below describes the report on measures that may help to save the Tonle Sap from destruction for the benefit of peoples of Cambodia and the world. This would also preserve possibility to inscribe it as natural World Heritage on par with the great adjacent cultural heritage: the Angkor Wat.*

Tonle Sap Lake, Cambodia. (Image: Teseum[3])

The Mekong River is often depicted as originating in the Qinghai-Tibet Plateau. Maps show it flowing downstream through China's southwest, and then forming the borders of or flowing through Laos, Myanmar and Thailand, before bisecting Cambodia and Vietnam's Mekong Delta on its 4,500 kilometre journey from the Himalayas to the sea.

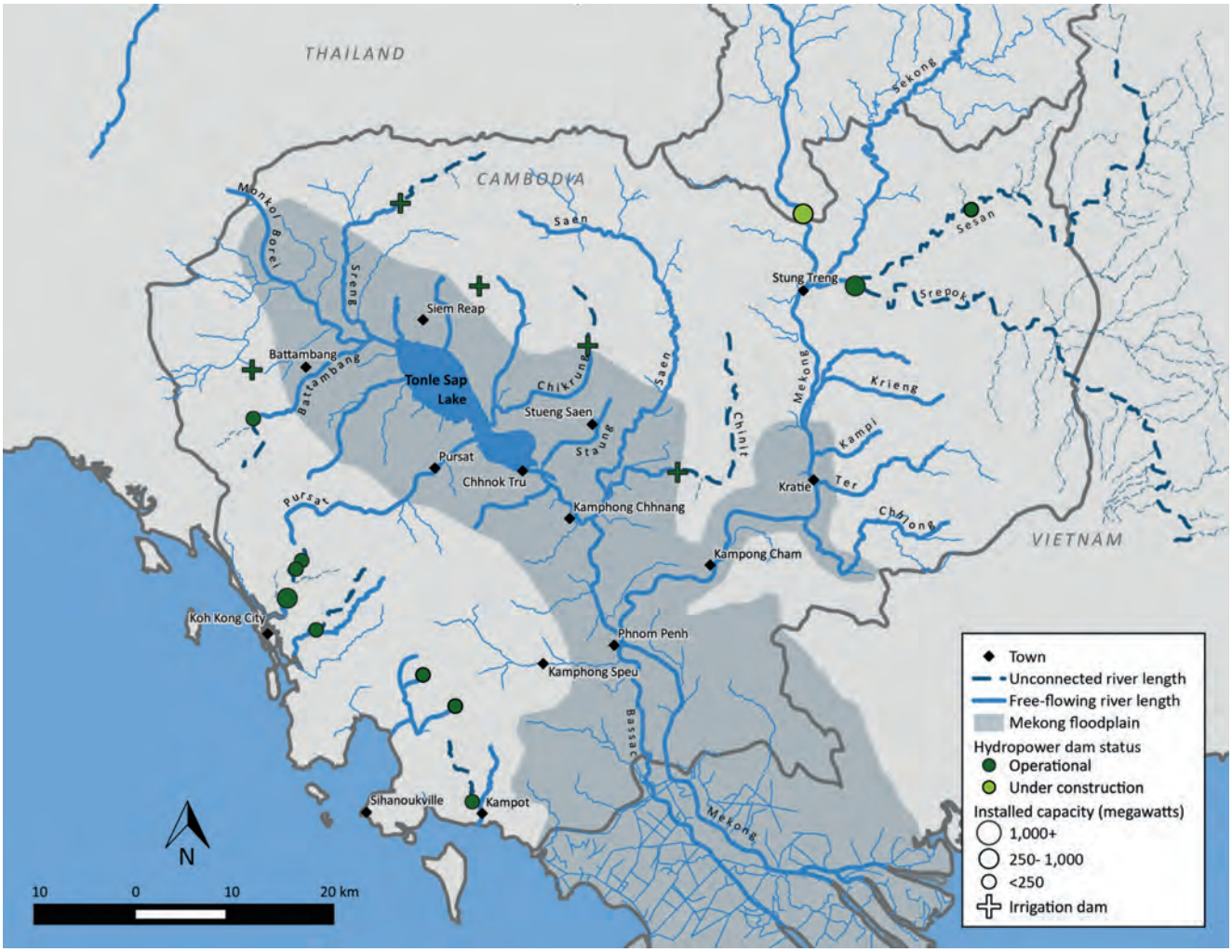
However, the Mekong has another point of origin: the Tonle Sap Lake in Cambodia. Each year life springs from the lake, mostly in the form of a massive fish population that migrates to the far reaches of the Mekong system both upstream and downstream.

This annual migration provides tens of millions of households throughout the Mekong Basin with regular protein. While the total catch from wild fisheries in all of North America's lakes and rivers is 160,000 tons, each year the Mekong system produces 2.6 million tons. The Tonle Sap alone provides around 500,000 tons, comprising 75% of Cambodians' protein intake, and making it the world's largest freshwater fishery.

But this rich resource is threatened by upstream dam construction, overfishing, unregulated agricultural practices and climate change.

The problem of dams

We recently published a report that explores the impact of human activities from a broader perspective[4]. It offers alternative development pathways to optimise trade-offs between water, energy and food production. These include basin-wide water and energy planning and a deeper incorporation of non-hydropower renewable energy sources into Cambodia's future power mix.



Map: *The connectivity of the Tonle Sap and Mekong tributaries in Cambodia*

These approaches can avoid upstream fragmentation between the Tonle Sap and the rest of the Mekong system. This way, the monsoon pulse which each year reverses the direction of the river, draining the lake and sending 70 times more water, organic material and fish back into it, can be preserved.

The annual flooding and draining of the lake acts as a heartbeat pumping life throughout the Mekong Basin. This process is threatened by the construction of and future plans for hydropower and irrigation dams upstream of the Tonle Sap in Cambodia, Laos, Vietnam and China. Dams and other built structures block or reduce flows in the Mekong, which reduces the amount of water, fish and nutrients going into the Tonle Sap each year and also constricts the ability of fish to find upstream habitats.

In Cambodia alone, the connectivity of the country's 11,000 kilometres of the Mekong/Tonle Sap river system has already been reduced by 31% by the construction of two hydropower dams and six irrigation reservoirs.

One of those hydropower dams, the 400-megawatt Lower Sesan 2, located just below the confluence of the Sesan and Srepok rivers, cut off more than 3,300 kilometres of tributaries to the rest of the Mekong system and the Tonle Sap when it was completed in 2017. The fish ladders incorporated by the dam developer, Chinese state-owned enterprise Huaneng Hydrolancang, are unlikely to accommodate a meaningful quantity of fish in a system that is known to have as many as thirty tons swimming through in one hour during peak migration season.

Further, even if some fish do make it past the ladders to spawn upstream, the eggs and fish larvae washed back downstream towards the Tonle Sap by the annual Mekong flood pulse will likely sink and perish behind the dam as the river slows on its approach. Lower Sesan 2 dam will reduce the Mekong's fish population by more than 9%[5].

Our study finds that the Cambodian tributaries of the Mekong are being dammed one project at a time with no comprehensive plan. Damming tributaries (rather than the mainstream) could reduce connectivity between the Tonle Sap and the rest of the Mekong system by 60%. Further, building the controversial mainstream dams at Sambor and Stung Treng would effectively annihilate Tonle Sap connectivity, terminating the lake's rhythm.

Many of the dams in Cambodia's inventory are poised for development through memoranda of understanding or concession agreements with Chinese dam developers. How these Chinese investments play out in the coming years could make or break Cambodia's Mekong, the viability of the Tonle Sap and the tens of millions of people it supports.

Only building dams in Cambodia's portion of the Mekong Basin above the Lower Sesan 2 dam could be a pragmatic option that protects the Tonle Sap. Our study shows how this could result in the generation of more than 1,000 megawatts additional capacity whilst potentially having zero net effects on Tonle Sap connectivity and fisheries productivity compared to the status quo.

However, such development should not be considered unless the resettlement needs of Cambodia's upland and ethnic communities upstream of the Lower Sesan 2 dam can be met. Cambodia's track record on resettlement is inadequate.

The region's solar belt?

Alternatively, the expansion of hydropower above the dam could be reduced or augmented by tapping into robust solar and wind endowments in Cambodia's Mondulkiri and Ratanakiri provinces, or exploiting wind, solar and biomass capacity across the kingdom.

Cambodia has some of the highest power prices in the whole of Southeast Asia, as high as US$0.25 per kilowatt hour in urban areas, whereas rural residents have often paid more than 80 cents.

The greatest opportunity for diversification of Cambodia's energy mix and shifting away from overdevelopment of hydropower lies in non-hydropower renewables. On 65% of Cambodia's land, solar irradiation levels are above 1,800 kilowatt hours per square metre. This offers a total solar potential of 8,000 megawatts, which is significant given the country's 10,000 megawatts of hydropower potential. Cambodia's wind potential could be as high as 6,500 megawatts according to an Asian Development Bank study.

In 2017, the Asian Development Bank announced its support for the first 10 megawatt commercial-scale solar farm in Cambodia and then continued in June 2018 with the announcement of a 100 megawatt solar farm tender. Since then solar investment has become a hot topic. In January 2019, Prime Minister Hun Sen visited Beijing and met with the dam developer Huaneng Hydrolancang. Instead of signing agreements for new hydropower projects, he inked deals for solar power.

While Cambodia has yet to set hard targets for solar development, new regulations and guidelines provide clarity for investors. For example, heavy consumers such as large apartment buildings, factories and other large compounds can install solar (above five megawatts) while maintaining connections to Cambodia's national grid. The Chip Mong Insee cement factory in Kampot recently installed 9.8 megawatts of rooftopsolar and in floating solar installations on its property. Cambodia's sole utility company, Electricity du Cambodge, is also moving toward the purchase of solar power from private producers. This could lead to high levels of distributed generation and encourage individual investments in solar.

Aside from regulation, the major challenge to developing more solar power is land. Issuing "economic land concessions" to foreign developers, most of them Chinese, has long been tied to land grabbing efforts. Some of these land concessions have been revoked due to lack of development and the government's redistribution processes, others still lie fallow because of low agricultural commodity prices in recent years. Most land concessions are in the areas withhigh solar radiation favorable to photovoltaic deployment. A portion of these deserted concessions, if properly utilised, could be used for solar farms, especially those close to areas of high demand.

With the help of foreign investors and development partners, most countries in the Mekong region are considering a greater role for solar and other non-hydro renewables. While the importance of renewables in reducing carbon emissions is increasingly understood, the role that non-hydro renewables can play in improving ecosystem services, and the availability of natural resources such as water and freshwater fish catches, is still undervalued.

Our report demonstrates how Cambodia can develop its power sector with a basin-wide vision that not only conserves the fisheries of the Tonle Sap Lake but also provides a pathway for the country to rise as a leader in sustainability and conservation efforts.

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1 This paper was originally published in the «China Dialogue» on March 11, 2019. Adopted in this volume with minor modifications. Source https://www.chinadialogue.net/article/show/single/en/11126-Sustaining-the-heartbeat-of-the-Mekong-Basin

2 For example, Three Parallel Rivers PAs of Yunnan, China, described in this volume by a case study «Great Leaping Tiger Dammed» by G.Lafitte .

3 Image source: https://www.flickr.com/photos/teseum/46065570642/)

4 Letters from the Mekong: Toward a Sustainable Water-Energy-Food Future in Cambodia. February 2019. https://www.stimson.org/content/letters-mekong-toward-sustainable-water-energy-food-future-cambodia-0

5 Article by Guy Ziv et al. https://www.pnas.org/content/109/15/5609

Wild Floods in the Amur River Basin

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Editorial note: *Free-flowing rivers with natural floodplains have a higher ability to retain water during high floods and prevent flood damage than rivers with floodplains developed for human use. Floodplain water retention capacity contributes to reducing discharges along the river bed and decreasing the speed of the maximum flows. This means a reduction in flood risks and damages to human settlements, an ecosystem service, often, appreciated only when natural floodplains are gone. The Amur River floodplains still function well, but people under-appreciate this service.*

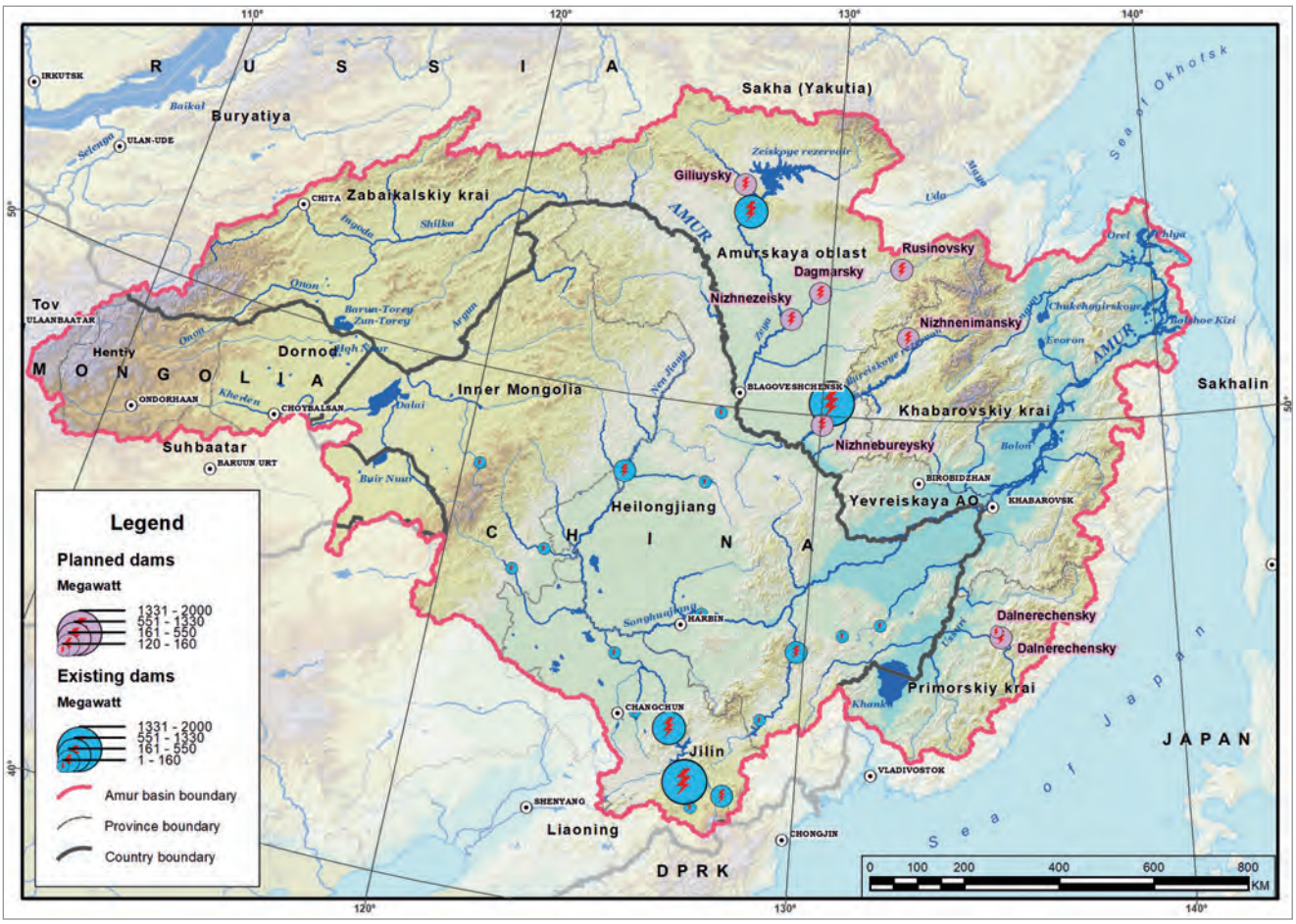
The Amur River (Heilongjiang in Chinese) is formed by the confluence of Shilka and Argun rivers; it flows into Sakhalin Bay in the Sea of Okhotsk. The length of the river from the confluence is 2.8 thousand km, the catchment area is 2.1 million square kilometers. The Russian-Chinese border goes along the rivers Argun, Amur, Ussuri, Tur, Turga and Sungacha for more than 3,500 km. The Amur is the largest free-flowing transboundary river in Eurasia, that retains rich biodiversity. (See the Amur River basin map below).

A catastrophic flood took place in the Amur basin from July to September 2013. It shed light on many characteristics of the natural processes in the Amur basin, as well as land, water and dam management issues. The transboundary location of the basin complicated flood management. During the flood, emergencies involving dyke failures which flooded villages and blocked major highways happened in all provinces along the Amur River. Damages in the Chinese portion of the basin were much higher than those in Russia due to the higher exposure of population and assets to flood hazards. In Russia, for more than 20 years, the need for floodplain zoning, land-use regulation and insurance mechanisms development for flood adaptation has been regularly declared. However, mainly hard engineering measures have been used for flood protection so far.

The 2013 experience can serve as a starting point for developing a joint Sino-Russian Integrated Flood Risk Management Plan[1]. In the course of planning various flood management measures should be evaluated in terms of their cost efficiency, social acceptability, environmental safety, and adaptation to climate change[2].

Flood control reservoirs

Since the disastrous 2013 flood, the Russian Government has issued instructions to develop a flow regulation system in the Amur basin. A list comprising 8–10 potential flood-control hydropower dams had been drafted by the beginning of 2014[3]. Some proposed reservoirs have been planned for already heavily modified tributaries (e.g. Zeya), while other designs targeted still free-flowing tributaries (e.g. Selemdzha, Shilka) and even the main stem of the Amur River.



Map: *Location of the existing and some proposed large dams with flood control reservoirs considered after the 2013 flood (A «mild» proposal without dams on Shilka and Amur rivers)*

The dam design process was supported by the China Three Gorges Corporation, which hastily signed with RusHydro Co. a Memorandum of Understanding for feasibility studies on dam development. Two years later this concept was abandoned as it was considered not economically feasible.

Building any new large dam that forms a water storage reservoir significantly alters the environment by changing flow and sediment regime and fragmentation of the river, etc.[4]. Building flood-control dams cannot entirely solve the problem of catastrophic floods either.

When designing flood control reservoirs, their feasibility should be assessed compared to alternatives, starting with the protection of the flood retention capacities of floodplains. Single-function flood-control reservoirs could be used on small and some middle-sized rivers of the Amur River basin where they can significantly reduce flood risks for local settlements, but a basin-wide strategy should rely on other measures as well. Other alternative solutions include various adaptation measures (introducing land-use regulations in flood-prone river valley areas; gradual removal of infrastructure unprotected by hydraulic facilities and adapting the remaining structures to periodic flood impacts) and promoting insurance coverage against natural disasters

Ecosystem services and dyke-building

A river's floodplain plays a major role in freshwater ecosystems. It has many regenerative capabilities supporting reproduction of meadows, floodplain forests, fish, amphibians and reptiles, as well as wetland birds and mammals. Periodic flooding of the floodplain is an important driver of its biological productivity[5].

130 fish species inhabit the Amur River and its floodplains' water bodies, 18 of which are endemic. Floodplains of the Amur and its tributaries create a belt of biodiverse wetlands — the Amur Green Belt. The river's floodplains are home to 320 terrestrial vertebrate species, 340 aquatic and coastal species[6].

The total area of natural floodplains along large watercourses of the Amur basin was estimated at 90,000 square kilometres. The total retention capacity on nine floodplain stretches of the Zeya and Amur rivers during the 2013 flood, calculated on maximum water levels, was about 130 cubic kilometers[7]. The water volume accumulated by natural floodplains was at least twice greater than the live volume of all existing and planned hydropower reservoirs of the Amur River basin. Optimal flooding levels in the floodplains should be defined under the new conditions to specify environmental flow requirements for existing and planned hydrological engineering facilities. Environmental flow releases should be incorporated into Operation Rules of the Zeya and Bureya reservoirs.

Flood protection dykes have more localized and thus less radical impact on floodplain ecosystems. Diking of river banks prevents flooding of floodplains and may lead to degradation of soils, reduction of fish spawning, etc. Construction of dykes narrows the flow and increases its depth and speed, thus destroying the spawning grounds and other habitats.

Despite their known limitations, dykes have been — and will remain in the foreseeable future — the primary structural protection measure for settlements in the Amur basin. The Comprehensive Scheme for Water Resource Management and Protection in the Amur River basin issued by Russia duly limits areas recommended for protection by dykes mainly to the settlements' territory[8]. The construction of a continuous 1200 km long line of dykes along the Amur River by China is cutting off large areas of floodplains and creates a potential risk of increased water levels, as the floodplains in China no longer accumulate flood waters[9]. Russia and China should agree on standards and limitations for transboundary riverbank protection by dykes which should be designed with the anticipation of a possible reduction of floodplain width on the opposite side.

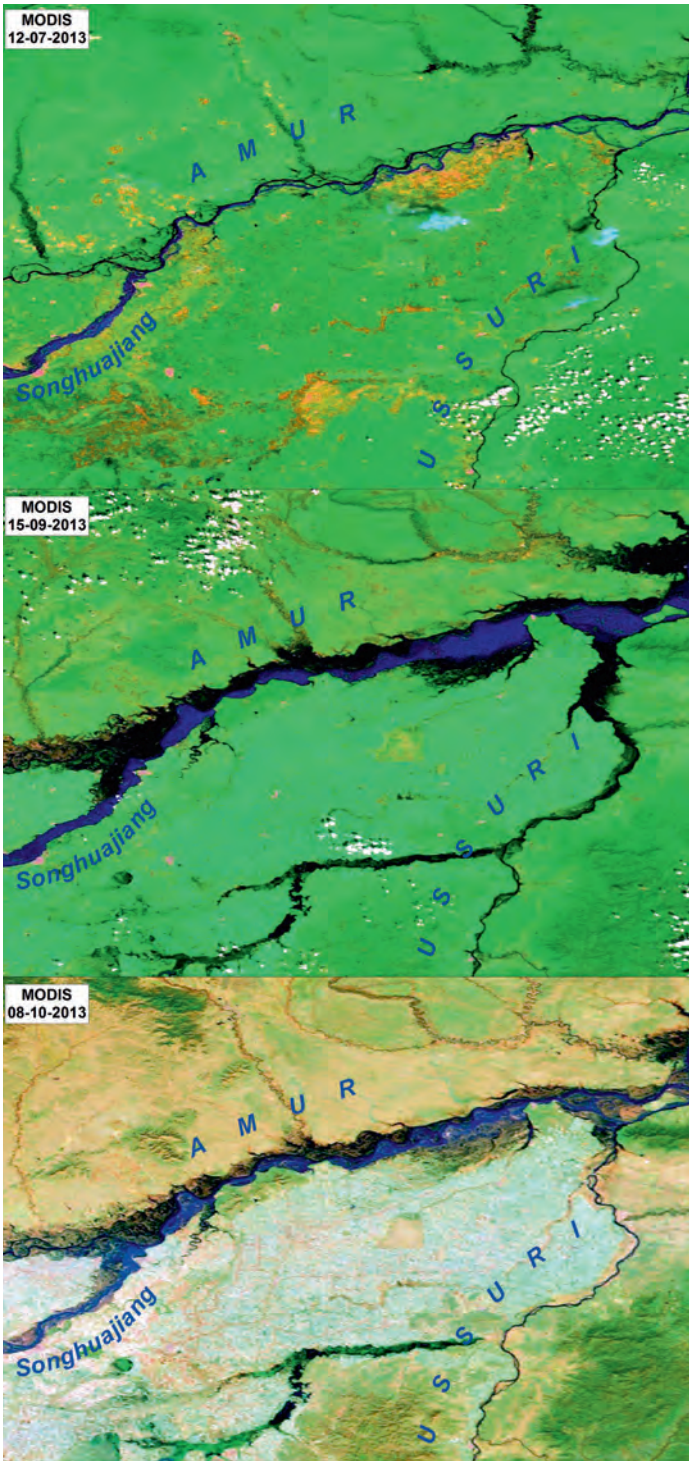


Image: *Middle Amur before, during and after the 2013 flood (MODIS NASA).*

International cooperation for biodiversity conservation

Biodiversity conservation is often achieved by the establishment of protected areas, which by their legal regime are also well suited to protect natural flood retention areas from undue development. This shows huge potential for synergy between biodiversity conservation and flood risk reduction in the course of river basin management planning and implementation.

In 2011, China and Russia adopted the "Sino-Russian Strategy for Development of a Transboundary Network of Protected Areas in the Amur River Basin for the Period till 2020". Based on its results, recommendations on establishing protected areas in floodplains which are particularly important in terms of accumulating flood waters and preserving valuable natural ecosystems should be prepared.

China and Russia should learn from each other's policies and flood management practices. In particular from China's National Zoning for Ecological Function Management[10] to delineate a complementary eco-functional zone for flood retention and biodiversity conservation in the transboundary Middle Amur River. A similar zone already exists along the Nen and Songhua rivers.

The two nations together would certainly greatly benefit from a joint integrated flood risk management program aimed primarily at a more efficient adaptation of economic activities and settlement planning to the Amur's cyclic hydrological fluctuations and maintaining productivity and diversity of the free-flowing river ecosystem. So this should be the basis for any approach to planning flood risk management in the transboundary Amur River basin.

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The Karnali River — Nepal's Last, Most Pristine Free-Flowing River

Karen Bennett. The Karnali Expedition

Karnali River (Nabin Baral, Karnali Expedition, 2018)

Of the three major rivers emerging from the Nepal Himalaya—the Koshi, the Gandaki, and the Karnali—the Karnali is the only major river that remains free flowing. All others have been dammed for hydropower generation, reflecting an increasingly intensive pattern of hydropower development across Nepal. There are currently four hydropower dams and two major irrigation diversions planned for the mainstem of the Karnali River, and the construction of any one of these infrastructure facilities will forever change the flow of the Karnali River, as well as the diverse values and benefits derived from it. The construction of all six facilities would devastate the river system and its species diversity and fundamentally alter the cultures and economies of riverine communities that depend on it. Given these expected developments, this may be the last opportunity to protect the ecological and social dynamics of this watershed before it changes irrevocably.

The Karnali River is the gateway to the Kailash Mandala region from the Ganges River. It provides a sacred corridor once travelled by Shiva and his wife Parvati on his way to his home in Mt. Kailash.

Today, the river corridor is travelled by tens of thousands of pilgrims annually. The opportunity to increase religious and adventure tourism in the Karnali region is extensive ranging from isolated camping adventures to the High Peaks of Api and Sipal Himal to helicopter transport through deep river canyons to world class kayaking and rafting adventures. Each of these would honor the diverse cultural aspects of the river corridor and be testament to the engaging beauty and diversity of terrestrial and aquatic environments one is able to travel through in a short 507 km transect of the river system.

Globally, rivers and streams are among the most threatened ecosystems, with rates of species loss greater than those on land (Dudgeon et al. 2006). In Asia, aquatic conservation has been severely hampered by a lack of study, creating a "knowledge impediment" to both quantifying and alleviating biodiversity loss (Dudgeon 2003). Unfortunately, Himalayan Rivers have traditionally been understudied. Kottelat and Whitten (1996) categorized Nepal as one of the countries in Asia where "some (fish) data are available, but their quality and the existing geographical gaps justify extensive field work." The IUCN (2010) classified 1/3 of freshwater species in the Eastern Himalayas (including our study site) as "Data Deficient." This deficiency is troubling, as the Eastern Himalayas was designated a Biodiversity Hotspot by Conservation International in 2000, and includes several "Global 200 ecoregions" that harbor irreplaceable or distinctive biodiversity (Olson and Dinerstein 1998). Impoundment of rivers through dam construction is one of the greatest threats to aquatic biodiversity worldwide (Richter et al. 1997), and recent hydroelectric development in the Himalayas suggests that dams may threaten Himalayan aquatic diversity soon (Grumbine and Pandit 2013, ADB 2018). Currently 79 species of fish, with several endemic species have been identified in the Karnali River with the highest number of species and the greatest populations below 1500 meters. Habitat for the critically endangered iconic Golden Masheer, Giant Catfish, Gharial and Ganges Freshwater Dolphin are all threatened by the four mainstem hydropower dams and two irrigation diversions being planned now.

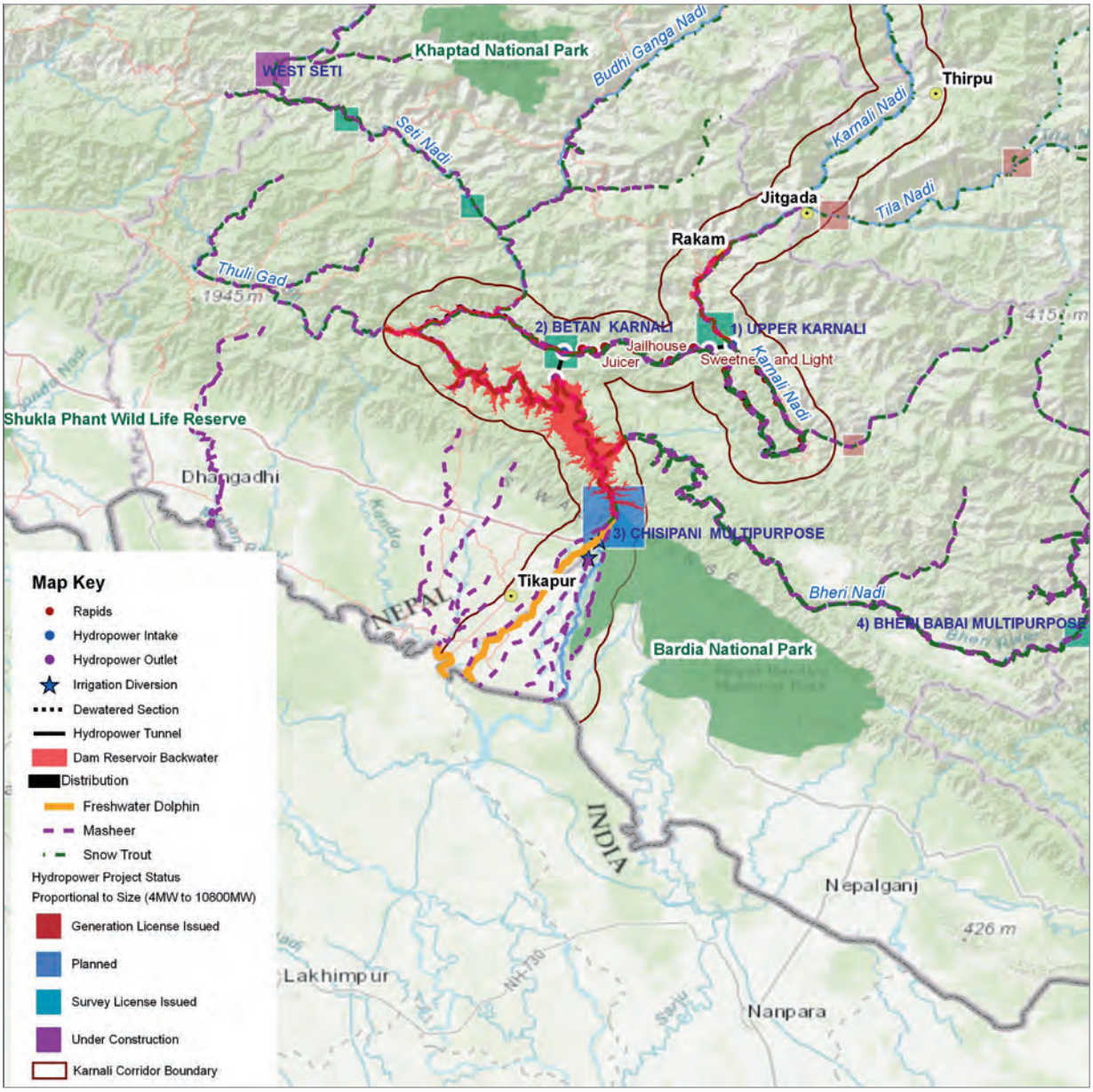
There is a brief window of opportunity to protect the existing resources (ecological, social and cultural values) of the Karnali River as a World Heritge Site before the alteration of environmental conditions. Designation of the Karnali as a World Heritage Site would promote more informed dialogue about the future. However, there are looming threats to the free-flowing nature of the Karnali River. Currently four hydropower dam survey permits, which would result in 13,384 MW of hydroelectric energy, have been issued for the mainstem of the Karnali River (See Map). Another 6,510 MW of energy is permitted on four of the major tributaries (Mugu, Tila, Bherri, and West Seti) and on three smaller tributaries in headwater streams of the Karnali. The tributary dams, if constructed, would yield six times the hydropower currently produced in all of Nepal. These tributary dams could be strategically placed and prioritized for construction to minimize impacts on the aquatic and cultural resources of the Karnali River thus leaving options open for the future while promoting the integrity of the Karnali mainstem – Nepal's last, most pristine free-flowing River.

1) The long-planned **Upper Karnali Hydropower Project (900 MW)** is a 64m high run of the river dam which would tunnel through the Mahabarat Range just below Daab for a short 2km long tunnel thereby gaining river power by shortening the distance of flow and creating a significant head to create electricity. The Upper Karnali Hydropower project would significantly reduce flows for 55 km of the river course for 8 months of the year, and block or alter migration of the endangered Masheer – even if the legally mandated 10% minimum environmental flows are maintained, this may not prove sufficient for some species. Sediment would also back up behind the dam, flooding and destabilizing hillslopes further upstream in the middle Hills physiographic region. GMR, the Indian development company is currently seeking financing for the project.

2) The proposed **Betan Karnali** Hydropower Project (688 MW) is a 50m high run of the river hydropower dam which would tunnel water through the Mahabharat just above the Seti River Confluence through the Siwalik Range just east of the Jamune community. If constructed, this dam would dewater 69 km of river through some of the most productive Masheer fish habitat in the entire Karnali river basin. The reduced flows downstream of this dam, even during the monsoon flows, would

allow the high sediment loads transported in both the Seti and the Thuli Gad rivers to block the mainstem of the Karnali making it impossible for fish passage and to run the river with kayaks or rafts. Backwater from this dam would flood several Class IV whitewater rapids effectively killing the current rafting industry. In addition, there are considerable questions about the stability of tunnel construction through the unconsolidated Siwalik Hills.

3) The **Chisipani Multipurpose Hydropower Project** (~10,800 MW) is a 370m high full channel spanning hydropower dam which will back up water flow in the Karnali 92-122 km above Chisapani or 6-36km past the Seti River confluence (Elan, 2018). The flooding will displace thousands of people. Habitat for freshwater dolphin, Giant catfish and the Golden Masheer would be eliminated. Five of the eight (62.5%) named rapids on the Karnali, the rapids that make the Karnali a world class river, would be flooded out below "Jailhouse Rapids" as well as 37.5% of the other unnamed rapids in the main rafting section of the river. This dam will permanently alter the sediment regime of the Terai and the productive farmland that local communities depend upon. Coupled with the existing irrigation outtake just below Chisapani, this dam will also alter the hydrologic and sediment regime of the entire alluvial fan.



Map: *Dams planned in Karnali Basin and their impacts. (Karnali Expedition - USAID)*

4) Irrigation withdrawals from **the Bheri-Babai Multipurpose Project,** which would divert at least 10% of the flow of the Bheri River to the Babai River system will also impact the flow of the Karnali River down to the Indian border. Data provided by IWMI indicates that 35% of the Karnali River's flow (on average) comes from the Bheri River. The alteration of the timing and amount of water flow would threaten the use of the Karnali river for freshwater dolphin habitat and wildlife in Bardiya National Park and throughout the Terai alluvial fan.

In addition, the Rani Jamara Kulariya Irrigation diversion project has already reduced flow to the eastern (Geruwa Channel) distributary channel of the Karnali affecting the wetland habitats of tigers, elephants, one horned rhinoceros and spotted deer. Continued withdrawals of Karnali River flows with this project threatens the river depth and the ability of the remaining Freshwater Ganges River Dolphin to use this area, the species only remaining habitat in Nepal (at least 43 individual dolphins have been recorded in Nepal's section of Karnali basin recently).

The time to protect the Karnali River is **'now'.** Recent news indicates that the Betan Karnali Hydropower Project has gotten financial closure through a consortium loan under the leadership of SBI Bank and Nabil Bank (Mero lagani, April 12, 2019). In addition, the Investment Board of Nepal has recently asked GMR Resources to finalize all financial preparations to construct the Upper Karnali Hydropower project, and that land acquisition for the project has already begun (Himalayan Times, 2017).

In short, because of intensive hydropower development in almost all of Nepal's major watersheds, and because of the looming threat of climate change and its unknown effects on its montane rivers and streams, Nepal is at risk of losing biodiversity before it can even be fully described. For all these reasons, global attention to the Karnali, while it remains free flowing, is critically urgent.

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The Greater Zab: The Last Free River of Mesopotamia

By Alex Kemman

Greater Zab river, Deraluk, Amadiya district, Iraq. 30 November 2018. (© Alex Kemman)

The water of the Tigris River is historically a scarce resource. Dams in Turkey, Iran and Iraq carry a heavy cost downstream. The land between two rivers – The Mesopotamia – is drying up.

Only one river in the Mesopotamian watershed is still flowing free: the Greater Zab. Supplying one third of water volume to the Tigris River it is a key river for humans and animals in the region.

The Greater Zab river springs in the high mountains of Southeastern Turkey, but increases dramatically in Iraqi Kurdistan where 65% of it's flow is added by other tributaries (Sheen, Chama, Rawanduz, Khazir). The Greater Zab basin is a region that is largely untouched by human activity and contains many Key Biodiversity Areas which include endemic species.

Globally, it is increasingly argued that rivers should remain free and that some rivers should be no go zones for dams. The water of the Mesopotamian rivers is vital for the lives of millions of people.

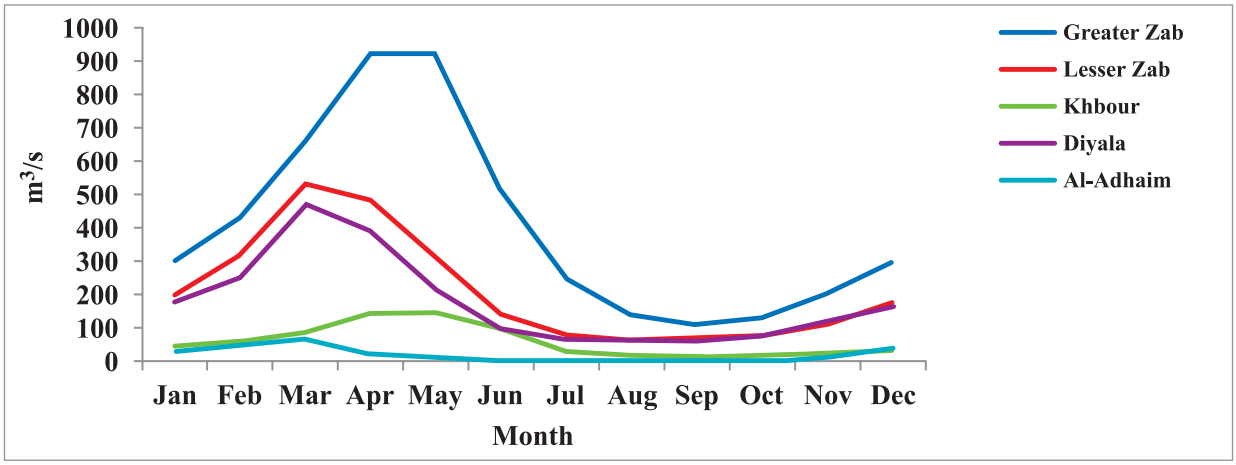


Figure: *The natural flood pulse in Tigris Basin is largely sustained by the free-flowing Greater Zab and is vital for continued well-being of downstream wetlands, including the marshes of the «Ahwar of Southern Iraq» World Heritage site*[1].

However, dozens of dams are planned both in Turkey and Iraq as companies and states see the undammed river as untapped potential for hydropower and irrigation. Greater Zab, the last free flowing river, represents the friction between freedom and control. Dams are political instruments to control the key resource of this region, and therefore the territory and population that lives in it. Some dams are even used as water-weapons.

Bekhme dam, Bradost district, Iraq. 23 november 2018. (© Alex Kemman)

It was Saddam Hussein who attempted to dam the Greater Zab first. 1.5 billion US dollars were spent on the Bekhme project, the largest dam of Iraq, but it was suspended during the Kurdish uprising of the 90s. In Kurdistan people believe this dam was meant to divide the Kurdish tribes. Others have propagated the dam as a way to control the flow to South Iraq, and use that as political leverage.

The 37 MW Deraluk Reshawa "run-of-the-river" hydropower project will be the first dam directly on the Greater Zab. The 129 million dollar project is financed by a Japanese development bank and is built by Boland Payeh Iranian company. Despite promises of employment opportunities and local development, most of dam construction at the Deraluk Reshawa dam is done by Iranian workers because of low wages.

Greater Zab river, Deraluk, Amadiya district, Iraq. 30 November 2018. (© Alex Kemman)

Rocks are blown up in order to make space for the dam. The construction was inaugurated in November 2015 by prime minister Nechirvan Barzani of the Kurdish Regional Government. The Kurdistan Region Government and most of the local population support the dam, while similar Turkish and Iranian dams are negatively conceived due to their downstream effects on Iraq (and Kurdistan). Geopolitics and ethnic identity frame the support or resistance towards the dams, especially in this region that is characterized by a struggle for self-determination.

1 Source: Nahlah Abbas et al. 2019 Recent Trends and Long-Range Forecasts of Water Resources of Northeast Iraq and Climate Change Adaptation Measures. Water 2018, 10(11), 1562; https://doi.org/10.3390/w10111562

The Europe's Last Wild River

"Save the Blue Heart of Europe" Campaign

The Vjosa River (Gernot Kunz)

***The Editors** have chosen the Vjosa River example to illustrate global mass-execution of natural river ecosystems by haphazard construction of multiple inefficient relatively small hydropower plants, the largest of which, Kalivac and Poçem hydro, are just over 100 MW each. These are not carefully planned micro-dams designed to serve needs of locals, but massive rampage through river basins by hydropower industry selling electricity to national grids, which would be impossible without ill-designed subsidies and waiver of stringent EIA requirements in the name of "clean energy".*

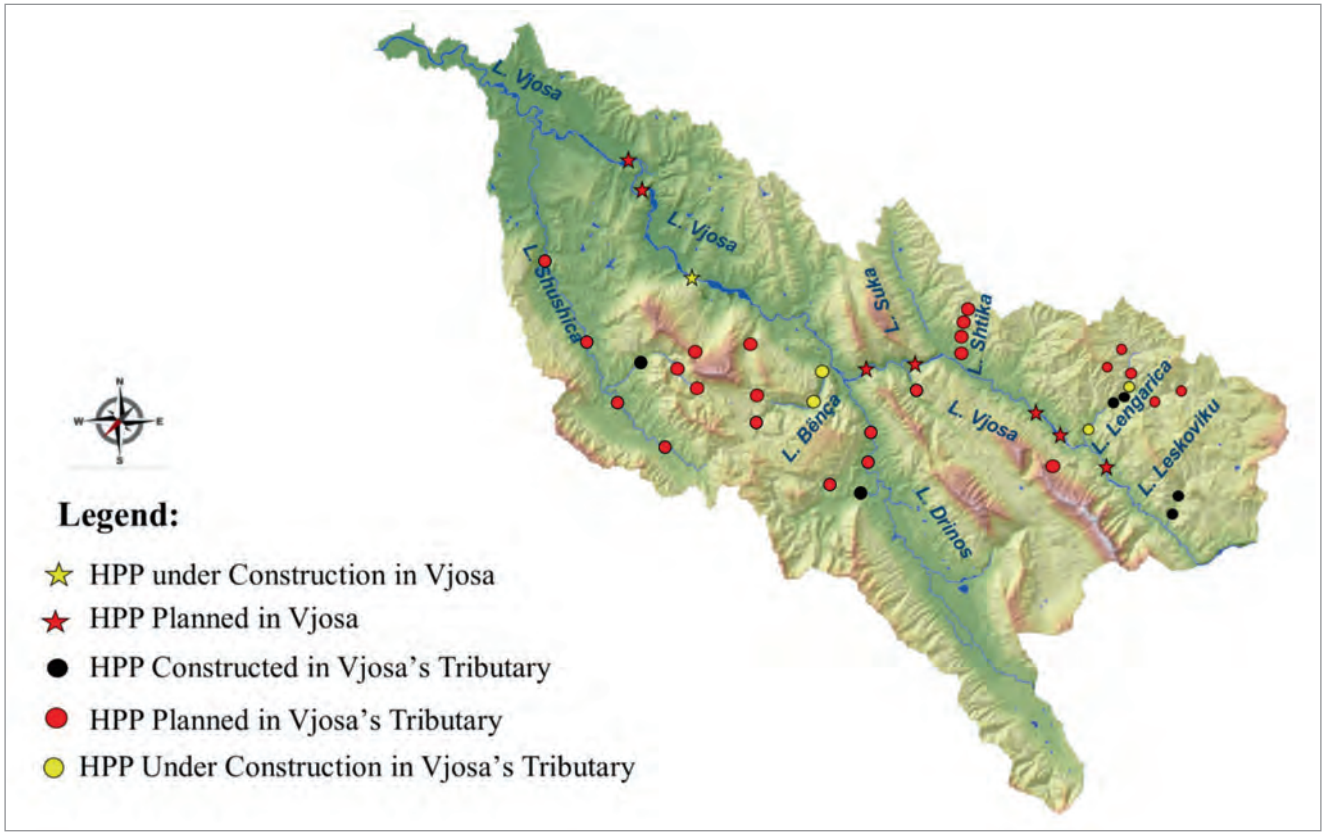
Given that pristine rivers have been heavily modified by water infrastructure throughout Europe, the near-intact Vjosa River could qualify for inscription on a World Heritage List as a superb example of ecological processes and complexity of the free-flowing river ecosystem in the Balkans, but its basin is being threatened by 42 mediocre hydro-dams instead.

The protection of the Vjosa in perpetuity as a National Park is a key goal of the campaign "Save the Blue Heart of Europe", which aims to protect the most valuable rivers in the Balkans. The campaign is coordinated by the NGOs Riverwatch and EuroNatur and carried out together with organizations in the Balkan countries (e.g. in Albania with EcoAlbania and other partners)[1]. This text was adapted from their communication to EU bodies and the Bern Convention Secretariat.

The Vjosa River in Albania is of pan-European or even global importance. Along its 270 km flow it represents one of the last intact large river systems in Europe, flowing from the Pindus Mountains in Greece to the Adriatic Sea without artificial obstacles[2]. It hosts all different types of ecosystems: from the narrow gorges in the upper part to the wide braided river sections in the middle part to the near natural delta. The Vjosa River is draining a total area of 6,700 km² in Albania and Greece and discharges an average of 204 m³/s into the Adriatic Sea. Even more outstanding about the Vjosa system is the fact that, besides the main river, also most of its tributaries are still in a natural or near-natural state. The intact tributaries add an enormous variety of habitats and biodiversity to the Vjosa river system.

Vjosa valley covers almost 16% of Albania's territory. Despite the lack of extended studies, due to variety of natural habitats, this part of the country creates the possibility of an ecological continuance giving shelter to rich biodiversity. Dimension, complexity and integrity of river habitats along the Vjosa are unique within Europe. The braided river system is characterized by large gravel banks with pioneer vegetation, islands, side arms, oxbows, ponds, and alluvial forests of native vegetation that provides breeding ground for typical bird species.

The habitats of the Vjosa valley are still in a natural or near-natural state. No artificial obstacles, weirs, or fixed embankments (except near bridges) disrupt the river continuity and morphodynamics. The main concern is the massive hydropower development that is foreseen on the Vjosa and its tributaries which will cause irreversible damage to this European natural heritage and its fauna and flora.



Map of Vjosa River basin with existing and planned hydropower.("Save the Blue Heart of Europe" Campaign)

42 hydropower plants are projected in the Albanian part of the Vjosa basin: 8 at the Vjosa itself and 34 at its tributaries. An additional five hydropower plants have already been constructed on two tributaries in the last years. While the Albanian government is pushing for new hydropower plants, it fails to have proper Environmental Impact Assessments (EIA) prepared for these projects. The proposed hydropower projects would flood unique alluvial areas with gravel islands, forests and fertile agricultural

lands. Therefore, all the species that live or forage in the area would be gravely affected. Albanian scientists predict, that the populations of many species would decline considerably. At least 177 species listed in the appendices of the Bern Convention would be affected by dam plans, especially by the Poçem hydropower plant project.

The project of Poçem hydropower (on the map marked by the second red star from the river mouth) foresees the construction of a dam around 30m in height, 200m in length and with an installed capacity of 102,2 MW. The HPP dam will create a reservoir of 24 km^2, which will flood about 2000 ha of agricultural land, in Mallakastra and Selenica Municipalities. The concession was given to the joint venture "Kovlu Energji" of Turkish companies "Ayen Enerji" and "Cinar San" on September 2016. The company did not perform public hearings with the affected community and Local Government thus violating the Albanian Law and international conventions. After a series of petitions, letters of concerns and protests, 38 residents and 3 NGOs filed a lawsuit requesting the annulment of the contract for the Poçem hydropower on December 2nd 2016. Within 5 months after a series of court hearings on May 2nd 2017 the Administrative Court of First Instance in Tirana decided to declare the nullification of the concession contract signed between the Ministry of Energy and Industry and the Turkish company "Kovlu Energji" as a result of a series of procedural law infringements.

The Kalivaçi project (on the map marked by a yellow star) is the first hydropower in Vjosa, that obtained permission in 1997. The construction of the dam began in 2007, but has stopped several times. In the beginning, the main source of investment was the Italian investor Becchetti Group and Deutsche Bank, but the construction works progressed only up to 30 %, keeping the river still untouched. In May 2017, the Albanian government canceled the contract with the Italian "Kalivaç Green Energy Co." and re-started tender for the construction of the Kalivaçi HPP, with the concession finally awarded to the joint venture of Albanian "Fusha sh. p. k." and Turkish "Ayen Enerji" (the co-owner of the joint venture "Kovlu Energji" for which the Administrative Court took the decision to cancel the concession for construction of Poçem hydropower). With a 47m high dam, the Kalivaçi hydropower foresees to cover about 1700 ha of various habitats, arable land and more than 120 houses on the Memaliaj Municipality. The 500m long dam, placed in both sides of the hills is planned to form a reservoir with a volume of 350 million m^3 and installed capacity of 111MW.

The projected hydropower plants would all have severe individual and fatal cumulative impacts on the pristine habitats of the Vjosa river system and the species it is hosting. In summary, the Poçem and Kalivaç as well as the other projects foreseen on the Vjosa and its tributaries would destroy Europe´s last intact wild river system. They would lead to a severe loss in biodiversity and affect all ecosystem services, such as natural purification of water, vast groundwater aquifers for drinking water supply and agriculture, flood mitigation, and its unique opportunities for a recreational development.

Unlike the "large" dam projects on the Vjosa itself, the smaller hydropower plants on the tributaries are designed as diversion type: up to 95% of the water is taken from the river, diverted into pipes to electricity-generating turbine at a lower elevation and then returned to the river kilometers downstream of the intake. This leads to a dry river bed below the intake, since the minimum flow necessary for biological processes is usually not maintained.

Editorial comment: *Small hydropower plants usually kill a small river even more thoroughly than some bigger dams silence larger watercourses. In a scandalous case of the 8 MW Lengarica Hydro on Upper Vjosa tributary, investigated and still monitored by the Ombudsman of the IFC (part of the WB Group)[3], even compliance with officially prescribed "minimal Environmental Flow" does not address rampant hydro-peaking (extremely uneven release of water dictated by energy demands) that is deadly for all aquatic species[4] which require natural flow regime. The IFC clients[5] are flushing Langarica as if it is a toilet and the agency's Ombudsman slyly states that "monitoring shows that (e-flow) requirements are being met".*

Lengarica Hydro on Vjosa tributary, disrupts flows in the national park. (Cornelia Wieser)

1 https://www.balkanrivers.net/en/key-areas/vjosa-river#anchor5

2 The only small water infrastructure is the Piges dam in Greece, about 10 km downstream the original Aoos/Vjosa source, which has no influence on free-flowing ecological processes in Vjosa River at large.

3 http://www.cao-ombudsman.org/cases/document-links/links-240.aspx

4 http://www.transrivers.org/2018/2432/

5 The Austrian ENSO borrowed USD 6 million from the IFC to build a hydropower plant inside Albanian National Park on Lengarica River. http://www.enso.at/en/references/portfolio/detail/lengarica/

Dams Decommissioned — Rivers Revived?

Editor's Note: *Many dams, typically small and medium in size, are being decommissioned around the world to restore freshwater ecosystems. This is an extremely expensive and difficult task. Bringing down a dam constitutes another radical change in environment and is associated with various hazards, such as release of toxic sediment accumulated over years behind the artifical barrier. Nevertheless, thousands of dams have been already undone and tens of thousands more are under consideration for removal. Rivers spanning World Heritage sites, nature reserves, indigenous traditional use lands and key biodiversity areas are the greatest priority for dam removal and restoration efforts. See several records of dam removal in such areas.*

Olympic National Park, Dam Removal Cost and Benefits[1]. USA. 2012

Removal of the Elwha and Glines Canyon Dams from the Elwha River in Washington State was the largest dam removal and river restoration project in the United States to date. Before these dams were built, the river supported ten runs of salmon and trout, including all five Pacific salmon species.

Left: *Elwha Dam under deconstruction (Ben Cody/Wikimendia)*
Right: *Elwha Dam removal finished, May 2013 (Zandcee/ Wikimendia)*

This project was a unique opportunity for fishery restoration because the upper section of its watershed lies entirely in Olympic National Park World Heritage Area, increasing the chances of successful recovery. The cost of removing two dams and restoring the river, as well as lost power generation, was outweighed by the benefits to the Lower Elwha Klallam Tribe, nearby communities, and American public. The Lower Elwha S'Klallam Tribe has lived in the area since before the beginning of recorded history, and the Elwha River and its fishery had served as the basis for the culture, economy and sustenance of the tribe, all of which were severely impacted by installation of the dams.

The US Congress passed the Elwha River Ecosystem and Fisheries Restoration Act in 1992. The Department of Interior purchased the two dams from James River Corporation in 2000 for $29.5 million. Two environmental impact statements (EIS) concluded that neither leaving the dams intact nor

installing fish passages would be sufficient to restore the fisheries. As a result, the Elwha and Glines Canyon Dams were removed in 2012. The total cost of purchasing and removing the dams and hydropower facilities, and conducting river restoration activities, was $324.7 million. Twenty years passed between when the Elwha River Ecosystem and Fisheries Restoration Act was passed and when the dams were removed.

Removing the Elwha and Glines Canyon Dams provided access to an additional 40 miles of mainstem river habitat as well as tributaries. In the first season after the Elwha Dam was removed, more than 4,000 spawning Chinook were counted.

Removing the dams and restoring the river and its historic fish runs have generated wide ranging benefits for local residents and visitors, including: cultural benefits for the Lower Elwha Klallam Tribe; improved catch rates for commercial and recreational anglers (estimated at $5.3 million dollars per year from increased total catch); additional jobs and income from dam removal and river restoration activities; additional jobs and income from new tourism; benefits to the American public from restoring a notable river; and a suite of ecological benefits from restoring the salmon runs. The processes of dam removal and river restoration also added at least 760 new jobs and $33 million in new personal income to the area. Loomis (1996) estimates dam removal and full restoration of the river would result in 500,000 more visitor days to the area per year from U.S. residents alone, with associated expenditures of $43.8 million per year. These expenditures were expected to support 446 additional jobs in the county.

Editor's Comment: *However successful in dam removal, managers of the World Heritage in the US learned that some most damaging dams cannot be removed due to their size, but require constant monitoring and mitigation. Nearly $10 million annually is spent on research and monitoring of effects from Glen Canyon Dam operations on the Grand Canyon National Park World Heritage Site[2]. Now due to climate change the Colorado River does not have enough water for all its large dams, but they are too big to be removed and little could be done to offset their impacts.*

Shiretoko - Flood Control Benefits Reassessed[3]. Japan, 2018

Following the World Heritage Committee Decision issued at the 41 session, the Government of Japan decided to remove three dams crossing the Rusha River and have launched a demonstration experiment to verify whether riverbed paths are able to function as an alternative to the bridge over the river.

Based on a special study of options available to remove three check dams, the Shiretoko World Heritage site managers decided to remove the central part of each dam, including their underground parts. By this method, it is expected that the removal of concrete dam including underground parts will restore subsurface waters, in addition to the braiding of surface waters. These will lead to an increase in suitable sites for spawning, and will make it easier for salmonids to migrate upstream through removed parts.

Nevertheless, if the removals of the three dams are conducted at the same time, there is a concern that resulting too rapid sediment movements may cause severe impacts on downstream area. Therefore, the removal of the dams will be gradually conducted from the upper stream, with monitoring of their effects.

Meanwhile, the managers have explained this plan to the fishery stakeholders and have gained their consent in 2018. Currently, specific methods and periods of the removal work are being discussed with the fishery stakeholders.

Left: *Current view of the Rusha River dams in Shiretoko*
Right: *Modelled result of dam removal*

The Construction and Destruction of the Shengxing Power Station. China, 2018[4]

Environmentalists and community activists in China's Sichuan province in November 2018 celebrated the demolition of an illegally-constructed hydropower station located inside the buffer zone of the ancient Dujiangyan (都江堰) Irrigation System, a protected UNESCO World Heritage Site and the world's oldest fully operational hydraulic engineering project. The Shengxing (圣兴) power station sits less than a kilometer away from the "Fish Mouth" levee, a key feature of the Dujiangyan system that for 2,300 years, has helped to protect against flooding and to channel water for agricultural use.

Dujiangyan community members celebrating the demolition of the Shengxing power station. The banner reads "We will protect you forever, Dujiangyan World Heritage Site!" (Peng Wei)

In 1973, a small-scale hydropower station called Zipingpu Power Station was built on a channel of Dujiangyan's Outer River. It was leased by a private citizen in 2005, who then joined with other shareholders in 2012 to form a joint holding company called the Shengxing Investment Company to build a new hydropower plant. One body that invested heavily in this new company was controlled by the Dujiangyan Administration Bureau, a government office primarily responsible for overseeing the management of local tourist areas such as Dujiangyan.

In a protected area such as Dujiangyan World Heritage Site, a wide range of national and provincial-level authorities must be consulted before new construction can be approved. Any construction in close proximity to a UNESCO heritage site in China also requires the approval of the Chinese National Commission for UNESCO. The Shengxing station was never subject to any of these processes.

The tireless and courageous work of community activists and the growing frequency of media reports exposed the full details of the corruption and misuse of state property by Dujiangyan City officials. Shengxing power plant stopped its operations in early 2017, and in August 2017 the Dujiangyan City government ordered the demolition of the illegal Shengxing station. The government officials were disciplined by the Communist Party, but faced no civil or criminal charges. It took until June 2018 for the demolition crews to arrive and finally tear down the structure, which is a good conclusion of this latest chapter in the fight to preserve Dujiangyan for future generations, and maintain the special character that makes it a vital, invaluable link to the past.

Demolishing Dams will Help Build an Ecological Civilization. China, 2019[5]

To protect the habitats of giant salamanders, a rare species in China, Zhangjiajie city, Hunan province, has closed down 34 hydropower stations located in a Giant Salamander National Nature Reserve that was founded for the protection of these amphibians, and 10 dams belonging to these hydropower stations have been demolished on the Lishui River, a major tributary of the Yangtze River in the province by December 2018. Beijing News comments:

The largest amphibian known today, the giant salamanders are called as "living fossils" as they date back to the era of the dinosaurs. Zhangjiajie is a major home to them.

The dams and power plants interrupted the flow of the river, and also blocked the breeding migration of aquatic creatures and the increase of human activities degraded the water quality. Despite the establishment of the natural reserve, the habitats of the giant salamander have shrunk to isolated spots on the map.

After the dams were removed and hydropower stations shut down, the flow of the river has recovered, and the water quality has greatly improved. The living environment of the giant salamanders and other aquatic live has markedly improved.

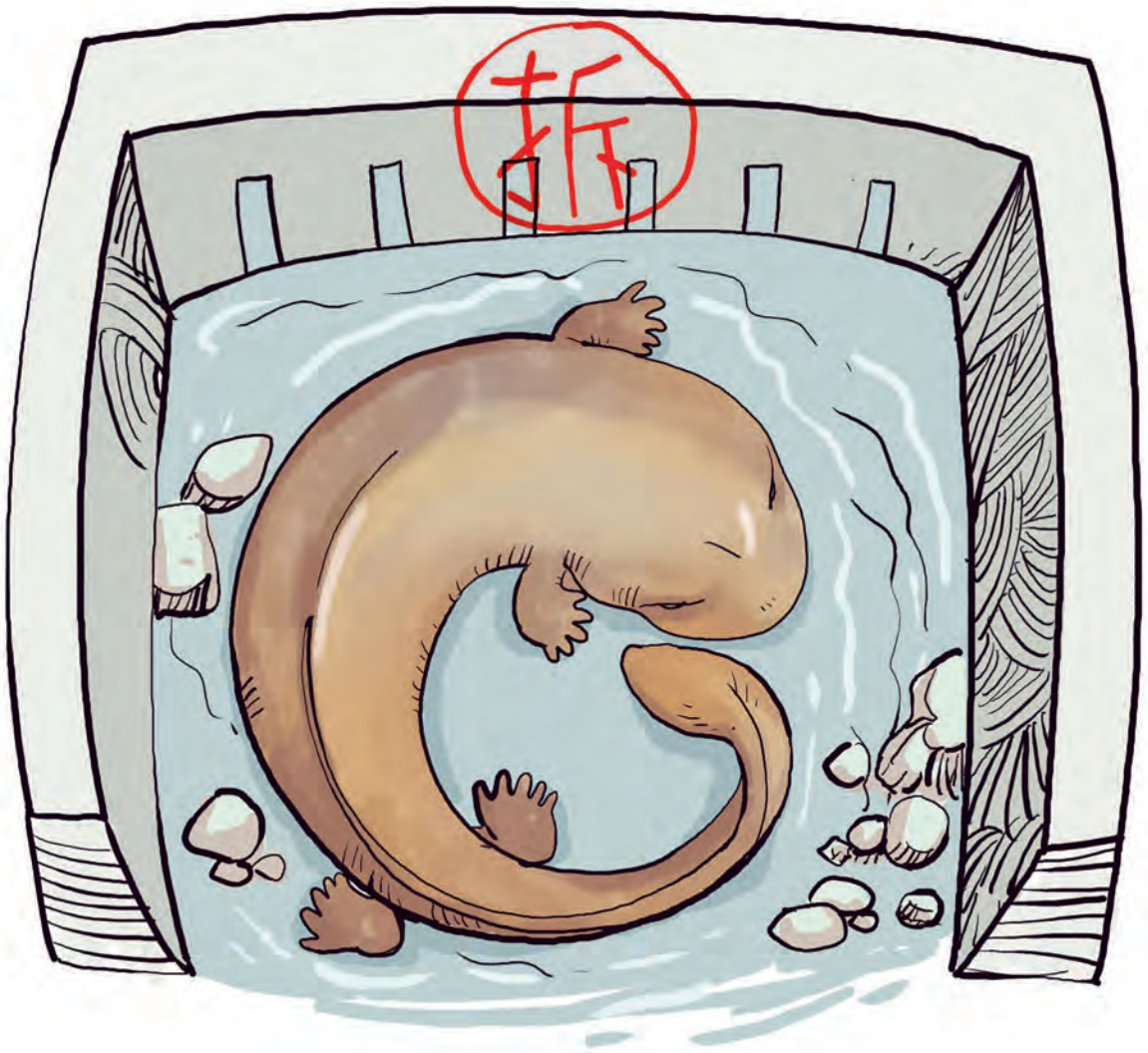
No doubt the city has set a good example for other places in making the right choice between ecological protection and hydroelectricity, which was being generated at a heavy environmental and ecological cost that was long ignored.

The construction of large-scale hydropower plants has been carried out for decades in Central and Southwest China, which are in the middle and upper-reaches of many rivers. With dams built on the upper reach of a river, the whole river valley downstream is affected, causing radical changes in the river ecology.

Many categories of fish cannot swim upstream to spawn because of the obstruction of the dams and hydropower stations. Statistics show multiple artificial reasons have almost depleted the fish population in the Yangtze River, the country's longest river, and many kinds of fish have died out quickly over half a century.

In the 1980s, some developed countries started reflecting on the negative ecological and environmental effects of hydropower, and the construction of dams in these countries slowed down. And some countries have no longer built dams since then, while the building of dams sped up in China.

Hopefully, the move of Zhangjiajie can prompt decision-makers to face squarely the series of ecological and environmental problems caused by fast development of the hydropower industry in the country's ecologically delicate regions. As China has vowed to divert its focus from economic growth to sustainable development and ecological protection, it is time to address the overdue challenge.



«Remove dams-free salamander!» poster

1 Case-study adopted from a report available at http://headwaterseconomics.org/economic-development/local-studies/dam-removal-case-studies

2 US Government. Grand Canyon National Park Periodic Reporting cycle II.

3 Government of Japan. State of Conservation Report on Shiretoko. November 2018.

4 Adopted from an article by Samuel Smith https://www.internationalrivers.org/blogs/435/china-shows-its-commitment-to-protecting-domestic-rivers-cultural-heritage

5 Republished without any edits from «China Daily» March 26, 2019. http://www.chinadaily.com.cn/a/201903/26/WS5c995f09a3104842260b2761.html

Part III. RECOMMENDATIONS AND BROADER PERSPECTIVES

Vjosa River (Gregor Subic)

Rivers, Dams and Heritage — Our Recommendations to the World Heritage Committee

Machakabab Spring (Karnali Expedition)

I. Protecting free flowing rivers, freshwater ecosystems and cultures:

The outstanding universal values of free-flowing rivers and their ecosystems, which may represent six World Heritage selection criteria V-X, are not adequately represented on the World Heritage List, and this holds true practically for all other types of protected areas, with the minor exception of sites listed under the Ramsar Convention as wetlands of international importance.

Freshwater biodiversity disappears from the Planet twice as fast as terrestrial or marine populations of biological species. Nevertheless, the IUCN World Heritage gap analysis for biodiversity underrepresented on the World Heritage List, undertaken in 2013[1]: "*focuses only on the terrestrial realm (a separate study is undertaken for the marine realm), and does not specifically deal with freshwater biodiversity.*" Some wild rivers are still represented in that report through assessment of protected areas which have been listed for features other than their freshwater biodiversity, such as the Grand Canyon, but there is no systemic analysis of freshwater ecoregions, which host about 30% of diversity of vertebrate species and display a tremendous spectrum of geomorphological and ecological processes.

Many important cultural phenomena are inseparable from natural rivers and the human dimensions of riverine heritage should be also subject to conservation efforts. Many rivers, although unregulated, have been utilized by people for centuries without destroying natural dynamics or key biodiversity features. Such river valleys, while not necessarily representing wilderness areas, are likely qualify for nomination as cultural landscapes. We believe that the World Heritage Convention is uniquely positioned to become one of the most important platforms to promote comprehensive preservation of the outstanding values of free flowing rivers and their ecosystems in each region of the world. For a start we need a series of new nominations dedicated to the protection of free flowing rivers and their ecosystems in each biogeographic region of the planet representing the most important ecological processes.

The 2013 IUCN Report calls for the next more comprehensive analyses of gaps to be undertaken by 2020. We argue that the most urgent part of that effort should focus on the previously overlooked freshwater realm.

- We urge the World Heritage Committee and the IUCN to commit immediately to a special thematic study for the identification of river ecosystems and freshwater ecoregions which should be represented in the World Heritage List.
- We also ask the World Heritage Committee and World Heritage Center to alert the States Parties to the urgent need to protect free flowing rivers and their ecosystems, and to develop and submit proposals for early nomination of known examples of still undamaged river ecosystems of outstanding universal values. Some potential candidates are described in this book, such as the Karnali, Congo, Amur and Vjosa rivers.

  We also ask the World Heritage Committee and World Heritage Center to promote conservation of free-flowing rivers and their ecosystems by expanding existing World Heritage properties to incorporate omitted riverine values. Examples in this volume include the Ahwar of Southern Iraq (Greater Zab River), Lena Pillars (Lena River) and Three Parallel Rivers of Yunnan PAs (Nu-Salween River and Tiger Leaping Gorge stretch of Jinsha River). We would argue that in most instances such re-nominations will not only increase and diversify Outstanding Universal Values (OUVs) preserved in these areas, but will be necessary for preserving the integrity of already existing properties by securing protection for key hydrological processes.
- We also believe that exploration of the possible contribution of World Heritage Convention to conservation of large wilderness landscapes and seascapes undertaken by IUCN[2] would be more complete and balanced if it addresses freshwater ecosystems along with terrestrial and marine. Free flowing rivers as freshwater "wilderness areas" merit specific approaches to their conservation. And the fact that both the conservation community and governments alike have been slow to recognize that, likely, contributed to the unimpeded catastrophic decline in freshwater biodiversity.
- Among all natural ecosystems on earth, rivers are most interconnected with living and ancient cultures. Co-management with indigenous river guardians should be a central part of the new concept. Nominations of free-flowing rivers and their ecosystems (and any other World Heritage areas) should be consistent with values of local indigenous communities and incorporate them as guardians of those waters and landscapes. Case studies from the Upper Enguri (Svan People), Rivers of Sikkim (Lepcha People) and Tropical Rainforests Heritage of Sumatra in this volume support this proposal. In addition there is a need to protect traditional livelihoods where they have shaped the river landscapes over time and/or have protected Outstanding Universal Values.
- Along with the World Heritage Convention all other existing legal conservation tools should be used and new approaches designed to ensure protection in perpetuity of the ecosystems of remaining free-flowing rivers. We urge the World Heritage Center, as well as Secretariats of the Convention on Biological Diversity, Bonn, and Ramsar Conventions, the New York and Helsinki Water Conventions to join forces with river-basin management bodies in order to develop a global strategy for the protection of the remaining free-flowing rivers, their ecosystems, and the global freshwater biodiversity.

II. Preventing Undue Impacts of Water Infrastructure

While it is not too late, we call on Parties of the Convention to ensure that World Heritage properties do not fall victim to competition for water, power and international investment. The harm caused by the creation of reservoirs, canals and dredging channels, causing alteration of natural flow and sedimentation regimes is profound and often irreversible.

We support the Committee's position that the construction of dams within the boundaries of World Heritage properties is incompatible with their World Heritage status. Going forward we suggest that the World Heritage Committee considers a resolution to forbid construction of large dams on rivers that are part of World Heritage sites and sustain the very conditions that the site was inscribed for. We also share the Committee's view that the potential impacts of any large-scale development, including dams, extractive industries, and transport infrastructure, on World Heritage properties located within their area of influence should be assessed through a Strategic Environmental Assessment (SEA) BEFORE such development decisions are made by the States Parties and investors. In the case of water infrastructure, those should be basin-wide SEAs with robust analysis of possible alternatives to the proposed development.

We believe that nowadays any hydropower which may negatively affect a World Heritage site should not be built under the disguise of "poverty alleviation" or "climate mitigation" since alternative renewable energy solutions are available to satisfy energy needs of local populations.

We want to suggest several measures to assist implementation of these decisions:

- **Allowable Limits to Alteration**

  Hydropower development has caused a dramatic world-wide decline in the number of connected, free-flowing rivers due to haphazard planning and disregard for environmental and social values. Only one quarter of sizeable rivers, longer than 1000 km, remain in near-natural condition from the source to the sea, with the rest no longer free-flowing[3]. Further degradation of intact river ecosystems should be stopped. Clear limits should be put on allowable alteration of large river systems by water infrastructure development, so that a basin can retain its key natural processes, species diversity and abundance, vital ecosystem services and associated cultural values. Such assessments are especially needed for basins containing World Heritage properties.

- **Precautionary measures of Decision 40 COM 7 and 42 COM 7 to be also applied to the properties on the Tentative List**

  Concerning candidate sites from the Tentative List of a State Party located in river valleys and deltas, we suggest that no dams and other large infrastructure be built in the respective river basins without proper assessments and a review of assessment results by the Convention bodies. In addition to the requirement on the incompatibility of large dams with existing World Heritage sites prescribed by Decision 40 COM 7 NO flooding by reservoirs of the sites placed on the Tentative List should be allowed.

- **Timeliness of implementation of specific decisions**

  The lack of timely implementation of decisions taken by the World Heritage Committee in past sessions resulted in increased threats and damage to World Heritage properties. These, for example, include cases in the Russian Federation, which failed to complete several requested EIAs, such as one on water level regulation at Lake Baikal, and the Lower Omo River Valley in Ethiopia threatened by impacts of Gibe III Dam. Both cases illustrate delays and non-compliance by States Parties.

  There are many pending Committee decisions prescribing complete and comprehensive SEA/EIAs on water level/flow regulation impacts and the requirement to design property-wide ecological monitoring systems related to infrastructure projects. To prevent massive non-compliance the World Heritage Committee may rule that where the Committee finds that its decisions and guidelines have not been followed (repeatedly) the World Heritage sites will be automatically placed on the List of World Heritage in Danger. The Lake Turkana case provides overwhelming evidence in favor of such regulations.

Additionally, it is recommended that any State Party planning or permitting large project investments in a basin where a World Heritage Site is located, should, at the earliest stage of planning, notify the World Heritage Center on the nature of the planned investment and whether, in the Party's opinion, it may affect OUVs and thus require an EIA/SEA. Environmental assessments should be pre-emptively applied on all World Heritage sites which potentially could be threatened by energy, water and transportation infrastructure projects. It is advisable that the World Heritage Committee set reasonable specific deadlines for EIAs/SEAs and request SEA (at least scoping for potential threats) as part of management planning for new World Heritage properties. This will harmonize and limit inconsistencies in the application of the Committee's recommendations by providing compliance mechanisms for practical enforcement, thereby reducing the rate of non-implementation of World Heritage Committee recommendations.

- **Addressing transboundary impacts**

  Many sites affected by water infrastructure (25% in 2018) are threatened across the borders by infrastructure built in other countries, often ignoring Article 6 of the Convention. Countries such as Turkey, Ethiopia, Bhutan, Mongolia, Kenya, Brazil are operating, developing or planning water infrastructure which may threaten World Heritage properties in adjacent countries. We suggest to use Article 6 to act pre-emptively rather than reactively, asking parties to assess potential transboundary impacts on World Heritage routinely while doing basin management planning and other large-scale development planning.

- **Insufficient investment safeguards and commitments of IFIs and the industry members**

  The Convention bodies and civil society organizations should reach out to international financial institutions partnering with states parties in water infrastructure projects which may potentially lead to degradation of the OUVs of the heritage sites. Some national and international finance institutions (IFIs) have already included wording on avoiding harm to the World Heritage in their adopted or proposed[4] policies. However, it seems advisable, that the Committee adopts a decision addressing financial institutions and companies established by convention parties, recommending that they adopt the wording of the Decision 40 COM 7 and Decision 42 COM 7 as minimal requirements for safeguarding heritage sites from impacts of hydropower dams and other large infrastructure. Good IFI practices should be showcased, as for example, the case with the China Export-Import Bank, which in consultation with the State Party reallocated to alternative development projects a US$1bn loan for Egiin Gol Hydro after learning that its potential harm to Lake Baikal World Heritage has not been properly assessed and discussed with World Heritage agencies.

  CSOs should team up with international institutions to urge investors and stakeholders to divest from large hydropower harming the environment similar to divestment from the coal industry.

  The World Heritage Committee is requested to stress in its decisions that information on intended infrastructure which may have impact on the OUVs of World Heritage properties which is to be provided according to §172 Operational Guidelines should also include a complete list of the institutions financing and executing the project.

- **Need to streamline and support pre-emptive early use of the strategic environmental assessment (SEA) tools**

  By Decision 42 COM 7 the Convention effectively calls on States Parties to support timely basin-wide SEAs before decisions on any water infrastructure projects which may be planned in a basin containing a World Heritage property. This requires site-specific follow-up from convention bodies. For example, in 2018-2021 the World Bank is supporting a SEA of basin-wide river manage-

ment and hydropower plans in key basins of Nepal[5]. Given that a large part of the 400 hydropower proposals are concentrated in Gandaki (Narayani) River basin with Chitwan National Park World Heritage in its downstream section, it is necessary to ensure that individual impacts of planned large dams (e.g. Budhi-Gandaki) and the cumulative impacts of all approved and projected hydropower on the World Heritage sites in Nepal are assessed and limits of allowable change (environmental flow regimes) defined before any decisions on dam construction are taken. Such strategic assessments must incorporate fair analysis of technological alternatives, especially now that hydropower is losing relative advantages to other types of renewable energy generation.

The Committee should increase the capacity of advisory bodies to provide technical support on SEA design and implementation and to strengthen oversight of compliance to achieve effective results. One simple form of guidance could be commissioning development of case studies on well-implemented SEAs to inform parties involved about best available practices.

- **More Stringent and Practical Environmental Assessment Guidelines Needed.**

  Decision 42 COM 7 says: "*42. Also noting that Environmental Impact Assessments (EIAs) and Heritage Impact Assessments (HIAs) do not always allow for a broad enough assessment of the potential impact of these large-scale developments, nor an assessment of a broad enough range of options at an early enough stage in the planning process,...*"

  In our reading, the World Heritage Committee Decision itself says that guidelines for doing EIAs and HIAs are not specific enough, and it doesn't provide enough guidance to do an EIA, SEA or HIA. In addition, it should be specified of what "broad enough" would mean.

  Impacts related to water course have their special pattern and assessment techniques. The World Heritage Committee recognizes that: "*17. ... urges States Parties to ensure that the impacts from dams that could affect properties located upstream or downstream within the same river basin are rigorously assessed in order to avoid impacts on the Outstanding Universal Value (OUV)*" (Decision 42 COM 7). However the Decision does not say **how** States Parties should ensure that, and neither says what a **rigorous assessment** should look like. As such, the Decision is open to very wide interpretation.

  We suggest that UNESCO/IUCN should develop specific criteria for such rigorous assessments. One of the possible basic requirements could be that the experts doing the assessments should be qualified independent specialists and (at least the key responsible leaders) should not be citizens of the State Party doing the assessment. The other basic requirement should be that Assessment Reports should be public and made available at UNESCO web-site (except for sensitive information protected by relevant laws on national secrets). UNESCO should also specify requirements on the contents and process of specific types of assessment in a binding guideline (e.g. basin-wide assessment of cumulative impacts from water infrastructure).

- **Coordination between and within conventions and international organizations on climate change policies to promote nature conservation and prevent destruction**

  We call for coordination between the World Heritage Convention and other biodiversity conventions on the one side and the Secretariat of the UN Framework Convention on Climate Change to ensure that adaptation and mitigation measures do not have any harmful impacts on World Heritage Sites and other areas of outstanding natural value. The World Heritage Convention should advocate nature-based solutions to climate change mitigation and adaptation which is a sustainable science-based approach fully consistent with the spirit of the Convention.

  This is an urgent matter since some States Parties have already included hydropower development potentially damaging to World Heritage as part of their initial Nationally Determined Contributions

(NDCs) under the Paris Agreement. Those NDCs include such examples as hydropower in Mongolia threatening Lake Baikal, dams in Nepal and Bhutan upstream from Chitwan and Manas national parks, hydrodams in Sumatra, as well as dams destroying the immense biodiversity of the Mekong River.

- **Environmental flows and other mitigation measures**

  Hydropower management anywhere should proceed only on the basis of comprehensive river basin management plans, which focus on (aquatic) biodiversity conservation, natural ecosystem services, well-being of local communities and sustainable development. Environmental justice, FPIC and community co-management of river basins should be fully incorporated as the main principles in such management systems. The World Heritage Committee and IUCN should identify and assess in cooperation with States Parties all properties which may be impacted by water infrastructure located in the same basins. Impacts already exerted by water infrastructure should be measured and mitigated. Already existing hydropower and other water infrastructure should be aligned with requirements for World Heritage protection or decommissioned.

- **Removal of harmful infrastructure**

  Dams and other water infrastructure negatively affecting protected areas and important biodiversity zones which can be decommissioned to ensure rehabilitation of river systems should be decommissioned, as it is being done now in EU, US and China. For inscribed and proposed World Heritage properties the opportunities for infrastructure decommissioning should be identified by the Convention bodies and the States Parties as soon as possible to remove additional undue pressure affecting wilderness areas and cultural landscapes. Many good examples already exist at several properties and this experience could be replicated elsewhere.

- **Other Protected and Key Biodiversity Areas**

  Not only World Heritage sites, but any biodiversity hotspots and protected areas (unless explicitly established at hydropower reservoirs), should be off-limits of new large-scale water infrastructure development and undue upstream and downstream impacts from hydropower. Legal loopholes that open the door for the destruction of rivers in protected zones should be revised, given that a wide range of alternatives in clean energy and water management are affordable in practically any country of the world.

III. Suggestions for Future Decisions of the World Heritage Committee

We suggest that the World Heritage Committee includes in its relevant 2019 Decisions the following language:

The World Heritage Committee

recommends **that IUCN and – where applicable – ICOMOS prepare a global thematic study for the identification of rivers, their ecosystems and landscapes, and freshwater ecoregions which should be represented in the World Heritage List. This study should include guidelines for the engagement of other relevant mechanisms, and the role of local and indigenous communities in the safeguarding of these areas;**

requests **the World Heritage Centre in its Periodic Reporting to include information on riverine values in and around existing properties, and mainstream this theme in its deliberations with other international bodies as other conventions' secretariats, World Bank, UNISDR and UN Habitat;**

calls upon **States Parties to identify free-flowing rivers, their ecosystems, landscapes and watersheds, provide measures for the safeguarding of these areas and collaborate with neighboring States Parties to declare them as IUCN trans-boundary protected areas;**

calls upon **IUCN and ICOMOS in their evaluation of such relevant nominations and in the State of Conservation reporting of listed properties, to apply pro-active tools as the Strategic Environmental Assessment (SEA) and comprehensive re-active tools through Impact Assessment (IA) and include the watersheds of these free flowing rivers;**

recognizing **the importance of sustainable development (WHGA decision...), requests IUCN to provide guidelines to determine the limits of alteration in watersheds containing World Heritage properties allowing for renewable energies at a scale in support of the local communities and preventing adverse impacts on World Heritage properties;**

requests **the World Heritage Center to engage into consultations with secretariats of other biodiversity conventions and the UNFCC to mainstream nature-based solutions into climate change mitigation and adaptation, and to avoid measures that may cause irreversible negative impacts on the World Heritage properties, biodiversity and protected areas.**

Lake Baikal - the largest body of water regulated by hydropower (RwB)

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How Green is 'Green' Energy?

Luke Gibson,[1,2] Elspeth N. Wilman,[2] and William F. Laurance[3]

Editors' note: *Energy companies, international financiers and other stakeholders keep pointing out that "other renewables also may have negative environmental impacts". We fully agree that any poorly-planned large-scale development may have detrimental consequences. However the negative impacts caused by conventional hydropower far outstrip those caused by wind and solar power plants in terms of their diversity and severity per unit production. To clarify status of current knowledge we included excerpts from this review article published in Trends in Ecology & Evolution • October 2017 DOI: 10.1016/j.tree.2017.09.007.*

Renewable energy is an important piece of the puzzle in meeting growing energy demands and mitigating climate change, but the potentially adverse effects of such technologies are often overlooked. Given that climate and ecology are inextricably linked, assessing the effects of energy technologies requires one to consider their full suite of global environmental concerns. We review here the ecological impacts of three major types of renewable energy – hydro, solar, and wind energy – and highlight some strategies for mitigating their negative effects. All three types can have significant environmental consequences in certain contexts. Wind power has the fewest and most easily mitigated impacts; solar energy is comparably benign if designed and managed carefully. Hydropower clearly has the greatest risks, particularly in certain ecological and geographical settings. More research is needed to assess the environmental impacts of these 'green' energy technologies, given that all are rapidly expanding globally.

Prescriptions for Sustainable Renewable Energy Growth

It is important to emphasize that research efforts on the three renewable energy sources examined here are uneven, with a particular gap in our understanding of solar energy and its impacts on biodiversity. However, based on this review, we found the most serious biodiversity and environmental impacts likely to arise from hydropower, followed by wind power and then solar energy. All three generate environmental disturbances, some of which have been largely ignored, but many of which can be mitigated.

Given that hydropower facilities are so large and require the most land area, it is difficult to mitigate their effects on biodiversity. That hydropower requires the construction of large reservoirs of water on previously dry land is an inescapable problem [25]. The large-scale effects on the flooded habitat and the secondary effects of associated roads and power lines on land-use change pose a serious threat to terrestrial biodiversity. Impacts on freshwater species and ecosystems are also substantial, although these are incompletely understood, and there is a growing appreciation that hydropower is often a substantial source of greenhouse gas emissions. Fortunately, the HydroCalculator, a free tool recently developed by the Conservation Strategy Fund, allows local citizens, scientists, and policymakers to calculate the projected carbon emissions produced by planned hydropower dams, and this could influence decisions about future dam construction [78].

The siting of these energy facilities is a crucial factor affecting their impacts on biodiversity. For hydropower, the landscape terrain often constrains development strategies for dams, but increasingly there

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is a recognized need that many decisions must be made at the river-basin scale. In the Mississippi River Basin, several of the largest tributaries of the river sustain >80% of large-river specialist fishes found in the river mainstem [79]. This suggests that large tributaries might serve as ecological surrogates for mainstems, and represent underappreciated conservation opportunities for the preservation of megafauna in major river systems [79]. Recent basin-scale assessments have been made for the Mekong River [30] and the Amazon [80], incorporating projected changes in hydrology and sediment transport that would affect ecosystem productivity, rural livelihoods, and biodiversity along the mainstem and tributaries. Such basin-scale assessments will be vital to balance the gains in energy supply versus losses in fisheries, agriculture, and biodiversity [35].

Little is known about the environmental impacts of solar energy [43]. However, based on available evidence, we know that the impacts of solar energy can be greatly reduced if new development is focused on lands that are already degraded and lack threatened species [45]. Solar installations should not be constructed in ecologically sensitive habitat. There are currently 1.1 billion ha of degraded lands globally [81], and at current capacity <0.1% of the available degraded lands would be necessary to double the current solar PV capacity – even without accounting for advances in the efficiency of solar energy [82]. More research on the specific impacts of solar energy developments are urgently needed, particularly given the rapid growth of this energy source.

The design of wind farms can be significantly improved to limit biodiversity impacts. In general, mortality rates increase with turbine height [56,60]. By building wind turbines at the lowest height feasible, mortality of birds and bats can be markedly reduced, although there may be tradeoffs between having a smaller number of large turbines versus many smaller turbines. Turbine placement is also crucial, and particular areas such as ridgelines, which are high- volume transit areas for flying wildlife, should be avoided whenever possible [56]. Wind farms should not be constructed near habitats for threatened bird or bat species, and important migratory routes for flying animals should be avoided whenever possible. Furthermore, wind technology should be improved to reduce the noise and heat generated by turbines.

Given that wind energy requires a smaller footprint than either solar or hydropower, and that its impacts are more easily addressed, wind is likely the safest form of green energy in terms of biodiversity. Clearly, however, there is scope to refine strategies to minimize the impacts of new wind projects on biodiversity and ecosystems.

Concluding Remarks

Renewable energy, a vital component of our global climate change mitigation strategy, needs to be considered within the broader context of biodiversity and ecosystem protection. Our analysis of three major types of renewables – hydro, solar, and wind energy – suggests that wind power is most likely the safest form of renewable energy in terms of its overall ecological impacts. Hydropower appears to be the most dangerous in terms of its potential impacts on terrestrial and aquatic species, native habitats, and greenhouse gas emissions. However, more research is needed on the long-term impacts of all three types of renewables and the best strategies to help to mitigate them. Recent policy changes targeting carbon emissions – including the landmark Paris Agreement – could trigger an avalanche of renewable energy projects [83], and concerted research efforts and practical planning guidelines will be necessary to help to ensure that such developments are truly as 'green' as possible.

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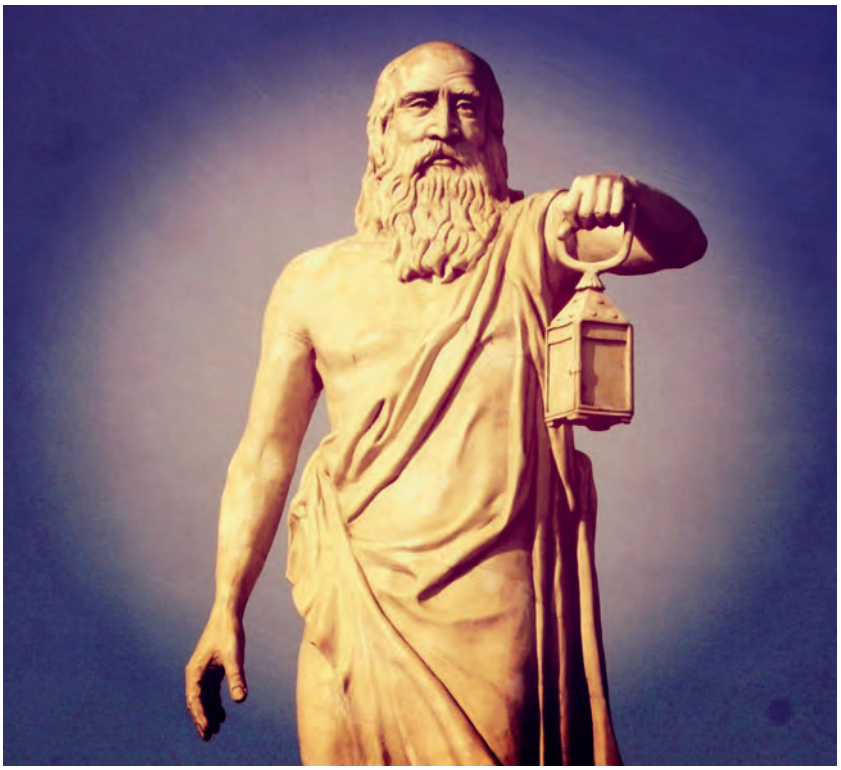
The Curse of Hydropower?

Omair Ahmad, The Third Pole



Searching for Sustainable Hydropower (RwB)

A new global study on the effects of hydropower dams on conflict, poverty, economic growth, debt and environmental effects finds that beneficiaries are far away, while those who lived near the projects suffer the most.

As the world continues to suffer from climate change impacts, decarbonisation of the global economy is one of the most urgent needs faced by governments. This, though, will never be the only axis on which strategic political and economic decisions are taken. With more than a billion people still living in extreme poverty, and another substantial number living just above the poverty line, rapid economic development will remain a priority for many countries. One of the key factors linking these two issues is the need for electricity, which has been identified by some countries, like China, as a basic human right.

One ways to square this circle is renewable energy, in which hydropower plays an oversize role. Developed early, and championed by state governments in both developed and developing countries, it has long dominated the renewable sector. Often seen as a win-win solution which allowed not just the generation of 'clean' energy, large hydropower dams were also seen as a way to manage uneven water flows to deal with both floods and droughts, as well as provide sustained irrigation to the agriculture. Leaders such as Jawaharlal Nehru, India's first Prime Minister, described dams as "the temples of modern India".

While some of these perceptions still exist, over the decades, dams have come under sustained criticism – even Nehru would rue the focus on gargantuan solutions that created problems of displacement, corruption, and conflict. While these criticisms have been around for some time, they have often been specific to projects or, at most, countries. A paper titled **"Internationalizing the political economy of hydroelectricity: security, development and sustainability in hydropower states"** by Benjamin K Sovacool and Gotz Walter looks at them globally.

Published in the *Review of International Political Economy*, the paper examines the key criticisms of hydropower, and its impact on conflict, poverty, slow economic growth, state indebtedness and environmental degradation. Bringing their expertise from the disciplines they teach, Sovacool from the School of Business, Management, and Economics at the University of Sussex in Britain and Walter from the International School of Management in Munich, Germany compare the performance of countries that derive more than 70% of their power from hydroelectricity to the oil producing OPEC nations, as well as non-hydro and non-OPEC countries. The analysis, using data sets from 1985-1994, 1995-2004 and 2005-2014, does two things: compares the performance of states dependent on hydropower with those not dependent on hydropower on these variables, as well as the impact of producing hydropower on these variables.

The study is huge. The authors write, "In the first timeframe, our data analysis encompassed 113 countries, followed by 137 countries in timeframe 2 and 140 countries in timeframe 3, with lower case numbers due to missing data, mostly related to islands or microstates. To put these numbers in perspective, the United Nations currently has 193 member states. Nonetheless, the countries included in our analysis still account for 91.6% of the world population in timeframe 96.2% of the world population in timeframe 2 and 96.0% of the world population in timeframe 3, respectively."

Table 3. *Mean cost escalation for various infrastructure projects*

Technology	Mean Cost Overrun Escalation (% project budget)	(n) for the sample
Nuclear reactors	117	180
Hydroelectric dams	71	61
Railway networks	45	58
Bridges and tunnels	34	33
Roads	20	167
Mining Projects	14	63
Thermal Power Plants	13	36
Wind Farms	8	35
Transmission Projects	8	50
Solar Farms	1	39

Source: Sovacool et al. (2014b)

In real terms it is hard to imagine a more comprehensive analysis, but the scale of hydropower in the global economy demands it. Sovacool and Walter write, "According to the International Energy Agency (2016), hydropower provided about 16.3% of the world's electricity and about 85% of its renewable power in 2015. Hydroelectric dams generated at least some grid-connected hydroelectricity in more than 150 countries: at least 50% of total electricity in more than 60 countries and greater than 90% in more than 20 countries (Hancock & Sovacool, 2018). Haas (2008, p. 86) argues that dams are the types of infrastructure that 'most fundamentally affect human settlement patterns, livelihoods, health and the environment', given that they impound about 14% of all global water runoff and operate on 60% of the world's 227 largest rivers."

The results that their study produced are interesting. On two of the six variables they tested, the data did not support the criticisms. Despite large scale displacement and security interests associated with large hydropower dams, levels of internal conflicts – though higher than in non-hydropower countries and lower than in OPEC countries – was not statistically significant. The other criticism that failed to hold up – a recent one – was that hydropower created more carbon than it offset. In fact the cumulative impact of hydropower did tend to – as its proponents suggest – decarbonise the economy, though at a slower rate.

In contrast, the data at least partially supported the four other points of criticism. "It seems that hydropower increases to some extent poverty, decrease GDP per capita, increase public debt and increase corruption," the authors note, adding, "It is especially noteworthy that we found that hydropower influences a country's governance, economic and development indicators significantly – even though it plays such a small part of the respective countries' economies."

Table 7. *Summary of hypotheses tests*

Dimension	Hypothesis	Results	
		Wilcoxon rank-sum test	Regression analysis
Internal Conflict	Hydropower increases conflict	Not supported	Not supported
Poverty	Hydropower increases poverty	Partially supported (timeframe 2 and 3)	Partially supported (timeframe 2 and 3)
Development	Hydropower decreases economic growth rates	Supported (all timeframes)	Partially supported (timeframe 2 and 3)
Fiscal responsibility	Hydropower increases rates of public debt	Partially supported (timeframe 2)	Partially supported (timeframe 2)
Governance	Hydropower increases corruption	Partially supported (timeframe 2)	Partially supported (timeframe 2)
Environmental degradation	Hydropower increases greenhouse gas emissions	Not supported	Not supported

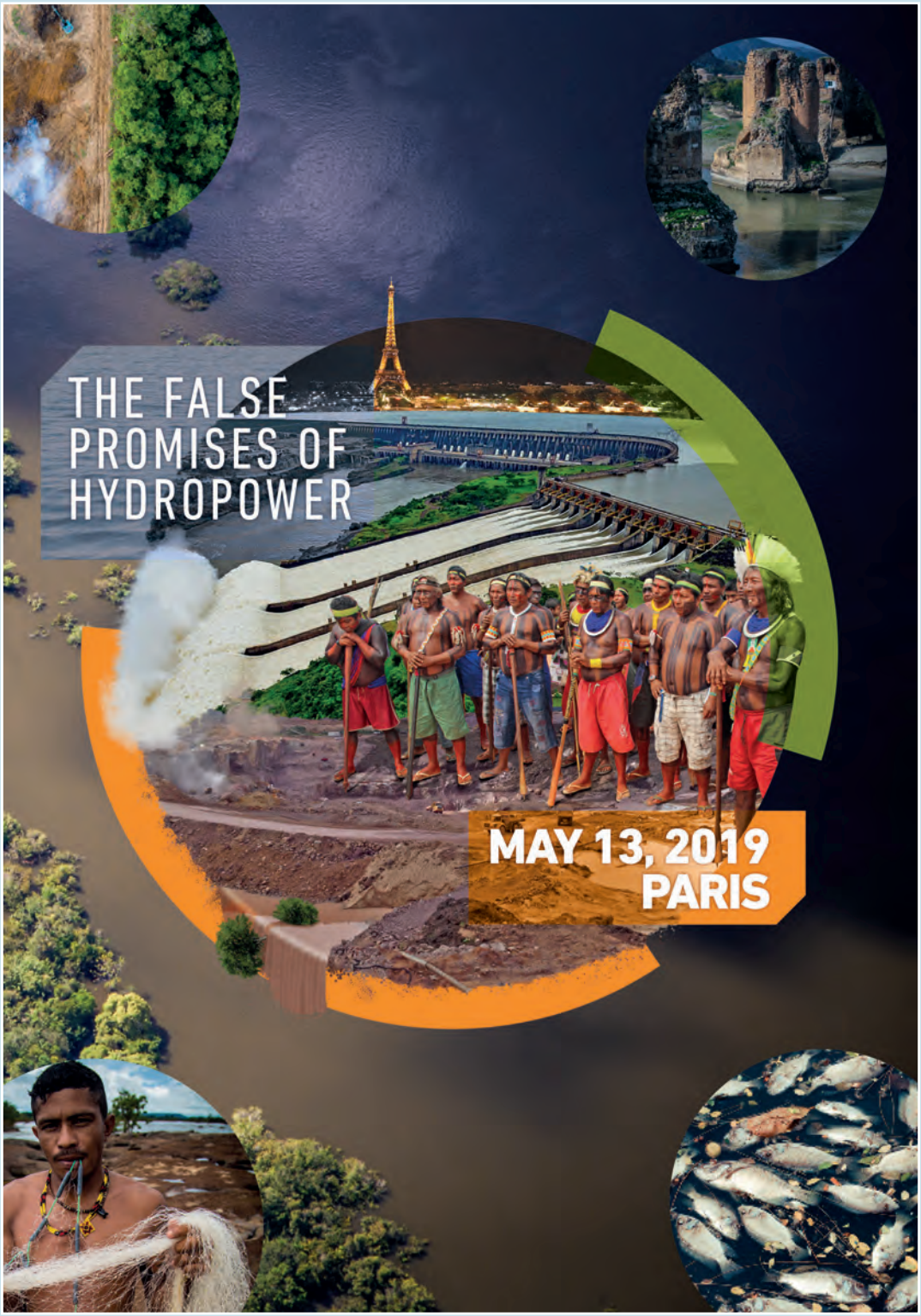
Source: B.Sovacool and G. Walter, 2019

What was even more interesting was that the countries dominated by hydropower did little better than the OPEC countries, often seen as having a "resource curse". Sovacool and Walter are clear, though, that not all hydropower projects need to be similar, nor their impacts. In other words, India's large reservoir based hydropower projects which have displaced millions – often without compensation or resettlement – are not comparable to Bhutan's run-of-the-river dam that has displaced 30 families, all of whom have been resettled. Instead they say that based on the data available, it is clear that hydropower presents some benefits and many costs, and the benefits may go to one set of people in urban areas far away, while the costs are largely borne by the indigenous people whose lands are flooded and livelihoods destroyed, exacerbating wealth gaps and slowing overall growth of the economy.

Both the winners and losers have to be recognised, and some form of equitable treatment is needed if hydropower power projects go forward. This should mean a much closer examination of hydropower projects in the pipeline. The purely positive ways that they have been portrayed by actors such as the World Bank and the International Energy Agency, which projected in 2012 that hydropower would double by 2050, have to be reassessed. Otherwise while the world may get some decarbonisation, it will be at the cost of further poverty, slower growth in poor countries, higher corruption, and much greater debt for nations that can least afford it.

This article adopted from «The Third Pole»: https://www.thethirdpole.net/en/2019/04/19/the-curse-of-hydropower/ April 19, 2019. Contains a review of B.Sovacool and G. Walter paper "Internationalizing the political economy of hydroelectricity: security, development and sustainability in hydropower states" published in the Review of International Political Economy https://doi.org/10.1080/09692290.2018.1511449.

Instead of Conclusion:
THE FALSE PROMISES OF HYDROPOWER



How dams fail to deliver the Paris Climate Agreement and the UN Sustainable Development Goals

A Joint Statement by Civil Society Organizations on occasion of the 2019 World Hydropower Congress in Paris, France

Protesters with portraits of activists killed for opposing hydropower projects at a manifestation in front of World Hydropower Congress venue on May 14, 2019. (RwB)

We live in an age of urgency. Scientists have warned that we have little time to act to bring climate change under control and protect the integrity of life on our planet.

Confronting the climate crisis requires creative solutions that both protect nature and respect human rights. Facing these challenges, we cannot remain silent onlookers while corporate profiteers, financiers, and their allies peddle false solutions for addressing climate change and implementing sustainable development.

A flagrant example of such deception is the attempt to portray large hydroelectric dams as a 'clean and green' source of energy, as can be seen at the 2019 World Hydropower Congress. Organized in Paris by the industrial lobby of the International Hydropower Association (IHA) in partnership with UNESCO,

the conference's title reads, "Delivering the Paris Climate Agreement and the Sustainable Development Goals."

Such glossy portrayals of hydroelectric dam projects—with an eye toward capturing financial incentives through mechanisms like Climate Bonds and the Green Climate Fund—conveniently ignore a long legacy of social and environmental catastrophes, economic waste and, all too often, massive corruption schemes that are the antithesis of truly sustainable development.

Let's consider some of the facts:

- Large hydropower projects - as well as cascades of smaller dams - have often provoked devastating impacts on highly vulnerable communities, including indigenous peoples. Hydroelectric dams, together with reservoirs and transmission lines, have forced the displacement of an estimated 40 to 80 million people without just compensation or reparations. The social and environmental consequences of hydropower projects extend far beyond these immediate impacts. With giant walls of concrete, hydroelectric dams cause profound impacts on freshwater ecosystems, disrupting the natural flow of water and sediments, impeding movements of migratory fish, deteriorating water quality, eliminating unique habitats and undermining biodiversity—all of which adversely impact the rights of local populations that depend on healthy, free-flowing rivers. It was recently estimated that hydroprojects have compromised the livelihoods of up to 472 million people living downstream from dams.
- Dam construction, especially in frontier areas like the Amazon, Tibetian Plateau, Congo and Siberia, has typically been accompanied by the opening of penetration roads, massive immigration, an escalation in illegal land-grabbing, logging, deforestation, and mining—all associated with increased levels of violence. The recent murders of human rights and environmental defenders like Berta Caceres in Honduras and Dilma Ferreira Silva in Brazil illustrate that extreme violence in rural areas is often directly traceable to dam proponents or linked to socio-environmental conflicts triggered by hydroprojects. Dramatic increases in urban violence and declining social indicators have also become commonplace in municipalities like Altamira, Brazil, heavily impacted by the Belo Monte mega-dam.
- Particularly in tropical regions, hydropower reservoirs emit significant amounts of greenhouse gases, being one of leading sources of human-induced methane emissions, which is much more powerful than carbon dioxide in provoking global warming. In some cases, hydropower projects are producing higher emissions than coal-fired power plants generating the same amount of electricity.
- Dams destroy forests, which serve as one of our planet's greatest carbon sinks and contribute to the fight against climate change. Recent studies have shown that, due to the effects they have on the hydrological regime, dams also harm trees and other vegetation, even those far away from the dam site itself. In frontier regions, dams open the door to extractive industries like mining, logging and agriculture, further threatening forests.
- Large hydropower projects often destroy cultural and historical heritage sites. Two recent examples include the flooding of the 10,000-year old historical town of Hasankeyf by the Ilisu Dam on Turkey's Tigris River and the destruction of the 'Sete Quedas' waterfalls on the Teles Pires River in the Brazilian Amazon—a sacred place of great spiritual importance for the Munduruku, Apiaka and Kayabi indigenous peoples.
- In numerous cases, large hydroprojects are threatening or already affecting UNESCO World Heritage sites, as in the case of the Gibe III dam in Ethiopia, which is producing disruptive downstream impacts on the Omo River and Lake Turkana in Kenya. The assault on these global natural treasures is illustrated by the fact that at least 20% of natural World Heritage sites are affected or threatened by dams or other water infrastructure projects; this percentage has increased over the last 5 years.

To make matters worse, mega-dams, with their chronic cost overruns and construction delays, have frequently left countries buried in public debt, as in the case of the Coca Codo Sinclair hydroproject in Ecuador, impairing the abillity of governments to invest in transitions to truly renewable energy estrategies.

Meanwhile, technological innovations in solar and wind generation are increasingly undermining the competitiveness of hydropower as an affordable energy source. In fact, hydropower has become the most unreliable of all non-fossil energy options, especially within the context of global climate change, with worldwide annual installations dropping by 50% over the past five years.

Given such fundamental problems, what has allowed for the propagation of destructive hydroelectric projects around the globe? And why have their advocates often benefitted from economic incentives, including carbon credits and 'clean energy' finance?

- The prioritization of large dam projects within national energy policies typically occurs in centralized decision-making processes. Such processes are characterized by an absence of transparency, citizen participation, and methods of strategic planning that would promote a comprehensive evaluation of energy needs that considers the social, environmental and economic costs and benefits.
- Political decisions concerning the identification of 'optimal sites' for dam construction are often based on basin-level inventory studies commissioned by private and state-owned construction companies, in which energy generation potential is essentially the sole criterion, while social and environmental impacts are downplayed or simply ignored. In some cases, basin-wide studies are not conducted at all.
- At the project level, environmental impact assessments are typically conducted and/or financed by dam proponents that systematically underestimate social and environmental impacts while grossly overestimating socio-economic benefits, based on an overriding concern with maximizing profit margins and demonstrating project "viability."
- Proponents often downplay the extreme vulnerability of hydroelectric projects to a changing climate; the periods of extreme drought and flooding predicted by climatologists, and increasingly apparent in many areas of the world, tend to render many dams useless during much of the year.
- There has also been a tendency to ignore the considerable body of scientific literature demonstrating that dams, particularly those located in the tropics, cause significant greenhouse gases emissions. These dams produce their peak emissions in the years after a reservoir is first filled, vastly hindering our efforts to limit the global temperature increase to 1.5 degree Celsius above preindustrial levels, as accorded in the Paris Agreement.
- A recurring characteristic of hydroelectric dam projects has been the absence of processes for free, prior and informed consultation and consent among indigenous peoples and other traditional communities, as guaranteed by ILO Convention 169 and the UN Declaration on the Rights of Indigenous Peoples (UNDRIP). The lack of such provisions within the IHA's Hydropower Sustainability Assessment Protocol (HSAP) and other "sustainability tools" is a glaring omission.
- Among corporate actors and financial institutions engaging in hydroprojects at a relatively advanced stage, a chronic problem has been a lack of adequate due diligence in managing social and environmental risks, including vetting projects for records of human rights violations like the absence of free, prior and informed consent among affected communities.
- There has been an absence of robust, independent monitoring of socio-environmental impacts and the effectiveness of legally required mitigation and compensation measures as a basis for improved governance, including as benchmarks for loan disbursements by financial institutions.

- When the dam industry has encountered difficulties in securing environmental licenses for poorly planned high-risk projects, members have frequently used their privileged access to high-level government officials to exercise leverage over key decision makers. Another frequent tactic has involved political interventions within judicial systems to undermine lawsuits that question violations of human rights and environmental legislation. Cooptation, intimidation and criminalization of movements, together with use of armed forces, have been adopted to undermine social mobilization and protests of dam-affected peoples in defense of their rights.
- Massive corruption scandals involving the hydropower industry indicate its central role as a driver of unethical, repressive and illegal behavior to sustain destructive dam projects. Three recent examples include revelations of nepotism, shady property deals and dodgy bidding procedures within the China Three Gorges Corporation, Brazil's Lava Jato investigations - which revealed extensive bribery by companies like Eletrobras and Odebrecht in dam-building contracts - and the Kirchner and Cerpernic mega-dams in Argentina, authorized as the direct result of under-the-table payments from dam companies to public officials, while impacts on the Perito Moreno glacier, a UNESCO World Heritage site, were simply ignored.
- The hydropower industry, led by the IHA, has resisted the adoption of robust social and environmental standards, such as the rights-based approach of the World Commission on Dams. They have opted instead for the application of voluntary, self-defined 'best practices' among a selected number of projects. Notwithstanding other limitations, the IHA's Hydropower Sustainability Assessment Protocol has been applied and made public for less than 1% of hydroelectric dam projects planned and built within the last ten years.

While illusions of "sustainable hydropower" have been propagated to global audiences through sophisticated communications strategies, key members of the industry have continued to dam many of the world's most biologically diverse and socially important rivers, including the Mekong, Xingu, Madeira, Teles Pires, Yangtze-Jinshajiang, and Bureya.

Meanwhile, there are active plans to dam many of the world's last remaining free-flowing rivers: the Congo, Lena, Irrawaddy, Vjosa, Nu-Salween, Amur-Heilongjiang, Selenga, Marañon, Juruena, Tapajós, Beni, Shilka and Karnali rivers, among others. Enough is enough!

A Call for Action

The undersigned civil society organizations call on the members of the International Hydropower Association, governments and international financial institutions to implement the following urgent actions:

- Steer priorities, investments and financial incentives away from additional hydroelectric projects and towards energy efficiency and more sustainable renewable energy options (e.g. solar, wind , micro-hydro on artificial water channels, etc.). Special attention should be given to opportunities for technological innovation, decentralized generation and improving energy access among isolated, off-grid communities.
- Eliminate financial incentives for new hydroelectric projects within climate change mechanisms, such as the Green Climate Fund and Nationally Determined Contributions, and within programs to promote implementation of the UN Sustainable Development Goals (with the possible exception of micro-hydro projects less than 100 kW).
- Commission independent audits of controversial existing dam projects and basin-wide cascades in terms of their social and environmental consequences, identifying steps to mitigate impacts and ensure just reparations for affected communities, based on direct consultations. When such measures are prohibitively expensive or otherwise inviable, the de-commissioning of dam projects should be undertaken.

- Ensure the alignment of operational procedures for existing hydroprojects with relevant territorial plans at the basin level, such as integrated water resource management and protected areas that ensure key ecological processes and the rights of local communities, based on the concepts and tools of participatory, adaptive management.
- Ensure that renewable energy policies and projects adopt, across the board, robust guidelines to safeguard human rights and environmental protections, such as ILO Convention 169 and the UN Principles on Business and Human Rights. No energy facilities that potentially impact the territories and livelihoods of indigenous peoples and other traditional communities should be authorized without obtaining the free, prior and informed consent of the community and ensuring the cooperative design of co-management strategies.

Among the benefits of such a paradigm shift in energy strategies and development planning will be major contributions toward protecting the world's last free-flowing rivers, vital for climate resiliency, biodiversity conservation and sustainable livelihoods.

Energy companies and governments must halt all efforts to dam the world's remaining free-flowing rivers and concentrate instead on: i) improving efficiency and the sustainability of existing hydropower projects and cascades; and ii) investing in energy efficiency and truly sustainable renewables.

Moreover, governments must urgently promote the permanent legal protection of the world's last free-flowing rivers, including transboundary watercourses, with due respect for the territorial rights of indigenous peoples and other traditional communities, who play fundamental roles as the guardians of healthy rivers.

Paris, May 13th, 2019

Leaders of Munduruku from Tapajos River Basin in Brazil are displaying their letter rejected by EDF Energy Company. Paris 2019 (Todd Southgate)

Editors' note: *Within 10 days before the World Hydropower Congress this Statement was signed by 250 civil society organizations from more than 70 countries. It was made public at the parallel event organized by CSOs during the Congress in Paris.*

The Statement is available in Chinese, English, Portuguese, Spanish, Russian, Burmese and French and open for signing by any civil-society organization.

For notes

For notes

Species Dammed:

Counterclockwise: 180 MW Lower Kihansi Dam in Tanzania built in 2000 (Salini Impregilo); Kihansi Spray Toad, who went extinct in the wild due to dam construction (Seanin Og/Wikimedia); Kihansi Falls - unique habitat of the endemic toad and other species destroyed by the Kihansi Dam.

Many species go extinct unnoticed, but this tiny toad from Tanzania, which has been extirpated by a dam, sponsored by the World Bank and NORAD, is still breeding in captivity at Bronx and Toledo zoos (USA). The lucky amphibian has a chance to be reintroduced into waterfalls of Tanzania someday.

Unfortunately, hundreds of migratory fish species, whose life cycles are disrupted as rivers are blocked (e.g. many sturgeon species), cannot be that easily released from breeding facilities, even if the fishes are preserved there, and face permanent extinction in the wild unless their rivers are freed from dams.

Back cover: Gezhouba Dam on Yangtze River (Image by Fxqf/Wikimedia)

The Chinese paddlefish (Psephurus gladius) *– endemic of Yangtze River heading to extinction due to overfishing and Gezhouba Dam construction. Patient scientists wait for 50 years after the last sighting of a species before declaring that it has gone extinct. The Paddlefish has not been seen for a decade.*

*(**Image by** Muséum d'histoire Naturelle – Nouvelles Archives du Muséum d'histoire Naturelle, Public Domain, https://commons.wikimedia.org/w/index.php?curid=9703783)*

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