



GLOBAL CHINA INITIATIVE



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Domestic Push Meets Foreign Pull

THE POLITICAL ECONOMY OF CHINESE DEVELOPMENT FINANCE FOR HYDROPOWER WORLDWIDE

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ABSTRACT

This study explains why China has emerged as the world's largest underwriter for hydropower projects in a short span of two decades. Its analysis points to a convergence of both domestic push and foreign pull factors. Domestically, this push stems from the alliance of a strategic trio among the Chinese hydropower sector characterized by growing comparative advantages and mounting development challenges, the Chinese state keen to pursue its international developmental strategies and economic diplomacy abroad, and the two policy banks mandated to fulfill the will of the Chinese state at home and abroad but dependent upon wholesale lending for revenues. Externally, the pull originates from a new boom of global hydropower buildout—concentrated primarily in low- and middle-income countries reliant upon foreign suppliers, contractors, and financiers to carry out their hydropower expansion. This comes at a time when leading multilateral development banks have increasingly pivoted away from hydropower.

Key Words: China, official development finance, hydropower, push and pull

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Introduction

Faced with pressure to deliver economic development, improve access to electricity, enhance energy supply security while simultaneously addressing the growing concerns about climate risks and impacts, many countries around the world have turned to hydropower since the turn of the century. According to the International Energy Agency (IEA), the world has added more than 530 GW of newly built hydropower generating capacity from 2000 to 2019, accounting for 40 percent of all capacity the world has built since the 1900s [1, 2]. This trend is particularly noticeable in the low- and middle-income countries with abundant hydropower resources. Table 1 shows that 87 percent of the hydropower generating capacity additions over the past 20 years have occurred in 16 countries—only less than five percent are scattered in three high-income countries, including Canada, the United States, and Japan, whereas the rest 82 percent are concentrated in 13 low- and middle-income countries (including upper-middle income countries); while China alone accounts for more than half of the world’s total capacity additions, many other countries in the global South, including Brazil, India, Vietnam, Iran, Laos, Ethiopia, Ecuador, and Myanmar, have all seen major hydropower expansion over the past two decades.

Table 1: Global Hydropower Buildout Boom, 2000-2019

	New hydropower capacity additions (GW)	% of global hydropower capacity additions	Classification by income
China	281.4	53.1%	upper-middle income
Brazil	51.27	9.7%	upper-middle income
India	25.4	4.8%	lower-middle income
Turkey	17.97	3.4%	upper-middle income
Viet Nam	15.06	2.8%	lower-middle income
Canada	14.74	2.8%	high income
Iran	10.49	2.0%	upper-middle income
Russia	7.6	1.4%	upper-middle income
Laos	6.73	1.3%	lower-middle income
United States	5.63	1.1%	high income
Pakistan	5.01	0.9%	lower-middle income
Japan	4.43	0.8%	high income
Ethiopia	3.67	0.7%	low income
Mexico	3.43	0.6%	upper-middle income
Ecuador	3.35	0.6%	upper-middle income
Myanmar	2.99	0.6%	lower-middle income
others	71.23	13.4%	
Total	530.4	100%	

Source: [1, 3, 4].

This new round of hydropower expansion marks a clear break from the past on two fronts. On one hand, it has revitalized hydropower development worldwide. The growth of hydropower worldwide measured by new capacity addition stalled in the 1980s and experienced contraction during the



1990s [5] due to growing international concerns about its environmental, social, and governance (ESG) implications as evidenced by the call for a new decision-making framework on hydropower development published by the World Commission on Dams [6]. On the other hand, it runs counter to the increasing warnings about the true costs of hydropower, especially in connection with the mega hydropower projects (HPPs), and the growing cautions about the possible benefits of hydropower are real but constrained by economic, sociopolitical, and environmental risks [7-9].

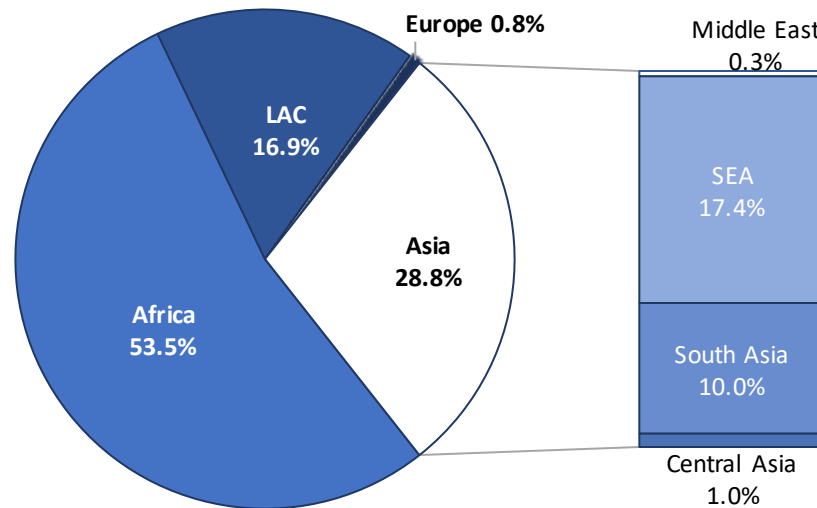
However, this new boom of hydropower development has created a tremendous opportunity for the key players in the Chinese hydropower sector, most of which are state-owned enterprises (SOEs). In a short span of two decades, Chinese hydropower SOEs have extended their reach to almost every part of the world. At the 2019 China Hydropower Forum, Zhang Ye, Director of the China Society for Hydro Engineering, revealed that Chinese companies have occupied over 70 percent of the international HPP construction market and participated in the development of 320 HPPs in operation or under construction with a total installed capacity of 81 gigawatts (GW) across 140 countries [10]. If all the hydropower generating capacity the Chinese hydropower SOEs helped build worldwide were concentrated in one country, it would match the size of Canada's hydropower market, the world's third-largest [3].

The globalization of the Chinese hydropower SOEs has generated a lot of analytical attention and spurred a growing body of literature. The literature has concentrated on two broad questions. First, what is the scale and magnitude of the Chinese hydropower SOEs' global expansion, and what drives it [11-13]? Second, how have the Chinese hydropower SOEs interacted with host countries and local stakeholders in shaping the ESG impacts of their dam-building activities [14-16]? While this literature has advanced our understanding of the two preceding questions, it has overlooked one important dimension—the China Development Bank (CDB) and the China Export and Import Bank (CHEXIM) have emerged to become the world's largest underwriters for hydropower, raising a question about what drives their rise in international development finance for hydropower. While some existing studies have examined the role of these two policy banks in connection with the globalization of the Chinese hydropower SOEs, none have assessed the scale of these two policy banks' hydropower financing or performed a systematic analysis of why these two policy banks finance foreign HPPs to begin with. While examining the Chinese hydropower SOEs' globalization or evaluating the ESG impacts of their dam-building activities worldwide, some studies tangentially attribute the role of the two Chinese policy banks to export promotion, but none have provided any systemic evidence to substantiate the linkage or looked into other drivers. In short, the existing literature has focused its unit analysis overwhelmingly on Chinese hydropower contractors; consequently, its analysis of the two Chinese policy banks, especially the motivations behind their development finance for hydropower worldwide, has been secondary and thin at best.

This study seeks to fix this glaring gap and place the two policy banks at the front and center of the inquiry. A deep understanding of why the two policy banks finance foreign HPPs is important because they have become the world's largest financiers for hydropower. According to China's Global Energy Finance dataset maintained by Boston University's Global Development Policy Center, CDB and CHEXIM have lent over \$44 billion for HPPs totaling over 27 GW across 38 countries from 2001 to 2020 [17]. Figure 1 illustrates the global distribution of these projects. Different from foreign direct investment (FDI) drawing on corporate savings or profits, issuance of corporate bonds or stocks, and commercial loans, the loans from the two policy banks constitute what is known as official development finance (ODF) [18-20]. A comparison of the two Chinese policy banks with the world's major multilateral development banks (MDBs) in the area of hydropower lending illustrates the preeminent role CDB and CHEXIM play in hydropower worldwide. According to the International Renewable Energy Agency (IRENA), eight leading MDBs, including the African Development Bank (AfDB), the Asian Development Bank (ADB), the European Bank for Reconstruction and Development (EBRD),

the European Investment Bank, the Inter-American Development Bank (IADB), and the Development Bank of Latin America (CAF), the Islamic Development Bank (IsDB) and the World Bank, have collectively provided a total of \$16.4 billion worth of development finance for hydropower worldwide from 2001 to 2017 whereas during the same time CDB and CHEXIM have mobilized \$40 billion [21]. Thus, it goes beyond doubt that China has emerged to become the world’s champion for hydropower through its two policy banks in less than two decades.

Figure 1: Regional Distribution of Chinese ODF for Hydropower Projects Worldwide, (2001-2020)



Source: [17].

In light of the enormous magnitude of the two policy banks’ ODF for foreign HPPs, it is time we brought back these two policy banks in our effort to understand China’s involvement in hydropower development worldwide. This study seeks to do just that. Specifically, we interrogate the questions of why these two policy banks have financed so many foreign HPPs abroad and how the Chinese ODF relates to the globalization of the Chinese hydropower SOEs and the pursuit of Beijing’s economic and political agenda worldwide. Further, we also examine how dynamics abroad, especially in countries that seek to expand hydropower, fit into China’s rise in hydropower development finance. Drawing mainly on primary data, we have adopted a political economy approach and developed a push and pull model to answer our question.

Structurally, this study consists of five parts and is organized as follows. After this introduction, Part Two will discuss the data we rely on, the research method we deploy, and the analytical model we have developed for this study. Part Three will investigate how the domestic push factors drive the Chinese policy banks to finance foreign HPPs while Part Four will focus on the role of the external pull factors. Part Five will conclude and draw out some of the policy implications.

Data, Research Method & Analytical Model

Data & Research Methods

This study employs three types of data in the analysis. First, it sources data on Chinese ODF for foreign HPPs from the publicly available China’s Global Energy Finance dataset maintained by Boston University’s Global Development Policy Center. The collection of this dataset follows the principle

of rigorous “economic journalism,” cross-language corroboration, and stakeholder verification.² In the absence of the two Chinese policy banks’ disclosure of their official record, this dataset provides the most reliable bottom-up, project-level tracking of Chinese ODF for HPPs worldwide. Second, it draws on primary data from the following organizations: IEA, the World Bank, IRENA, the US Energy Information Agency (EIA), the China Electricity Council, and the Global Dam Watch. Third, it has also incorporated into the analysis primary and secondary sources in Chinese, including government documents, official corporate documents, peer-reviewed journal publications, and official newspaper reports.

Based on the aforementioned three types of research data, this study engages in both qualitative and quantitative analysis throughout the study. Specifically, it adopts a political economy approach to investigating both the internal push factors and the external pull factors that drive the two Chinese policy banks to finance HPPs worldwide. To establish linkage between these factors and Chinese ODF for HPPs worldwide and sort out their relevance, it also deploys some statistical analysis.

Analytical Model

Our push-pull analysis, as delineated in Table 2, allows us to develop a dynamic model that makes two revelations. First, it shows how the interests of the Chinese hydropower SOEs, the Chinese state, and the two policy banks converge. The Chinese hydropower SOEs expand overseas to exploit the strength they have acquired from their decades of dam building experience in the world’s largest hydropower market and to fend off the growing threat of the shrinking development space for hydropower at home. This expansion coincides with the Chinese government’s pursuit of two national development strategies—the going out strategy since the turn of the century and the Belt and Road Initiative (BRI) since 2013—and its broader economic diplomacy. Meanwhile, as instruments of the Chinese state [22, 23], CDB and CHEIXM should facilitate the global expansion of the Chinese hydropower sector and bridge interests of the Chinese state and those of the Chinese hydropower sector. This obligation

Table 2: Analytical Model

Level of analysis	Independent variables		Dependent variable (Y)
	Domestic push (X_1)	Foreign pull (X_2)	Chinese ODF for hydropower
State level	Beijing’s international development strategies and economic diplomacy	Hydropower development boom in the global South	
Industry and corporate level	Strength and weaknesses of the Chinese hydropower sector	Dependence in the global South on external suppliers and contractors for hydropower supply and development	
Industry and organizational level	The two policy banks’ organizational mandate and organizational interests	Dependence in the global South on external capital for hydropower financing; MDBs have shifted away from hydropower toward solar and wind power	

Source: Author’s analysis.

² For a description of the methodology behind the compilation and verification of the dataset, please refer to https://www.bu.edu/gdp/files/2021/03/GDPC-Database-Methodology-Guidebook_EN.pdf.

stems from their mandate to increase the globalization of the Chinese hydropower sector, promote its export, and facilitate the execution of China's international development strategies and economic diplomacy [19]. But financing HPPs transcends promoting the interests of the Chinese hydropower sector and the priorities of the Chinese state—it also allows the two policy banks to advance their interests of expanding operations beyond the Chinese shores and increasing their international revenues. Thus, financing foreign HPPs advances the interests of the Chinese hydropower industry, the Chinese state and the two policy banks simultaneously. It is this convergence of these three sets of overlapping interests that constitutes the push for Chinese ODF for foreign HPPs.

Second, while the interests of the Chinese hydropower industry, the Chinese state, and the Chinese policy banks conspire and give rise to a collective push for the globalization of Chinese hydropower ODF, the opportunities for hydropower buildout and the resultant opportunity for hydropower equipment trade and hydropower financing worldwide have also grown tremendously since the turn of the century. Specifically, these opportunities emerged from this new round of hydropower construction boom since 2001, led by the active pursuit in many low- and middle-income countries. Due to their lack of the technological, engineering, and financing capacity to carry out the hydropower expansion, these low- and middle-income countries have turned to international suppliers, contractors, and financiers for assistance. Meanwhile, MDBs have gradually shifted away from hydropower to focus more on non-hydro renewables, such as solar and wind power. This interaction of the low- and middle-income countries' pursuit of hydropower expansion and dependence on external suppliers, contractors, and financiers, together with the MDBs' shift away from hydropower, has combined to produce a pull for the Chinese hydropower SOEs and the two Chinese policy banks to supply, build and finance HPP worldwide.

The Domestic Push for Chinese Policy Banks to Finance Hydropower Abroad

The domestic push for Chinese hydropower ODF abroad speaks volumes about how the interests of the Chinese hydropower sector, as represented by its flagship SOEs, the Chinese state, and the two Chinese policy banks intersect in the era of the globalization of the Chinese economy and China's engagement in infrastructure projects worldwide. Specifically, this push emanates both internally from the identity and self-interests of these two banks and externally from the expansion impulse of the Chinese hydropower sector and the Chinese state's international developmental strategies and economic diplomacy needs.

Financing Foreign HPPs is Consistent with Organizational Identity and Self-Interests

Viewed from an organizational perspective, financing foreign HPPs is consistent with both the identity and self-interest of the two policy banks. Two fundamental realities provide testimony. First, historically the two policy banks have always supported the Chinese hydropower sector out of their original organizational mandate, long before the Chinese government launched its going out strategy and BRI. This is especially true for CDB. With a historical focus on the basic infrastructure (such as roads, railway, and ports), the basic industries (such as raw materials, energy, and transport), and the pillar industries (such as machinery, electronics, automobile, and construction) [19, 24], CDB has always acted as the financial backbone of the hydropower expansion in China. According to Vice President of CBD Zheng Zhijie, the bank has provided over 350 billion yuan (about \$50 billion³)

³ All of yuan-dollar conversions in this study are made on the basis the average annual exchange rate published on the website of the Federal Reserve Bank of Saint Louis, available at <https://fred.stlouisfed.org/series/AEXCHUS>, accessed on April 2, 2021.



worth of loans for hydropower development in China from 1994 to 2011, accounting for 40 percent of the country's aggregate hydropower finance during the same period [25]. Over the past couple of years, CDB has steadily increased its financial support for hydropower. Based on a speech delivered by Vice President of CDB Wang Yongsheng at the China Hydropower Development Forum, the bank's cumulative financial support for hydropower at home has reached 437 billion yuan (or \$65 billion) by the end of 2016 [26], registering a total growth of 29 percent in five years. As the bank answered the call of the Chinese government to support the going out of Chinese companies beginning from 2003 [22], CDB has gradually increased its support for the global expansion of the Chinese hydropower sector. According to the China Global Energy Finance dataset, CDB has provided \$6 billion worth of loans to 14 HPPs with the involvement of Chinese hydropower SOEs across six countries, including Laos, Sri Lanka, Belarus, Fiji, Argentina, Ecuador, and Peru as of 2020 [17]. Thus, CDB's support for foreign HPPs with the involvement of Chinese hydropower SOEs is both a natural extension of what it has been doing at home and an outgrowth of its organizational mandate, which has grown over time in response to the evolving priorities of the Chinese state [19].

Established primarily as an export credit agency, CHEXIM is obligated to promote Chinese export with proprietary intellectual property rights, proprietary brands, and high value-added [23]. Financing foreign HPPs enables CHEXIM to fulfill its organizational mandate because its overseas lending for hydropower is frequently conditioned on the contracting of Chinese hydropower companies and the sourcing of Chinese hydropower equipment, technologies, and services. Ever since issuing the first export buyer's credit for Sinohydro's undertaking of the engineering, procurement, and construction (EPC) contract in the Iranian Taleghan reservoir and HPP in 2001, CHEXIM has been financing Chinese hydropower SOEs' involvement in HPPs worldwide. According to the China Global Energy Finance dataset, CHEXIM has provided \$36.8 billion worth of loans to 77 HPPs across 32 countries from 2001 to 2020, which is more than six times what CDB has lent worldwide for HPPs during the same time frame [17]. These loans, as to be discussed later, go a long way to support the Chinese hydropower sector that is ready to expand abroad because of its growing competitiveness and mounting challenges at home.

Second, financing foreign HPPs with Chinese involvement is also in the organizational interests of the two policy banks. With no retail banking operations, both CDB and CHEXIM raise their funds through bond issuance on a market basis; as a result, they are primarily engaged in wholesale banking and rely heavily on lending for revenues [18]. Thus, they grow mainly through their lending operations. Turning overseas also made sense for CDB as it faced growing competition from the state-owned commercial banks (SOCBs) in its priority areas at home. This competition has grown more intense in the aftermath of the 2007-2008 Global Financial Crisis as these SOCBs have also stepped up their lending to areas traditionally dominated by the policy bank [27].

Financing Foreign HPPs to Help the Chinese Hydropower Sector Expand Overseas

In addition to advancing their organizational interests and carrying out their organizational mandate, CDB, and CHEXIM finance foreign HPPs to promote the export and internationalization of the Chinese hydropower sector. This point becomes clear when one examines how the two policy banks' loan finance fits in with the need for capital in many low- and middle-income countries seeking to expand hydropower. Due to the lack of wherewithal to pay upfront for the technologies, equipment, or services necessary for their hydropower expansion, their governments often engage in international borrowing and prefer to award projects to contractors that can facilitate or provide financing. When approached by these governments or requested by the Chinese hydropower SOEs pursuing opportunities in these low- and middle-income countries, the Chinese policy banks provide export credit, concessional loans, or mixed credit facilities that blend preferential and market-based loans to these sovereign governments. These loans often entail overseas contracting of Chinese hydropower

SOEs anchored to integrated EPC contracts, service contracts, such as construction contracts and operation and maintenance (O&M) contracts, or a public-private partnership (PPP) arrangement, such as build, operate, and transfer (BOT) and build, own, operate and transfer (BOOT). These service-oriented contracts or PPP arrangements share one thing in common—the export of Chinese equipment, materials and parts, and services. The author has verified that all of the foreign HPPs CDB and CHEXIM have financed in 2001-2020 are tied to Chinese hydropower export or contracting of some kind. Thus, it is clear that the two policy banks finance foreign HPPs to help Chinese hydropower SOEs expand overseas.

What prompted the two policy banks to assist the Chinese hydropower SOEs with their overseas expansion, to begin with? As the Chinese hydropower sector entered into the 2000s, two competing dynamics have conspired to push it to expand overseas. Specifically, these two dynamics include the Chinese hydropower sector's increasing competitiveness across all segments of the value chain and the growing challenges that constrain its growth at home. On the one hand, the Chinese hydropower sector's growing strength derives from its tremendous expansion over the past two decades thanks to two major factors. First, the Chinese economy has been growing at a rapid pace since the country entered the World Trade Organization (WTO) in 2001. Indeed, the Chinese economy grew at an average rate of 10.6 percent per annum in 2001-2010 and 7.3 percent in 2011-2019 despite its recent slowdown [4]. This rapid economic growth directly gives rise to the demand for power, thereby spurring the expansion of hydropower, which accounts on average for 17 percent of the country's electricity supply from 2001 to 2019 [28]. Second, China defines hydropower as renewable energy and integrates it into the country's renewable energy development target as evidenced by the 11th Five-year Plan for Renewable Energy Development [29]. Thus, China's push for renewable energy expansion as part of the national endeavor to reduce pollution, cut carbon, and foster the growth of the so-called strategic emerging industries (SEIs) provides hydropower with guaranteed growth. This guarantee, as to be discussed later, takes the form of centrally mandated hydropower development targets, which are allocated across the country. These two dynamics have together led to a favorable environment for hydropower, which saw its total installed generating capacity more than quadrupled over the past two decades, doubling from 2001 to 2008 and doubling again from 2008 to 2017 [28]. Viewed from a global perspective, net hydropower capacity additions in China grew by 281 GW in 2001-2019, accounting for 54 percent of the world's net hydropower capacity additions during the same period and exceeding the combined total installed capacity of the next three biggest hydropower markets in the world—Brazil, Canada, and the United States [1]. As a matter of fact, since surpassing the United States in total installed hydropower generating capacity as the world's largest hydropower market in 2001[9], China has led the world in hydropower expansion over the past two decades, with its installed hydropower capacity reaching 358 GW at the end of 2019 and accounting for 27.4 percent of the world's total [1, 28].

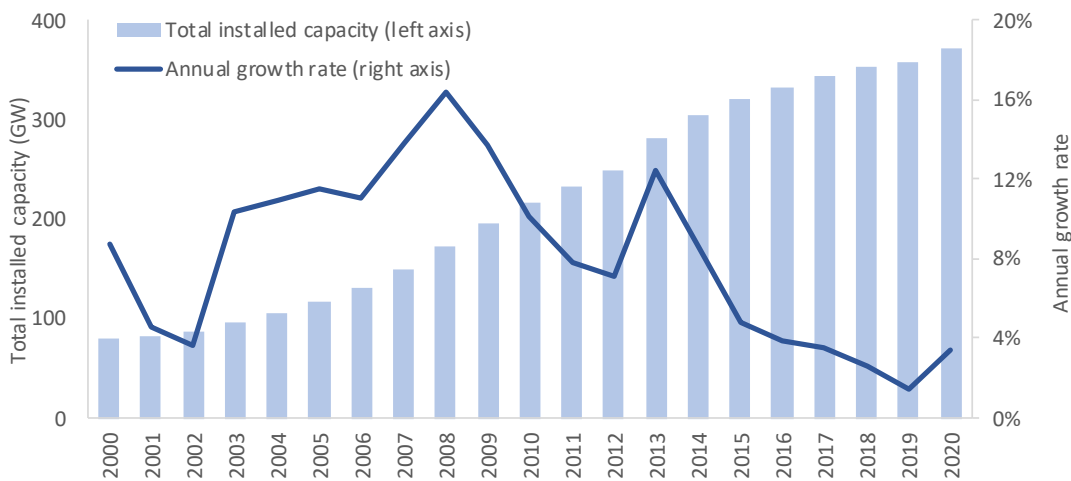
It is this magnitude of the hydropower expansion that has provided the Chinese hydropower sector, especially its flagship hydropower SOEs, with the leverage to gain access to advanced foreign technologies and a training ground for them to solidify their core competence and leapfrog to become global leaders across the entire value chain of the hydropower industry. In the area of manufacturing, when sourcing supplies for the Three Gorges Dam (TGD), the largest HPP in the world, in the 1990s, the Chinese government required leading Western firms, such as ABB, Alstom, General Electric, and Siemens, to manufacture half of their turbines and generators in partnership with Chinese counterparts [11]. This partnership provided Chinese SOEs with a golden opportunity to shorten their learning by doing process and to catch up in a short span of time. The rise of the Harbin Electronic Corporation (HEC) provides a case in point. While participating in TGD, HEC assumed the role of subcontractors for leading Western firms and engaged in joint-designing and joint-manufacturing with its Western partners at the outset. In a matter of six years, HEC gained the competence to operate as independent contractors for TGD [30]. Further, while learning from its Western

partners, HEC developed its 700-MW turbine technology that was adopted for TGD. It then kept blazing new trails by producing the 770-MW turbines for the Xiluodu Dam and the 800-MW turbines for the Xiangjiaba Dam in Yunnan Province and then the 1000-MW turbines, the biggest of its kind in the world, for the Baihetan Dam in Central Hubei Province [30]A. With its continuous progress, HEC has transformed itself from a technological laggard to a leading pioneer in large-scale hydropower equipment manufacturing in less than two decades.

Further, the massive hydropower buildout in China has also fostered the world’s leading players in hydropower design and construction. For example, the Power Construction Corporation of China (Power China) is responsible for the construction of over 65 percent and the design of more than 80 percent of the medium- and large-scale hydropower projects in China [31] while the China Energy Engineering Corporation (CEEC) has designed and constructed more than 1,000 hydropower projects in China, accounting for 30 percent of the domestic market share [32]. With these enormous experiences, it is not surprising that Power China and CEEC are ranked as No. 1 and No. 2 in the power sector amongst the world’s top 225 design firms and No.1 and No.3 in the power sector amongst the world’s top 250 global contractors [33].

On the other hand, while its core competence and international competitiveness continue to solidify in the midst of the country’s hydropower expansion, the Chinese hydropower sector has gradually bumped into some growing and interconnected challenges that have started to threaten its growth at home. Collectively, they point to a shrinking development space caused by the country’s recent slowdown, the rising costs of hydropower development in China, political complications at home and abroad, and expectations that the future growth trajectory of hydropower will diminish. Taken together, they constitute the precursor to the beginning of a sunset industry.

Figure 2: Hydropower Expansion in China, 2001-2020

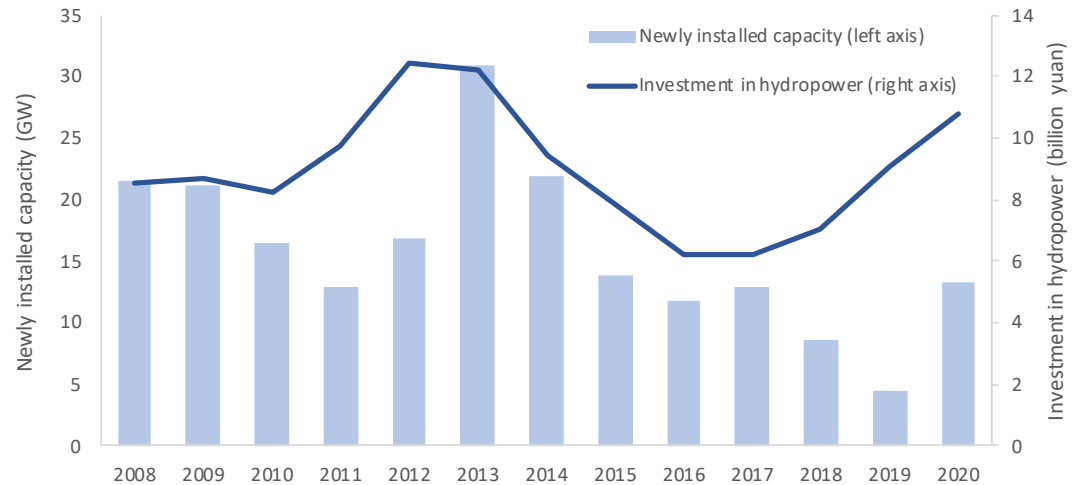


Source: [28].

After galloping at a rapid pace, the Chinese hydropower sector’s expansion has lost steam since 2008. As shown in Figure 2, while China’s total installed hydropower generating capacity continued to expand in absolute terms over the past two decades, the growth rate of its annual capacity addition peaked in 2008 and registered a clear downward trend after fluctuating in 2012-2013. Specifically, China’s installed hydropower capacity grew on average at 10 percent per year in 2001-2013 but the rate dropped to 4 percent in 2014-2020 [28]. This slowdown corresponds to the same trends in hydropower investment and annual capacity additions. Figure 3 illustrates that the annual hydropower capacity additions have also exhibited a downward trajectory since peaking in 2013.

The same pattern is also echoed by the annual hydropower investment, which took a nosedive after 2013, bounced back since 2017 but has not regained all the lost ground as of 2020.

Figure 3: Annual Hydropower Investment and Capacity Additions



Source: [28].

Four main factors have contributed to this slowdown in China’s hydropower sector. First, the Chinese economy started to gradually slow down following the 2007-2008 Global Financial Crisis. While Beijing’s aggressive and timely stimulus softened the blow from the external shock, the slowdown took hold after the Chinese government put the brakes on its runaway credit expansion beginning from 2012 [34, 35]. As a result, the Chinese economy has entered into a new normal of growing at below 8 percent per year since 2012 [4], thereby denting the overall power demand. Next, the tempering demand for power clashed with the buildup of excess power generating capacity, especially in the case of coal-fired power. Some scholars estimate this excess generating capacity to be 140-160 GW in 2015 [36, 37], which is 9-10 percent of the country’s total installed coal-fired power generating capacity for the same year. Other than coal-fired power, hydropower has also increasingly run into competition with wind and solar power, especially when it comes to grid connection in Southwestern China. This competition between wind/solar power and hydropower is particularly noticeable in Yunnan Province and coincides with a growing curtailment of both wind/solar and hydropower electricity [38]. Similarly, curtailment in Sichuan Province has also been a growing problem since 2006 [39].

Second, the slowdown in hydropower expansion is accompanied by the rising costs of hydropower development in China. After years of development, Southwest China, including Guizhou, Chongqing, Sichuan, Yunnan, and Tibet, has become the center of gravity for new hydropower development. Taken together, these five southwestern localities account for over two-thirds of the country’s technically exploitable hydropower potential and boast of six of the 15 hydropower bases in China, including the Yarlung Zangbu River, the Jinghsa River, the Yalong River, the Dadu River, the Nu River and the Lancang River [39, 40]. Although 20 GW plus of hydropower generating capacity has been built along these six rivers, they remain relatively underdeveloped when compared with the Yangtze River and the Yellow River [39]. However, many of these rivers are located in mountainous areas characterized by severe weather, difficult terrains, complex geologies, distance from population centers, rich biodiversity, fragile ecosystems, and seismic activities. While residential displacement is less likely to become a major issue given their distance from populations centers, the preceding complications not only pose great challenges to hydropower designing and engineering but also require long-distance transmission lines and high maintenance costs due to seismic hazard, thereby

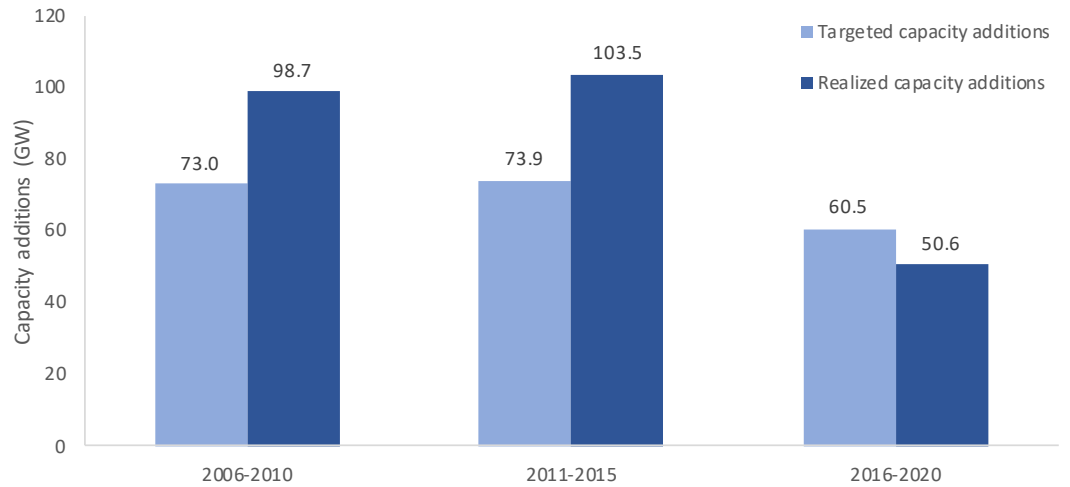


further increasing the costs of hydropower development in these areas. As a result, the actual costs of hydropower are on average 75 percent higher than budgeted costs [7]. In light of the above-mentioned softening demand for power, excess coal-fired power capacity, and the declining costs of non-hydro renewables, it is not surprising that China has been adding more capacity additions in both solar and wind power than in hydropower since 2015 [1].

Third, international and domestic politics also complicate the prospect for large dams in China. Three of the above-mentioned six major rivers with much untapped potential are transboundary. For example, the Yarlung Zangbu River flows to South Asia and is known as the Brahmaputra River there while the Nu River and the Lancang River flow to Southeast Asia and are known as the Salween River and the Mekong River respectively. Consequently, attempts by China to dam these rivers upstream often stoke concerns and sometimes protest in the downstream countries. For instance, China's effort to build a cascade of 13 dams along the Nu River in 2003-2005 led to a public petition to the Chinese ambassador in Thailand from 83 different organizations in December 2003 [41]. Domestically, large-scale hydropower projects have also become a lightning rod for public action due to their ESG consequences. While igniting protests overseas, the Nu River dam also galvanized the opposition from a wide range of environmental non-governmental organizations (NGOs), journalists, academics, and concerned citizens in coordination with international environmental NGOs [41]. This public opposition forced then Premier Wen Jiabao to halt the Nu River project in 2004 and led to the cancellation of the Tiger Leaping Gorge dam in 2007. The success of these public campaigns generated a great level of optimism about environmental governance in China. For instance, Andrew Mertha describes the journalists, activists, and academics as "water warriors" and portrays them as new actors of environmental governance in "a less authoritarian China" [42]. Others saw the success of the campaign against the Tiger Leaping Gorge dam as the advent of the new era of a green movement in China [43]. With the benefit of hindsight, it is clear that some of the optimism has been exaggerated given that some of the halted projects have resumed and the bottom-up environmentalism has lost momentum as the Chinese state tightens its grip over society. Nevertheless, thanks to these high-profile movements, large-scale hydropower projects have come under closer scrutiny. Their environmental approvals have become more arduous and protracted while their resettlement costs have been on the rise, with their share now exceeding 20-40 percent of total hydropower investment [44].

Fourth, the future growth of hydropower in China is likely to be limited at best. Recent failures to meet the hydropower development target under the country's five-year plans (FYPs) already point to the writing on the wall that bodes ill for hydropower's future. As shown in Figure 4, while the hydropower expansion exceeded the country's official development target under the 10th FYP (2010-2011) and 11th FYP (2011-2015), it fell behind the target under the 13th FYP (2016-2020). Upon a closer look, Jia Kehua of the *China Energy News* revealed that 52 percent and 48 percent of the targeted conventional hydropower and pump storage capacity additions were left unfinished under the 13th FYP [45]. With this reality check, it comes as a little surprise that the central government in Beijing did not announce any hydropower development target under its recently released 14th FYP for 2021-2025. While the 14th FYP did identify harnessing the 70 GW of hydropower potential along the Yarlung Zangbu River in Tibet as its priority [46], few analysts expect a large-scale dam to be completed along the river over the next five years considering the complications associated with this transboundary river discussed above and the construction delays associated with large hydropower projects [9]. When projecting the growth outlook for China's hydropower sector, the IEA constructed two scenarios, according to which the net additions of installed capacity are likely to be 45.7 GW under the main case and 60.7 GW under the accelerated case for 2021-2025 [1]. In comparison with the development target under the 13th FYP, the IEA's accelerated case for the next five years shows a marginal growth of 0.4 percent whereas its main case represents a contraction of 16.4 percent for the next five years.

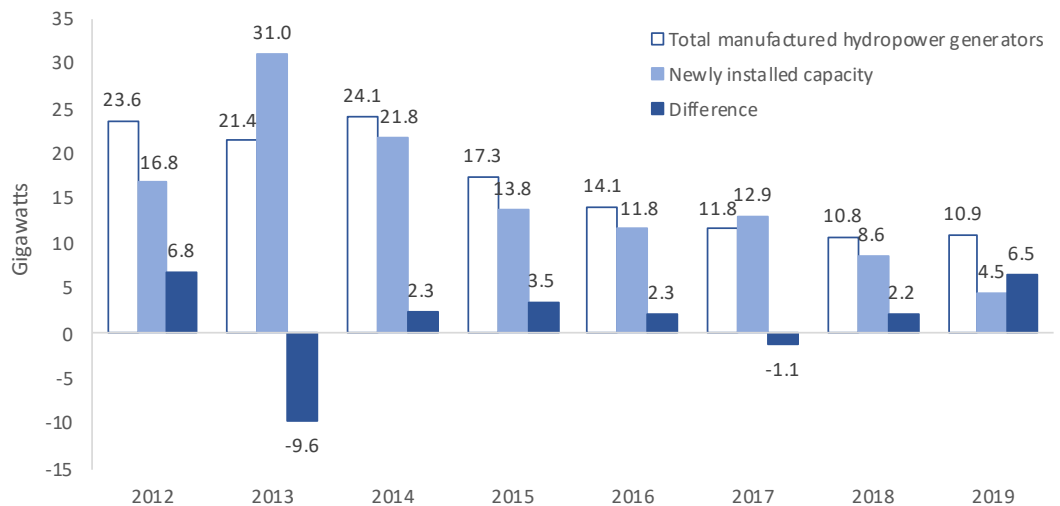
Figure 4: Hydropower Expansion Under the 10th, 11th and 12th Five Year Plans



Source: [28].

The slowdown in China’s hydropower sector against the backdrop of its growing challenges at home carries some serious consequences. In addition to squeezing the revenues required to deal with these challenges, the slowdown in hydropower expansion also translates into problems for the country’s hydropower equipment manufacturing sector, which has developed an annual capacity to manufacture 20-30 GW of hydropower equipment as illustrated in Figure 3. As hydropower expansion slows in China, Figure 5 shows the total amount of hydropower generators manufactured exceeded the total installed hydropower capacity in China since 2014, pointing to signs of excess hydropower equipment manufacturing capacity. Meanwhile, the slowdown and its resultant problems have also created reverberations for hydropower employment across China. According to IRENA, China’s hydropower employment started to decline in 2013, with 2016 and 2017 witnessing a contraction of 7 percent and 20 percent respectively [47, 48].

Figure 5: Estimated Excess Capacity in Hydropower Generator Manufacturing in China, 2012-2019

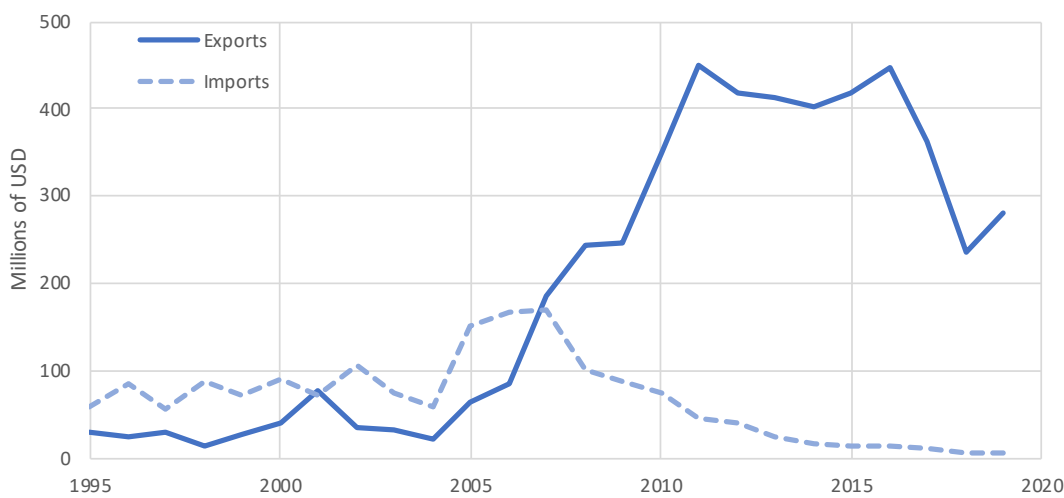


Source: Author’s estimate based on data from [28] and the International Energy Network (in-en.com).



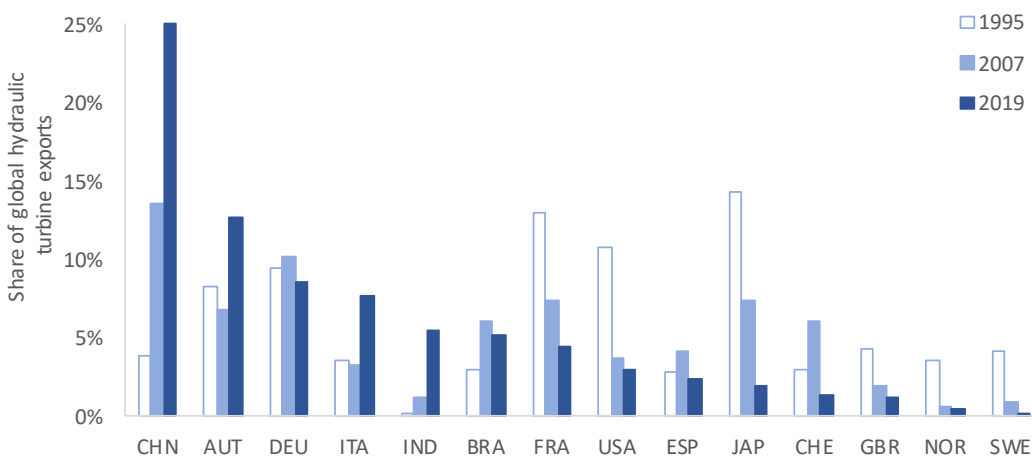
In face of these problems at home, the Chinese hydropower sector has increasingly been selling overseas. Figure 6 reveals that China turned into a net exporter of hydraulic turbines in 2007 and despite some slight decrease in 2017-2019 its exports have maintained a clear upward trajectory since 2007. This jump in Chinese hydraulic exports coincided with annual hydropower capacity addition peaking in China in 2007 and maintaining a downward trend since then as depicted in Figure 2. To put the growth of Chinese hydraulic turbine exports in a global perspective, Figure 7 compares China and 13 leading hydraulic turbine exporters, which together accounted for 80 percent of the world's exports in 2019. While China merely represented 4 percent of the world's hydraulic exports in 1995, its share of the global exports jumped to 14 percent in 2007 and it became the world's leading exporter in the same year; it has maintained its global dominance since 2007 and accounted for one-quarter of the global hydraulic exports in 2019 [49]. The rise and dominance of China as the world's leading hydraulic turbine exporter, as shown in Figure 7, forms a sharp contrast with the decline of the traditional dominant players, such as Japan, the United States, and the United Kingdom and dovetails with the globalization of Chinese hydropower SOEs discussed earlier.

Figure 6: China's Exports and Imports of Hydraulic Turbines, 1995-2019



Source: [49].

Figure 7: China's Rise and Dominance as the World's Leading Hydraulic Exporter, 1995-2019

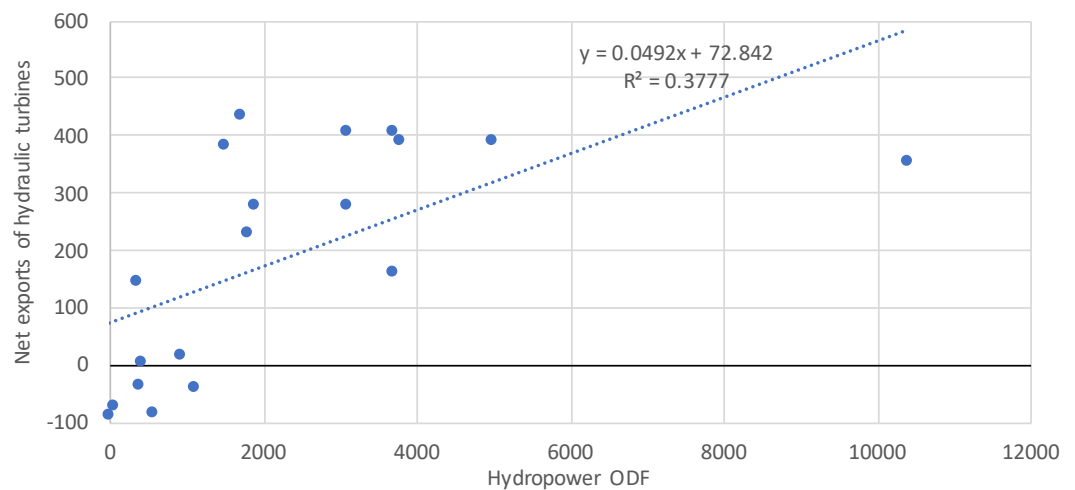


Source: [49].

Note: CHN: China, AUT: Austria, DEU: Germany, ITA: Italy, IND: India, BRA: Brazil, FRA: France, USA: United States, ESP: Spain, JAP: Japan, CHE: Switzerland, GBR: United Kingdom, NOR: Norway, SWE: Sweden.

Consistent with the literature that highlights the market-seeking and profit-seeking global expansion of Chinese firms [50, 51], this coexistence between the increasing strength and growing threat facing the Chinese hydropower sector has together given rise to the impulse and impetus for the leading SOEs to expand overseas to capitalize on their growing comparative advantage and offset the growing challenges confronting at home. A statistical analysis of the Chinese exports of hydraulic turbines and the Chinese hydropower ODF worldwide provides evidence that the latter is a precursor to the former. Indeed, a two-variate linear regression of the two sets of data yields a p-value of 0.005, pointing to a statistically significant relationship between the Chinese hydropower ODF and the Chinese net exports of hydraulic turbines worldwide in 2001-2019 at the 99 percent confidence interval. Figure 8 demonstrates that when net Chinese exports of hydraulic turbines increase by \$1 million the Chinese hydropower ODF grows by \$73 million ceteris paribus. The R square of this regression model is 0.38, meaning 38 percent of the variation in Chinese hydropower ODF is tied to the changes in Chinese net exports of hydraulic turbines from 2001 to 2019. While confirming that the two Chinese policy banks finance foreign HPPs to promote Chinese hydropower exports, the preceding statistical analysis also suggests that other motivations are also at work.

Figure 8: Chinese Net Exports of Hydraulic Turbines and Chinese Hydropower ODF Measured in Million US Dollars, 2001-2019



Source: authors' calculation on the basis of data from [17, 49].

Financing Foreign HPPs to Promote the Interests of the Chinese State

In addition to promoting export, the two policy banks' financing of foreign HPPs is also consistent with their mission to fulfill the will of the state. So far as the Chinese hydropower sector is concerned, while the Chinese hydropower SOEs have largely expanded around the world out of their own volition [11], their expansion dovetails with three priorities of the Chinese state abroad—the going out strategy, the BRI, and its economic diplomacy.

First, since the beginning of the 2000s, the Chinese government has made a strategic decision to pursue growth and development by globalizing its economy. To achieve this goal, China has adopted the broadly defined “going out” strategy. This strategy, as defined by the country's chief development agency the National Development and Reform Commission (NDRC), together with CDB and CHEXIM between 2003 and 2005, identifies as priorities for financial support the international expansion aimed to achieve the following four objectives: promoting the country's use of and access to foreign natural resources, expanding domestic export, enhancing acquisitions of



overseas strategic capital, such as advanced technologies, management experience, and talents, and improving the global competitiveness of corporate China through overseas investment [19]. As discussed earlier, Chinese hydropower SOEs embarked on overseas expansion primarily to capitalize on their core competence across all segments of the hydropower value chain and offset their growing challenges at home. Thus, financing foreign HPPs with Chinese involvement allows the two policy banks to promote Chinese hydropower SOEs' export and enhance their global competitiveness. For instance, CHEXIM's provision of a 200-million-dollar loan helped Sinohydro win its first overseas BOT contract to develop the Kamchay Dam, the largest in Cambodia. Once awarded the contract, Sinohydro, as the sole owner of the project, also undertook the EPC and O&M contracts through its subsidiaries. Taken together, these three contracts enabled Sinohydro and its subsidiaries to export to Cambodia its hydropower planning, designing, engineering, construction, maintenance services as well as sourcing hydropower equipment from major suppliers such as HEC. In cases where host countries repay their loans for HPPs with natural resources, such as Ecuador and Ghana, financing foreign HPPs with Chinese involvement also enables the two policy banks to pursue China's resource security overseas. Hence, financing foreign HPPs allows the two Chinese policy banks to promote three of the four goals of the going out strategy.

Second, the global expansion of the Chinese hydropower sector, together with the two policy banks' support, overlaps with the Chinese government's effort to promote global connectivity with China through the BRI, which President Xi Jinping launched in 2013. This overlap is found in two official documents. First, to lay out the blueprint for the BRI, the three Chinese bureaucracies, including NDRC, and Ministry of Foreign Affairs, and the Ministry of Commerce, jointly issued the *Visions and Actions on Jointly Building Silk Economic Belt and 21st Century Maritime Silk Road* on March 1, 2015. This document identifies international cooperation in hydropower as a priority for the BRI and recommends cooperation across the integrated value chain, especially in equipment manufacturing and engineering services [52]. When elaborating on how China should implement the BRI, the State Council, China's cabinet, went one step further and offered more details. In its *Guiding Opinions on Promotion of International Production Capacity and Manufacturing Cooperation* issued on May 13, 2015, the State Council called on the country's hydropower sector to accelerate its going out by "actively expanding hydropower markets in relevant countries," "participating in major electric power projects by multiple means," and "enlarging China's hydropower equipment and technology export" [53]. Further, the State Council made it clear that the Chinese government should increase preferential lending while its policy banks should enhance their support through syndicated loans, export credit, and project finance [53]. Considering the slowdown in the country's hydropower development and the resultant repercussions for the country's hydropower equipment manufacturers and hydropower jobs since 2013 discussed earlier, the inclusion of international hydropower cooperation in the BRI blueprint and its implementation guidelines amounts to an official endorsement of what the Chinese hydropower SOEs and the two policy banks have been doing since the early 2000s.

A glimpse at the empirical data indicates some correlation between the Chinese ODF for hydropower and the two development strategies of the Chinese government. Indeed, the two policy banks started to provide ODF for hydropower in 2001 and increased their provision following the launch of the BRI. According to China's Global Energy Finance dataset [17], while the two policy banks issued about \$15.2 billion worth of ODF for foreign HPPs in 2001-2012, the scale of their hydropower ODF jumped up to \$28.8 billion from 2013 to 2020, registering a 90 percent growth in eight years. This suggests that CDB and CHEXIM have indeed taken hues from both the BRI blueprint and its implementation documents and answered the call of the Chinese government.

Third, participation in hydropower development abroad also fits in with China's economic diplomacy toward countries in the global South. To carry out its economic diplomacy, China gives foreign aid in three categories—grants, interest-free loans, and concessional loans—that are often associated

with its provision of complete projects, goods and materials, technical assistance, human capital development assistance, medical assistance, emergency assistance, and debt relief [54]. The grants and interest-free loans come out of the Chinese government's budget overseen by the Ministry of Finance while concessional loans are issued by CHEXIM [18, 55]. China has had a long history of supporting hydropower development overseas through its foreign aid, although the size of these HPPs tends to be small. For instance, the Chinese government provided foreign aid to the development of over 70 HPPs in Peru, Ecuador, and Columbia in 1981-84, three HPPs in Cuba, and the Moco-Moco HPP in Guyana in 1999 [56]. Moving into the new century, China continued to provide limited aid to hydropower development overseas. For instance, CHEXIM provided the government of Ghana with 90 percent of the funds totaling \$562 million required for the construction of the Bui Dam, with \$270 million issued in the form of concessional loans at a fixed interest rate of 2 percent while the remaining \$292 million taking the form of export credit at commercial rates; as part of the deal, Sinohydro, a subsidiary of Power China, was awarded the EPC contract while the Ghanaian government offered a state guarantee of the loans based on its cocoa beans export to China [57].

There is little doubt that the primary purpose of Chinese foreign aid in hydropower is political. Beijing often frames its aid in foreign HPPs as gestures of China's goodwill and friendship and its commitment to development in the global South. At the same time, Beijing also uses Chinese ODF for foreign hydropower as an instrument and leverage to boost China's image as a development enabler, open up commercial opportunities, win over contracts for Chinese firms, boost bilateral ties with recipient governments, and even reshape geopolitical arrangements in favor of China. CHEXIM's financing and building of hydropower projects in Nepal's Rasuwa District provides a case in point. In a recent study, Murton, Lord, and Beazley [13] delineate how China's involvement in Nepal's hydropower infrastructure development after a 7.8-magnitude earthquake hit the South Asian nation in 2014 has yielded benefits for both the Nepalese and the Chinese state: on the one hand, it has allowed the Nepalese government to extend its state-building activities to remote areas by delivering development dividends and integrating these remote areas into central control; on the other hand, China's development assistance has incentivized Nepal to alleviate China's concerns about the Tibetan exiles in the Nepalese border areas by imposing restrictions and conducting surveillance on their public gatherings and pulled Nepal closer to China's orbit away from India.

However, one should avoid rushing to a sweeping general claim when analyzing the geopolitical dividends of the Chinese hydropower ODF for three reasons. First, most Chinese ODF for hydropower does not fall in the category of foreign aid. Concessional loans for foreign HPPs account for less than 15 percent of the total Chinese ODF for hydropower in 2001-2020 [16]. Further, some recent studies about the utility of China's economic statecraft show ambiguous strategic dividends [58] and thus cast doubt over the effectiveness of the country's foreign aid in hydropower in enhancing its geopolitical influence or reaping the strategic externality of the economic statecraft. Chinese hydropower SOEs often prioritize the standards of host governments over the strategic concerns of the Chinese state while operating overseas [59]. Finally, even if there appears to be some congruence between Chinese ODF for hydropower geopolitical or strategic dividends that have accrued to Beijing, separating the impact of Chinese hydropower ODF from the broader economic, political, and diplomatic engagement between China and the recipient countries represents a trying analytical challenge.

The External Pull for Chinese Policy Banks to Finance Hydropower Abroad

Just as the interests of the Chinese hydropower sector, the Chinese state, and its policy banks converged to give rise to a growing impulse, pressure, and incentive for the Chinese hydropower SOEs to expand beyond the Chinese shores, the demand for hydropower equipment and parts, hydropower

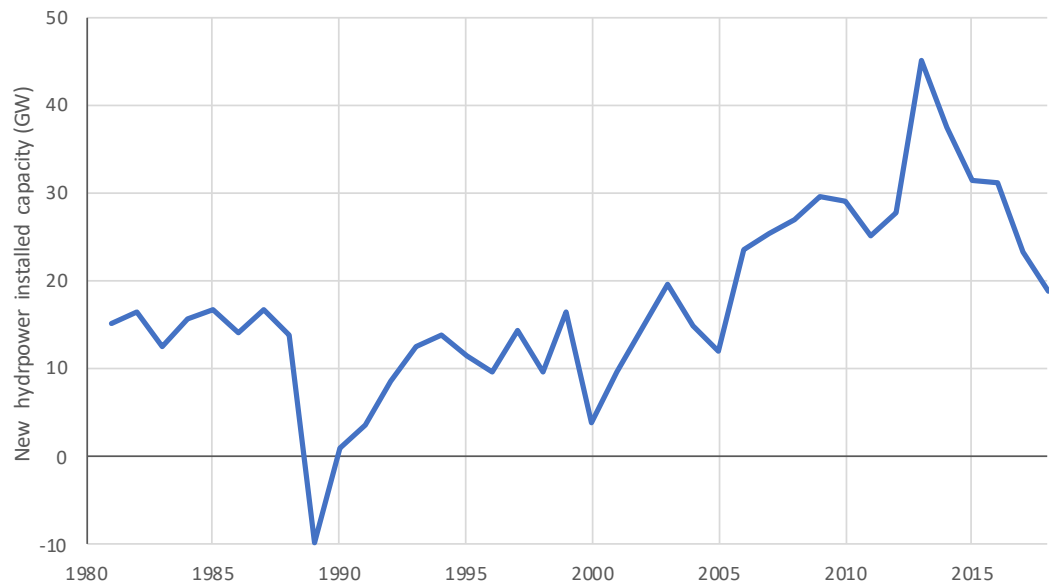
services pertinent to hydropower designing, engineering, construction and management, and hydropower finance started to grow abroad, especially in the low- and middle-income countries. This growth is a byproduct of a new round of global hydropower buildout boom, the growing attraction of low- and middle-income countries as destinations for hydropower trade and finance, and the MDBs' pivot away from hydropower.

First, three emerging dynamics have facilitated hydropower's comeback worldwide, especially in the global South. To begin, multilateral agreements and development goals have increasingly recognized and endorsed the role of hydropower in sustainable development in the era of growing concerns about climate change. As of 2015, a total of 2717 HPPs, accounting for over 20 percent of all Clean Development Mechanism projects in the pipeline database were expected to receive certified emission reductions (CERs) under the Kyoto Protocol [60]. Meanwhile, the Nationally Determined Contributions (NDCs) under the Paris Climate Agreement include a cumulative target of adding 110 GW hydropower worldwide from 2015 to 2030 [61]. To achieve the Sustainable Development Goals (SDGs) pertinent to energy, including the Paris Climate commitment, the IEA recommends an average annual growth rate of global hydropower consumption at 3 percent through 2030 [62]. Assuming an average capacity factor of 38 percent for hydropower across the world, which is the embedded assumption behind the IEA hydropower generation dataset, the author estimates that the world needs to add about 418 GW of hydropower between 2020-2030. Next, leading MDBs, such as the World Bank and ADB, have recommitted to hydropower since the early 2000s. While its development finance for hydropower declined by 90 percent in 1992-2002 [63], the World Bank resumed financial support for hydropower in 2003 and has gradually stepped up its support over the past decade. Indeed, according to the IRENA data on renewable energy finance, the World Bank issued a total of \$6.2 billion worth of loans for hydropower worldwide from 2000 to 2017 while ADB lent \$2.4 billion for hydropower during the same time frame [21]. Although these MDBs' lending constitutes a fraction of the total investment in hydropower, it encouraged private sector investment and engagement. Finally, the South-to-South trade and investment have seen rapid growth and replaced the MDBs and Western multinational corporations to become the main source of hydropower financing and hydropower technology transfer. For instance, South-to-South trade in hydropower products and equipment surged from less than 10 percent of total global trade to almost 50 percent in 2004-2012 [2]. While illustrating China's rise and dominance in the global hydraulic turbine exports in 1995-2019, Figure 7 also shows the rise of Brazil and India as the world's leading exporters. Meanwhile, development banks from China and Brazil have provided a total of \$40 billion and \$22.8 billion worth of development finance for Hydropower respectively in 2000-2018, far eclipsing the combined total of MDBs' hydropower lending during the same period [21].

Thanks to the convergence of the above-mentioned dynamics, the world has seen a global dam construction boom since 2001. As Figure 9 shows, after experiencing a persistent slowdown in 1980-2000, new capacity additions in hydropower worldwide have increased steadily and maintained an upward trajectory since 2001, although this growth has stalled since 2014 [3]. From 2000 to 2019, the world has added 517 GW of hydropower generating capacity, accounting for 40 percent of the aggregate installed capacity the world has since the 1900s [1]. To put this boom in a historical perspective, while the global dam-building effort measured by the cumulative volume of water impounded peaked between 1970 and 1979, the cumulative discharge of rivers being impounded by large dams has grown consistently since 2001 and is now close to the level witnessed in 1970-1979 [5].

Second, three measures in many of these low- and middle-income countries have improved their attraction as a destination for hydropower development finance and enhanced the bankability of the HPPs they seek to finance and build. To begin, many have embarked on an aggressive pursuit of hydropower. The Laos People's Democratic Republic (LPD) provides a case in point. With the third

Figure 9: Annual Global Hydropower Capacity Additions, 1980-2018



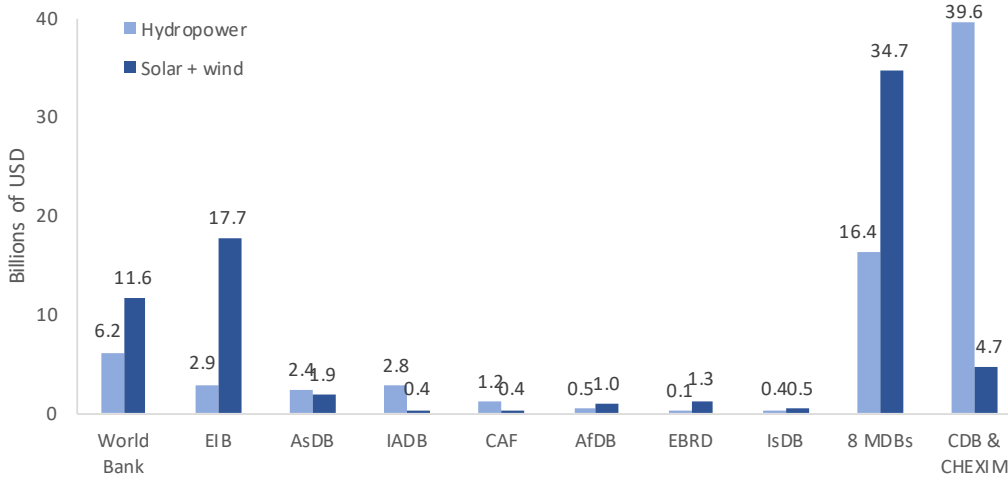
Source: [3].

smallest economy in Southeast Asia but rich in hydropower resources, LPD aimed to turn itself into the “battery of Asia” and use hydropower to improve access to electricity, assist its effort to graduate from the least developed countries (LDC) club and increase revenues through hydropower export to neighboring countries, such as Thailand and Vietnam as well as China. To accomplish these objectives the LPD has crafted aggressive hydropower development targets, instituted preferential taxes and tariffs to lure foreign participation, and encouraged foreign investment in its hydropower sector [64, 65]. Next, many of these countries have liberalized their hydropower markets by opening them up to foreign investment and removing entry barriers. Coincidentally, much of this liberalization has been mainly “initiated, directed, and partly financed by the World Bank Group and the International Financial Corporation (IFC)” through the structural adjustment policies prescribed under the so-called “Washington Consensus” [66]. Finally, to attract foreign investment for hydropower, many of these governments provide risk mitigation mechanisms through guarantees from the host governments or backing from MDBs, risk-sharing financing arrangements such as PPP, and power-purchase agreements (PPAs) that minimize offtake risks and ensure steady revenue stream for investors [67] public affair: Hydropower financing in the Mekong Basin. Together, this hydropower market liberalization and financialization of hydropower dam investment have allowed investors and financiers to offload their financial risks while receiving high returns from the erstwhile high-risk assets [68].

Finally, while MDBs, such as the World Bank [69], have stepped up support for hydropower since the early 2000s, the majority of them have allocated more of their lending to non-hydro renewable power, such as solar and wind power, than hydropower over the past decade or so. Figure 10 shows that except for ADB, IADB, and CAF, the other major MDBs, including AfDB, ISDB, EIB, EBRD, and the World Bank have all lent more to solar and wind power than hydropower. Specifically, the eight MDBs have mobilized more than twice the amount of development finance for solar and wind power than hydropower from 2001 to 2017. In contrast, during the same time frame, CDB and CHEXIM have mobilized more than twice the amount of development finance for hydropower but lent less than one-seventh of what the eight MDBs did for solar and wind power. When examining MDBs’ green power investment in 2006-2015, Steffen and Schmidt [70] also find that the world’s major MDBs have gradually reduced their finance for hydropower, especially between 2013 and 2015, and instead shifted more of their lending toward non-hydro renewable power. This shift by the MDBs



Figure 10: Development Finance for Solar and Wind Power versus Hydropower: MDBs versus CDB and CHEXIM, 2001-2017



Source:[21].

coincided with China’s launch of the BRI, which called on the Chinese hydropower SOEs to accelerate their international expansion and urged the two policy banks to step up their financial support. This gradual shift away from hydropower to solar and wind power lending by the world’s leading MDB has certainly opened up opportunities for grabs against the backdrop of a global hydropower construction boom in the global South and the resultant growing demand for hydropower development finance.

As a result, much of the new hydropower capacity growth has taken place in low- and middle-income countries. Table 1 shows that the overwhelming majority of the global hydropower capacity additions have occurred in low- and middle-income countries. Moreover, the 38 countries that have received Chinese hydropower ODF account for 19.4 percent of the world’s new capacity additions excluding China from 2001 to 2018 [3]. However, very few of these countries have amassed the financial, technological, or managerial prowess to manufacture, procure, engineer or construct large-scale HPPs. As a result, to fulfill their hydropower expansion, these countries have to rely on external financiers and contractors to plan, design, procure, build and even maintain the hydropower plants. China stands out as an attractive option to turn to because it boasts both world-class hydropower SOEs that possess core competence across the integrated value chain and policy banks that have engaged the world on all forms of energy [18, 71] whereas the MDBs have pivoted away from hydropower.

Conclusion and Implications

While bringing back the two Chinese policy banks into a systematic inquiry of Chinese overseas development finance for hydropower for the first time, we have shown that our push/pull model helps to explain why CDB and CHEXIM have emerged to become the world’s largest underwriters of HPPs. With its installed hydropower generating capacity more than quadrupled over the past two decades, China has experienced the world’s biggest hydropower expansion for the past two decades. This expansion has in turn fostered some of the world’s most competitive hydropower contractors and generated a fundamental impulse for China’s flagship hydropower SOEs to expand

overseas to exploit their comparative advantages. On the other hand, starting from 2013 the Chinese hydropower sector has increasingly bumped into four fundamental challenges—a slowdown in hydropower installation, rising hydropower development costs, increasing political complications, and a constrained growth outlook. Taken together these challenges produced a mounting pressure for the Chinese hydropower SOEs to go beyond the Chinese shores to look for solutions to their domestic problems. Eager to capitalize on their comparative advantages and offset domestic challenges, Chinese hydropower SOEs started to expand overseas in the early 2000s. To beat out the competition and win contracts, these SOEs have turned to the two policy banks for assistance in arranging development finance for the host governments in the low- and middle-income, which depend on external suppliers, contractors, and financiers for fulfilling their hydropower development targets. The two policy banks answered the request and provided Chinese ODF for these foreign HPPs out of their organizational mandate to carry out the priorities of the Chinese state, their deep historical ties with the Chinese hydropower SOEs, as well as their organizational interests. Further, this global expansion spearheaded by the Chinese flagship hydropower SOEs and underwritten by the two Chinese policy banks also coincided with the Chinese government’s two developmental strategies—the going out strategy and the BRI—and its economic diplomacy necessities. As a result, the Chinese hydropower SOEs’ global expansion has gained support from the Chinese state, which further reinforces the incentive for the two policy banks to back the global expansion of the Chinese hydropower SOEs. Ultimately the push from the Chinese hydropower sector and the push from the Chinese state converge with their symbiotic relationship with the two policy banks to foster this strategic alliance among the trio in the globalization of the Chinese hydropower sector.

While the domestic push factors started to line up in the same direction, external opportunities also came into place. Specifically, these opportunities emerged from this new wave of hydropower construction boom around the world since the turn of the century, especially in low- and middle-income countries. Further, they were also the byproduct of three mutually reinforcing developments—electricity market liberalization, the increasing financialization of hydropower investment, and the readiness of the host governments and MDBs to offer risk mitigation guarantees. Taken together, these three developments have not only improved the attraction of these low- and middle countries as a destination for hydropower trade and development finance but also enhanced the bankability of their hydropower dams. However, many of these countries lack the necessary capital, technological know-how, and managerial know-what to carry out their hydropower expansion at home. Thus, they frequently import all of the three elements from abroad. Against this backdrop, the MDBs’ gradual shift away from hydropower has further tilted these countries toward China, which not only boasts some of the world’s most competitive hydropower contractors and suppliers but also has the world’s largest providers of ODF.

As a result, the combination of these push and pull factors have created a performance storm for the Chinese policy banks, which are uniquely positioned to promote the interests of the Chinese hydropower sector and fulfill the will of the Chinese state while pursuing their organizational interests simultaneously. As this strategic alliance among the Chinese hydropower sector, the Chinese state, and the two policy banks takes hold, there is still plenty of room for the push and pull factors driving the globalization of the Chinese hydropower ODF to run their course. Domestically, the push from the Chinese hydropower sector, the Chinese state, as well as the two policy banks suggest that the pressure, impetus, and incentive for CDB and CHEXIM to underwrite foreign HPPs remains strong. Externally, low- and middle-income countries with rich hydropower resources are continuing their active pursuit of hydropower expansion in the name of energy security, economic growth, regional trade integration, water management, and climate change. Further, this pursuit is framed as part of their NDCs under the Paris Climate Agreement and their quest for SDGs. What this means is that the external pull factors will also linger. Hence, the globalization of the Chinese hydropower sector is likely to continue while the Chinese policy banks will remain the handmaid to its expansion.

Finally, different from the hydropower construction boom in the 20th century that were primarily financed by international financial institutions and built by Western private firms, this new wave since the turn of the century features the rise of China, together with other emerging powers from the global South, such as Brazil and India in the global export of hydropower parts and equipment, the financing and the building of dams around the world. This rise of these new players, mostly state-owned, raises two important questions for future research: how do their interactions with host governments and local stakeholders in financing and building dams around the world differ from their peers' in the previous round of the global hydropower construction boom concerning hydropower politics and ESG impacts at the local level? What does this tell us about their role in shaping global hydropower governance? Answers to the questions are of great importance as they will determine whether the pursuit of hydropower in the name of sustainable development will realize its promise and reveal whether China's pledge to build a global "community of common destiny for mankind" can live up to its reputation.

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