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Dear Editors,

Please find here enclosed the manuscript entitled:

Environmental Justice and Chinese dam-building in the global South

We hope that this paper can be considered for publication in the “*Hydropower and energy development*” *Special issue in Current Opinion in Environmental Sustainability*.

By combining information from the recent literature on Chinese engagement in large dam development overseas and the Global Atlas of Environmental Justice - EJAtlas dataset, this paper analyses from an environmental justice perspective the main drivers and contested aspects of Chinese hydropower investments in the global South. Chinese investments in large hydropower dams have rapidly increased all over the world in the last 20 years. With an estimated 380 large dam projects in more than 70 countries worldwide either built, under construction or planned, Chinese companies and banks are today the biggest hydropower builders and financiers at the global level. The paper analyses how unequal distribution of power between governments, Chinese dam builders, financiers and affected communities can result in social-ecological change and ecological distributional conflicts.

Besides contributing to the discourse on sustainability of large dams from an environmental justice perspective, this paper also provides useful information to policy-makers, NGOs and international organizations regarding governance issues, such as assessment of the impacts, consultation processes and mitigation.

The paper shows that the way Chinese actors engage with the host governments and local populations, such as the limited responsibility and engagement with the local socio-environmental context, and dam-building in ecologically and culturally fragile zones, has raised a vivid debate in academia in terms of environmental justice concerns. The paper also states that while research on the implications of Chinese large hydropower dam development in Asia and Africa is advancing, there is far too little research which looks at environmental justice and other geographical areas, such as for instance Latin America.

This paper aims to make a valuable contribution for opening up future research on environmental justice and contested aspects of Chinese and non-Chinese large hydropower expansion in the global South.

Due to the relevance of the topic analyzed, I feel confident that this paper will be of interest for the journal readers.

I confirm that neither the manuscript nor any parts of its content are currently under consideration or published in another journal.

Thank you for your time and consideration.

Sincerely,

Giuseppina Siciliano

Highlights

- Chinese hydropower dominate the international hydropower industry
- Contested aspects of Chinese large hydropower dam development are multidimensional
- Rather few studies focus on Chinese dam-building in geographical areas other than Africa and Asia.
- Few studies focus on Chinese dam-building from an environmental justice perspective

Environmental Justice and Chinese dam-building in the global South

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Keywords

Hydropower; Chinese investments; Environmental Justice;

Introduction

After a period of relative stagnation, in recent years the construction of hydropower dams has experienced an unprecedented global boom in both scale and extent [1]. The global hydropower installed capacity has grown by 39% in the period 2005-2015, with an average growth rate of about 4% per year (World Energy Council Database, URL: <https://www.worldenergy.org/data/resources/resource/hydropower/>). Zarfl et al. [1] estimate that 40% of the total future electricity capacity addition from hydropower will be installed in low and middle income countries.

Until the early 2000s, the World Bank was the largest financier of large-scale hydropower development in low and middle income countries. However, due to the massive social and environmental impacts associated with large dam constructions [2] and the increasing public contestations [3**], the sector went into a lull during the 1990s and many projects were dropped. After 2000, Chinese companies and banks became global leaders in large hydropower dam development, especially thanks to a series of Chinese internationalization policies, of which the most relevant are the 2000 “Going-Out” strategy and the 2013 “Belt and Road Initiative” [4]. The driving forces behind this were equally economic and political [5].

These strategies encouraged Chinese State-Owned Banks (SOBs) and Enterprises (SOEs), as well as private enterprises, to engage in new investments in infrastructure development abroad with the authorization and financial support of the central government [6**]. According to the most updated database available on Chinese overseas engagement in hydropower (last updated in September 2017), 96% of Chinese overseas hydropower projects have been built and planned after 2000 [4]. Some of these large dam projects have been questioned in the literature mainly regarding social-ecological changes, transboundary and governance issues, and in relation to environmental justice and ecological distributional aspects [7, 8,9,10*,11*,12*,13**, 14, 15**, 16**].

In this paper we set out to explore the drivers and conflictive outcomes linked to the social-environmental governance and management challenges of Chinese large dam constructions in the global South. We reflect on the body of literature published in recent years on Chinese dam developers' engagement overseas and on Chinese dam projects located in different regions of the world by using information from the Global Atlas of Environmental Justice (EJAtlas Database, URL: <https://ejatlas.org/>).

“Push” and “pull” factors of Chinese overseas dam-building in the global South

With an estimated 380 large dam projects in more than 70 countries worldwide either built, under construction or planned, Chinese companies and banks are today the biggest hydropower builders and financiers at the global level [4]. Most of the Chinese overseas large dams have been built or planned in the period 2006-2017, and located in developing countries in South and Southeast Asia, Africa and Latin America (Table 1). With 41% of the whole projects, Southeast Asia represents the preferential geographical localization of Chinese hydropower development for obvious reasons of geographic proximity, physiographic conditions of rivers, close political and economic relationships and cultural similarities [4].

Table 1 Estimated hydropower capacity and percentage of Chinese overseas hydropower projects (built, planned and under construction) by region, 2006-2017 [4]

Region	Total of hydropower capacity (MW)	Number of hydropower projects (%)
Asia (SE)	63444	41
Asia (S)	26822	10
Africa	21210	25
Latin America	9631	10
Europe	5984	10
Asia (Central)	2151	3
Middle East	558	1
Oceania	180	0
Pacific	59	1

As China has become the leading actor in dam-building in the global South, there have been an increasing interests from academia and international organizations to look at the motives of Chinese State Owned Banks (SOBs) and Enterprises (SOEs). Based on the literature on Chinese overseas engagement in hydropower development, in Table 2 we distinguish between “push” and “pull” factors of Chinese overseas dam-building, differentiating between diversified drivers and motives that “push” Chinese banks and hydropower companies to invest abroad and “pull” factors as the motives of the host governments to welcome Chinese hydropower investments.

Table 2 Push and pull factors of Chinese overseas investments in hydropower

Drivers	Push factors (Chinese investors and financiers)	Pull Factors (host countries)
Political	<ul style="list-style-type: none"> • Going Abroad Strategy (1.0 and 2.0) • Belt and Road Initiative 	<ul style="list-style-type: none"> • Improve energy access and energy security • Development and economic growth • “No strings attached”
Economic	<ul style="list-style-type: none"> • Access to new hydropower markets for hydropower companies • Access to cheap loans for hydropower companies • Bundling of aid-trade and investments 	<ul style="list-style-type: none"> • Access to finance • Low costs and reduction of overrun costs • Bundling of aid-trade and investments • Industrial development
Geopolitical	<ul style="list-style-type: none"> • Access to natural resources (water, minerals, fossil fuels) • Geographical proximity, political relationships and cultural similarities • Hydropower imports 	<ul style="list-style-type: none"> • Climate change mitigation • Investment in low carbon energy • Establish new international geopolitical alliances (esp. for Latin America)
Reputational	<ul style="list-style-type: none"> • Help countries from the Global South to develop • Desire to become the biggest dam-building player at the global level 	<ul style="list-style-type: none"> • Icons of modernity • International agreements on Climate Change – CDM projects

Emerging in 1999 the Going-Out Strategy of China coincided with China's 2001 admission to the World Trade Organization (WTO) and urged Chinese firms to take advantage of the world trade by investing in global markets. Also the "Belt and Road Initiative" established in 2013 seeking to expand Chinese trade and investments including investments in hydropower along the land-based "Silk-Road Economic Belt" (SREB) and the sea-based "Maritime Silk Road" (MRS). This initiative will take advantage of international transport routes as well as core cities and key ports to build six international economic co-operation corridors and further strengthen bilateral and multilateral economic agreements between China and other nations; it supports Chinese investments in hydropower across Central Asia and along the maritime route from the South China Sea to the Indian Ocean, East Africa, the Red Sea and the Mediterranean [17, 18*].

These strategies have different aims: economic, reputational and geopolitical. From a reputational point of view they have the ambition to set China as a global leader in international cooperation by helping low and middle income countries to develop through the provision of infrastructures mainly in mobility (i.e. road, railway, port construction), energy, and agricultural sectors [17, 5, 19]. From an economic point of view they have the intention to push Chinese firms to seek for new market opportunities abroad, especially for oversaturated national markets with high domestic expertise and stiff competition, such as the hydropower sector [20, 15**]. The expansion of Chinese hydropower firms abroad is highly supported by the lack of many international competitors and copious state funding, particularly through preferential loans from Chinese state-owned banks, and well-funded financial institutions such as Exim Bank of China [6**] and more recently the Silk Road Fund and potentially from the new multilateral development bank, Asian Infrastructure Investment Bank (AIIB). Many of the Chinese hydropower companies are SOEs and often business decisions are influenced, initiated and guaranteed by the Chinese Government regardless of whether they bring positive returns [15**]. At the same time, the peculiarity of Chinese overseas dam-building is the bundling of aid, trade and investments. For example, Chinese overseas investments in hydropower can be a package rather than a separate initiative, which comprises not only investments in the construction of the dam but also in different infrastructures and economic sectors, concessional loans, as well as trade agreements all together [20, 18*]. The bundling of aid, trade and investments of Chinese hydropower is sometimes linked to geopolitical drivers, particularly the seeking for new trade agreements to access natural resources, such as oil, food, water, energy and minerals [18*, 22, 23, 24, 25] (EJAtlas Database, URL: <https://ejatlas.org/conflict/hatgyi-dam-myanmar>; EJAtlas Database, URL: <https://ejatlas.org/conflict/myitsone-dam-on-irrawaddy-river-myanmar>). Another peculiarity of Chinese investments overseas is the "no-string attached" policy, which means that they tend to pursue a non-interference policy with little, if any, political preconditions on the host countries [26]. This attitude to business relations differs from the conditions imposed by Western countries, or other international aid organizations, such as the World Bank or International Monetary Fund, which prescribe a number of conditions to be met, including specific environmental and political conditions (e.g. human rights, democracy, and international labor standards) [27].

Comparatively low costs, reduction of overrun costs, technical capacity, access to large finance with low or no-conditionality attached and on occasion cheap loans in a time when other OECD investors decided to opt out of large hydropower dam construction, make Chinese investors attractive partners for low and middle income countries with problems of electricity access and energy security and most importantly with low capital and technical capacity to invest in big infrastructure projects (Table 2) [15**, 21*, 28]. Hydropower dams also represent an opportunity for developed countries to invest in climate change mitigation strategies in low and middle income countries through the United Nations' carbon-offsetting scheme Clean Development Mechanism (CDM), and more recently also through the Green Climate Fund [29]. Despite the high number of large hydro projects in the CDM pipeline, climate

neutrality of large hydropower dams and reservoirs is questioned by some scholars [30, 31]. Some scholars and activists argue that it should not be included in climate mitigation programs such as the CDM [32, 33]. Key contentious issues are methane emissions caused by submerged organic matter in stagnant water of reservoirs, particularly in the tropics [34, 35]. From a reputational point of view, large dams are also considered “powerful icons of modernity, economic success, national prestige and technological progress” [36], especially in low and middle income countries.

Environmental justice and conflictive aspects of Chinese overseas dam projects

Studies on environmental justice in large hydropower dam development is today a growing research field [37, 38, 39, 40, 41, 3**]. Moreover, growing investment into large hydropower dams in the global South has been associated with the rise of ecological distribution conflicts and violence [3**]. Such conflicts arise over environmental injustices caused by the way how environmental benefits and burdens from large dams are distributed across different social groups, as well as over procedural issues, i.e., how institutions and power relations shape the decision-making process [42, 43, 16**].

Overseas Chinese investments attracted special attention from literature for the novelty of its actors and dynamics, as well as its size, speed of investment and global coverage [15**]. In Table 3 we provide an analysis of the main controversial aspects of Chinese investments that have resulted or may result in environmental justice concerns and conflicts between Chinese dam-builders, host governments, and local communities.

Table 3 Conflictive dimensions and aspects of Chinese hydropower investments in the global-South

Dimension	Key conflictive aspects
Geography and responsibility	<ul style="list-style-type: none"> • Siting (environmental and social risks) • Rural-urban relations • Transboundary issues • Impacts on vulnerable groups (e.g. Indigenous Peoples)
Resource access	<ul style="list-style-type: none"> • Enclosures • Distribution • Appropriation
Governance and power relations	<ul style="list-style-type: none"> • Accountability • Transparency and procedural justice • Inclusiveness • Social-Environmental Impact Assessment (ESIA) • Social safeguards measures • Monitoring and mitigation of the impacts • Unbalanced power relations • Unclear responsibilities
Technology transfer	<ul style="list-style-type: none"> • Transfer of expertise, skills and knowledge • Employment
Culture and identity	<ul style="list-style-type: none"> • Livelihoods • Social cohesion • Recognition of different worldviews • Historical tensions

Geography, responsibility and resource access

The spatial dimension of energy provision, both in terms of localization of extraction and energy distribution, poses environmental justice concerns [45]. Decisions over the localization of large dams should assure the minimization of the socio-environmental impacts (responsibility principle) and the equal distribution of benefits between populations in different geographical areas (distributional principle) [43], for instance, between urban and rural dwellers [44**].

The siting of large hydropower dam projects in ecologically and socially sensitive zones, such as protected areas and biodiversity hotspots, or land under Indigenous customary rights, is a central conflictive aspect identified in the literature of Chinese large dams investments in the global South. For instance, the Bakun dam in Malaysia, built in a biodiversity hotspot in Borneo following the resettlement of ca. 10,000 indigenous, has been a source of ongoing disagreements between the State, Indigenous Peoples and NGOs [46, 47*, 48*] (EJAtlas Database, URL: <https://ejatlas.org/conflict/malaysia>). Yet it also needs to be acknowledged that the role of Chinese firms and financiers was limited due to extensive Malaysian development in the Bakun dam building process.

Concerning the fair distribution of benefits, the reduction of energy poverty, especially in rural areas, is one of the main justification of large dam construction in low and middle income countries. In some countries Chinese hydropower projects make vital contributions to energy access for rural communities [49*, 50*]. On the flip side, there are several cases where the electricity produced is not used to close the rural electricity gap, but instead electricity is exported, or used for urban development, industrial and mining productions [51*, 46]. This aspect provokes distributional justice concerns, as for example for the Chinese planned Naung Pha dam in Myanmar, in which 90% of the produced electricity is planned to be exported to China, despite the government's claim to address Myanmar's growing energy needs. Social mobilizations against the dam plans have therefore arisen (EJAtlas Database, URL: <https://ejatlas.org/conflict/naung-pha-dam-on-the-salween-river-shan-state-myanmarEjatlas>).

Chinese large dams may furthermore raise transboundary concerns and conflicts for the use of water resources between neighboring countries, as has been observed in the Mekong Basin [18*, 52]. In Vietnam for instance China's dam building activity upstream of the Mekong is perceived as potentially undermining national development due to water access security reasons, leading to political tensions between the two countries [11*]. Reduced access to land for agriculture and poor fertility of land has been also one of the main concerns of resettled communities from several Chinese hydropower projects located in Africa and Asia, as indicated in the cases analyses in Siciliano et al., 2018b. Resource access and appropriation by Chinese investors through multi-purpose investments linked to large dam projects have also been analyzed in the literature and reported in the media, such as trade agreements for mining resources access in the Amazon associated to the São Luiz de Tapajós hydropower plant [23], cocoa production in Ghana associated to Bui dam [22] and oil in Ecuador associated to Coca-Codo Sinclair dam [24].

Governance and power relations

Accountability, transparency, participation and informed consent of those affected by energy projects is at the basis of justice principles in energy decision-making [43]. Moreover, restoration of the negative socio-environmental impacts is considered fundamental to ensure energy justice [53]. For dam construction this is pursued for instance with the implementation of Social-Environmental Impact Assessments (ESIA), resettlement planning frameworks, social safeguards measures, post-acceptance monitoring and mitigation of the impacts, as well as inclusiveness of the entire decision-making process [2].

For large dams in the global South, responsibility for the realization of such safeguards mechanisms is regulated by the host countries legislations. This is particularly the case with Chinese investments [8] for which environmental and political preconditions are rarely attached, as discussed previously. Nevertheless, the literature has posed the accent to the responsibility of Chinese builders and

financiers according to the types of contract, i.e. Build, Operate and Transfer (BOT) and Engineering, Procurement and Construction (EPC) contracts. Under EPC contracts (turnkey contracts), the builders are responsible for the construction of the dam while the host countries take the responsibility of carrying out the preliminary studies including the EIA, provide the technical, legal and other guarantees, handling resettlement and compensation processes, monitor implementation, and operate the dams. Under BOT arrangements, the dam-building company provides technical capacity for construction and operation in exchange of operating rights for a period of typically 20-30 years [54*]. The company then later hands back the ownership of the dam to the host government.

According to a study by International Rivers on the implementation practices, and environmental and social commitments of seven major Chinese overseas hydropower companies, EPC Contractors outperform BOT Contractors in both policy and project assessments. Among the mentioned reasons is that EPC contracts require less long-term involvement than BOT contracts in terms of environmental and social safeguards. This highlights the challenges for the implementation of international, Chinese and national host country laws and standards when enforcement of regulations in the host countries is weak [54*, 13**].

An example is the case of the Kamchay dam in Cambodia, where law enforcement is weak [6**, 8]. The construction of the dam commenced in 2007, however the EIA was not completed until 2012. Justice concerns were voiced over the poor participation of affected communities, irregularities in the compensation schemes, and lacking implementation of environmental safeguards and mitigation measures [51*, 55*]. In other cases under EPC contracts, such as the Bui dam in Ghana and Bakun dam in Malaysia, international standards for the preparation of the EIA were accomplished, but opposition and complaints from resettled communities arose over poor participation, location of the resettlement area, land scarcity, lack of proofs of house ownership, lack of employment alternatives, or lack of security services to prevent the increasing crimes in the resettlement areas [12*, 48*].

Technology transfer

Urban et al. [56*] found that in the case of BOT contracts, which requires longer-term involvement of Chinese dam-builders in the host countries, despite the transfer of technology (hardware), the transfer of skills and know-how for operation and maintenance and the knowledge and expertise for innovation in hydropower is often limited. This aspect has raised concerns from local workers as contracts tend to be often for short-term and low-skilled employments, such as in the case of Kamchay dam in Cambodia.

Culture and Identity

The recognition of different values and worldviews in society is fundamental to achieve social cohesion and to assure that energy decisions respond to principles of procedural justice [43]. Del Bene et al [3**] argue that protests against dams are frequently attempts of affected groups to protect their own ways of life and cultural understandings of sustainable resource uses. According to Hensengerth [57**] the potential lacking engagement of Chinese companies with local communities and the poor recognition of their different values is likely to further exacerbate conflicts, while causing identity fragmentations and cultural losses.

A recent study on large hydropower dam in the Greater Mekong Region, for example, has shown that dam programs commonly tend to ignore different cultures and identities of affected populations, leading to value fragmentation and regional conflicts and tensions [57**]. For instance, the Lower Sesan 2 dam in Cambodia has provoked conflicts because the rights and tradition of Indigenous communities were largely ignored, including their spiritual attachments to the river [57**]. Also, the

Upper Yeywa dam in Myanmar, currently under construction by Chinese companies, has become very controversial because it would flood important cultural sites and hundred years old stupas (EJAtlas Database, URL: <https://ejatlas.org/conflict/upper-yeywa-dam-on-the-namtu-river-shan-state-myanmar>). Latin American literature has also stressed on the nature of conflicts as defense of one's territory against the expansion of the "extractivist frontier" and its local cultural impacts [58, 59]. China capital is advancing very fast in a number of megaprojects in Latin America, including energy infrastructures, at least since 2008 [60], often justified as green financing of development and integration of the region [61]. The Cola Codo Sinclair project in Ecuador, Cachuela Esperanza on river Beni in Bolivia [61], and the large scale hydroelectric exploitation of Patuca River in Honduras [62] are examples of the first Chinese dam-developers engagement in the region which have resulted in contestations from local groups due to the loss of cultural diversity. Chinese dam construction was also found to exacerbate historical tensions because of its development in culturally fragile zones in Asia [65]. Examples are the development of Myanmar's Salween dams in areas of ethnic conflict, such as the Hatgyi dam in Karen state (EJAtlas Database, URL: <https://ejatlas.org/conflict/hatgyi-dam-myanmar>), or the Kunlong dam in Shan State (EJAtlas Database, URL: <https://ejatlas.org/conflict/kunlong-dam-on-the-salween-river-myanmar>). Concerns were voiced they could trigger reoccurrences of armed conflict and threaten a fragile peace process between ethnic armed groups and the Myanmar Army [63*].

Conclusion

Chinese large dam builders and financiers dominate the international large hydropower industry in terms of size, speed of investment and global coverage. There is the potential for Chinese large hydropower dam development to provide energy access to poor countries. Still nearly 20 years after the World Commission on Dams' report has been published, which openly condemned the negative implications of large dams on local populations and the environment, environmental justice concerns and conflicts associated to large dams remain unsolved problems in the global South. The way Chinese actors engage with the host governments and local populations, such as the "no-string attached" policy, bundling of aid-trade and investments, limited responsibility and engagement with the local socio-environmental context, and dam-building in ecologically and culturally fragile zones, has raised a vivid debate in academia, in the media, as well as within civil society organizations. While research on the implications of Chinese large hydropower dam development in Asia and Africa is advancing, there is far too little research which looks at environmental justice and other geographical areas, such as for instance Latin America. This paper aims to make a valuable contribution for opening up future research on environmental justice and contested aspects of Chinese and non-Chinese large hydropower expansion in the global South.

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In this paper a unique database of 220 dam-related environmental conflicts, retrieved from the Global Atlas on Environmental Justice (EJAtlas), and based on knowledge co-production between academics and activists is analyzed.

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[5] China Policy, 2017: **China going global. Between ambition and capacity,** Beijing, China.

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This paper by utilising the political ecology approach evaluates the transnational impacts of a rising China looking at hydropower and the mineral sector.

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[10*] Chan DSW: **Asymmetric bargaining between Myanmar and China in the Myitsone Dam controversy: social opposition akin to David's stone against Goliath.** *Pac. Rev.* 2017: 1-18. <http://dx.doi.org/10.1080/09512748.2017.1293714>.

Drawing on 35 interviews with anti-dam campaigners and other stakeholders in Myanmar, this article shows how bilateral agreement between Chinese investors and local partners without domestic endorsement can result in dam construction failure.

[11*] Urban F, Siciliano G, Nordensvard J: **China's Dam Builders: their role in transboundary river management in Southeast Asia,** *Int. J. Water Resour. Dev.* 2018, **34(5)**: 747-770 <http://dx.doi.org/10.1080/07900627.2017.1329138>.

This article investigates China's role as large dam builder in the Greater Mekong Sub-Region in South-East Asia. It addresses the environmental, social, economic and political implications of large dams' construction in the area by drawing on case studies from Cambodia and Vietnam.

[12*] Yankson PWK, Asiedu A, Owusu K, Urban F, Siciliano G: **The livelihood challenges of resettled communities of the Bui Dam project in Ghana and the role of Chinese dam-builders**, *Dev. Policy Rev.* 2016, **36**: 476-494, <http://dx.doi.org/10.1111/dpr.12259>.

By conducting 43 interviews and 11 focus group discussions in Ghana this article examines the nature of the livelihood challenges for resettled communities due to the construction of the Bui hydropower project, their causes, and why they were not avoided and the role of the Chinese builders. The paper found that while Chinese dam-builders played a major role in financing and enabling the dam's construction, the Ghanaian governance arrangements were found to be more important in addressing the livelihood challenges.

[13**] Kirchherr J, Matthews N, Charles KJ, Walton MJ: **“Learning it the Hard Way”: social safeguards norms in Chinese-led dam projects in Myanmar, Laos and Cambodia**. *Energy Policy* 2017, **102**: 529–539. <http://dx.doi.org/10.1016/j.enpol.2016.12.058>.

This paper analyses social safeguard norms in Chinese-led dam projects in Myanmar, Laos and Cambodia. The paper finds that in recent years Chinese builders increasingly take into account international norms. The authors argue that the root cause for this change is social mobilization against Chinese dam projects.

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This paper explores the interests of Chinese stakeholders and investigates the wider implications of Chinese dams on the local, national and international contexts. The paper concludes that the planning, building and mitigation strategies of Chinese dam-building need to be implemented in a more sustainable way that takes into account national development priorities, the needs of local people and the impacts on natural habitats.

[16**] Siciliano G, Urban F (Eds): *Chinese Hydropower Development in Africa and Asia: Challenges and Opportunities for Sustainable Global Dam-Building*. Routledge, London Press; 2018.

This book explores the governance and socio-economic implications of large Chinese dams' development in low- and middle-income countries in Asia and Africa and looks at how these big infrastructure projects promote sustainable local and national development in the recipient countries.

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This chapter explores the incentives, disincentives and risks for Mekong governments and Chinese actors to partner in hydropower development in the Greater Mekong Sub-region— namely, Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam.

[19] NDRC and NEA: Energy Supply and Consumption Revolution Strategy (2016-2030). 2017, Beijing, China URL: <http://www.gov.cn/xinwen/201704/25/5230568/files/286514af354e41578c57ca38d5c4935b.pdf>

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[21*] Kirchherr J, Matthews N: **Technology transfer in the hydropower industry: An analysis of Chinese dam developers' undertakings in Europe and Latin America.** *Energy Policy* 2018, **113**: 546–558.

This paper identifies the extent, drivers and inhibitors of technology transfer of Chinese dam developers' undertakings in Europe and Latin America. The paper found relatively few Chinese undertakings and thus limited evidence for technology transfer both in Europe and Latin America. Transfers identified are frequently mutual with the Chinese player transferring technology to the host country and vice versa.

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