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Dinosaur Dams

THE HISTORICAL ORIGINS OF CHINESE HYDROELECTRIC PROJECTS AND THEIR ENVIRONMENTAL IMPLICATIONS

BY JULIE RADOMSKI[1]

ABSTRACT

Hydroelectric megaprojects represent an important target for Chinese development finance in the 21st century and will likely remain so given their categorization as renewable energy contributing to a green energy transition. Yet, Chinese-financed hydroelectric dams overseas have faced numerous social, environmental and political challenges. This paper investigates this pattern through a systematic examination of the historical origins of Chinese-financed hydroelectric dams worldwide, revealing that many of these projects are based on studies developed in the mid-20th century by multilateral development banks (MDBs). How widespread is the phenomenon of Chinese development finance being used to revive older MDB project designs? What are the implications of this pattern for project outcomes? A medium-N analysis of the 43 hydroelectric megaprojects financed by the China Development Bank (CDB) and the Export-Import Bank of China (CHEXIM) establishes that half of these projects are verifiably based on MDB studies. Further, a substantial number of the remaining projects are based on other historic plans. To analyze the implications of this phenomenon, an exploratory case study of Ecuador's Coca Codo Sinclair project (1,500 MW) demonstrates a causal link between the revival of

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historic studies and the challenges that these hydroelectric projects face today in terms of environmental risk. Additional cases of Souapiti in Guinea and Jatigede in Indonesia provide support for this link despite significant regional variation in the histories of hydropower development. The results highlight the need for Chinese development finance institutions (DFIs) to establish a pipeline of novel renewable energy projects that contribute more effectively to the sustainable development goals of the Green Belt and Road Initiative (BRI).

Keywords: hydropower, Chinese development finance, multilateral development banks, environmental governance, environmental and social risk, sustainable development, renewable energy

INTRODUCTION

Hydroelectric megaprojects represent an important target for Chinese development finance in the 21st century, with Chinese banks becoming the most significant source of financing for large dam projects worldwide. Moreover, this pattern is likely to continue—and even intensify—given that hydropower projects are categorized as sources of renewable energy that contribute to the green energy transition (IEA 2024; NDRC 2022).[2] However, Chinese-financed megadams[3] around the world have faced numerous social, environmental and political challenges, often leading to significant delays or reducing their actual energy production. As a result, these challenges not only inhibit the opportunity for the projects in question to contribute to their host country's sustainable development and green transition goals, but they have also, in some cases, led to reputational harm for Chinese entities operating abroad.

This paper investigates this phenomenon through a systematic examination of the historical origins of Chinese-financed hydroelectric power plants, revealing that many of these projects are based on studies developed in the mid-20th century by multilateral development banks (MDBs). While academic "common knowledge" exists that Chinese projects in the Global South are often based on older studies, the breadth and implications of this phenomenon have not previously been systematized. How widespread is the phenomenon of reviving older MDB hydropower project studies? What are the consequences of this pattern in terms of project outcomes? Moreover, what can be learned from existing projects for future Chinese financing in support of renewable energy generation? This analysis aims to determine the extent to which Chinese-financed hydroelectric megaprojects rely on anachronistic development plans that were previously discarded or may not align with contemporary environmental and social best practices. While the practice of reviving fossilized "dinosaur dams" may facilitate project design and speed up projects in the short term, this paper argues that it can contribute to negative environmental and social impacts during the construction or operational phases of the dams.

A thorough exploration of the histories of each of the 43 hydroelectric megaprojects (>100 MW) financed by the China Development Bank (CDB) and the Export-Import Bank of China (CHEXIM) between 2000-2023 establishes the generalizability of the dinosaur dam pattern. The historical backgrounds of these projects were researched using publicly available information drawn from

[2] This is a standard categorization on the part of Chinese DFIs as well as the International Energy Association (IEA), though hydropower is also categorized separately from other sources of renewable energy by some analysts due to its environmental impacts. China's 14th Five-Year Plan on Renewable Energy Development considers hydropower as a component of the country's domestic renewable energy transition, and the recent Energy Law of the People's Republic of China also defines hydropower as renewable (NDRC 2022; People's Republic of China 2024).

[3] Although hydropower size classifications vary, this paper considers hydropower megaprojects as having a generation capacity of 100 MW or above (Zarfl et al. 2015).

project webpages, news coverage and MDB archival documents, producing a novel medium-N dataset. The results show that over three-quarters of the hydroelectric megaprojects financed by Chinese development banks originate from historical project designs, nearly half of which (20) had been financed by MDBs, including the World Bank, African Development Bank (AfDB) and Inter-American Development Bank (IDB). This trend is particularly pronounced in Latin America and Africa, where Chinese entities have historically had less involvement in the energy sector as compared to Asia and the Mekong Basin.

To explore the implications of reviving old project studies for these dams in the present day, a case study on Ecuador's Coca Codo Sinclair (CCS) hydroelectric project (1,500 MW) demonstrates a causal link between relying on outdated studies and the project's ongoing challenges. CCS was financed by CHEXIM and built by Sinohydro beginning in 2010, yet the project design is based on IDB studies conducted during the 1970s and 80s. Moreover, the project's environmental studies relied on environmental data collected from this time period, and the IDB itself declined to finance the project without additional socioenvironmental studies. Currently, the project is facing severe environmental risk, namely regressive erosion on the Coca River that threatens its continued operations. In addition, the cases of the Jatigede Dam in Indonesia and the Souapiti Dam in Guinea demonstrate the worldwide extent of this pattern while also highlighting regional variations. The Souapiti Dam has its roots in the French colonial period yet was never prioritized for development financing, being passed over by the AfDB and the World Bank on multiple occasions. The Jatigede Dam was in the World Bank project pipeline in the 1980s but was canceled due to the degree of displacement that would have been caused by its reservoir. In their modern iterations, Souapiti and Jatigede have both proven politically contentious, and each caused the displacement of over 10,000 rural subsistence farmers. Taken together, these cases illustrate that reusing historical studies as the basis for hydroelectric megaprojects—especially those that have been previously rejected by MDBs—can introduce severe risks to their long-term development outcomes.

This research provides an empirical contribution to the study of Chinese development finance, as the pattern of resuscitating shelved projects has been anecdotally observed by scholars of Global China (including but not limited to this study's focus on hydropower projects) but has not been systematically evidenced (see Han and Webber 2020; Hensengerth 2013; Wilmsen et al. 2025). Additionally, the findings confirm this trend and serve as a basis for policy recommendations regarding the future development of renewable energy projects. Hydropower is likely to continue to represent an important component of Chinese overseas development financing in order to meet the renewable energy goals of the Green Belt and Road Initiative (BRI) (BRIGC 2022). Indeed, although recent trends indicate that these projects are no longer being financed at a large scale by China's development finance institutions (DFIs), Chinese firms continue to invest in hydropower through foreign direct investment (FDI) and public-private partnerships (PPP) (BU GDP Center 2025). This more recent phase of the BRI could draw on lessons from past policy bank-supported projects, as the implications for environmental and social risk remain highly relevant.

Going forward, the track record strongly demonstrates that hydroelectric projects should not be assumed to support sustainable development prima facie. Low- and middle-income countries may have the incentive to solicit hydropower project financing for existing (older) project designs, given urgent pressures for inexpensive non-fossil fuel electricity on a short time scale. However, these incentives are not necessarily aligned with long-term sustainable development or the reputational outcomes for Chinese development financiers. It would better serve the interests of Chinese companies, financial institutions and indeed diplomacy to question and rigorously evaluate the "green" designation of large hydropower projects. Furthermore, this paper also argues for the need for Chinese DFIs to establish a pipeline of new renewable energy projects developed based on contemporary environmental legal standards, at the domestic level, and best practices, at the international level. Such a pipeline would provide alternative projects to meet the green energy demands of host countries while contributing more effectively to the sustainable development goals of the Green BRI.

HYDROPOWER AND ENVIRONMENTAL AND SOCIAL STANDARDS OVER TIME

Throughout history, dams have often been portrayed as emblematic of modernity and national progress, symbolizing the state's capacity to control nature and deliver development (Kaika 2006; Mitchell 2002). Though this association dates back centuries, the history and politics of dam development have reflected shifting geopolitical currents of the day. During colonial administrations across Asia and Africa, control of water was central, while Cold War rivalries once drove US- and Soviet-backed infrastructure megaprojects across the Global South in a bid for influence (Ekbladh 2002; Sneddon 2015). However, hand in hand with their potent symbolism of domination over nature, dams' environmental impacts have also been increasingly recognized in recent decades (Scudder 2012; Tilt et al. 2009). Critics, gaining resonance through transnational civil society advocacy networks beginning in the 1980s, have identified severe impacts of development finance-supported dams, including ecosystem disruption, biodiversity loss and the displacement of local communities, often with inadequate compensation or participation for those most directly impacted (Khagram 2004; McCully 2001; Rich 1994).

In response to the widespread recognition of the elevated environmental and social impacts associated with dams, international initiatives, including the landmark World Commission on Dams (WCD) 2000 report, sought to establish standards for more sustainable hydropower development (WCD 2000). The WCD emphasized principles of participatory decision-making, benefit-sharing and recognition of rights for affected communities. These guidelines influenced safeguards and best practices adopted by institutions like the World Bank and the International Hydropower Association (IHA) while also informing national-level environmental and social risk management policies (Sneddon and Fox 2008). The IHA and relevant stakeholders have since developed tools such as the GHG Reservoir Tool (G-Res) and the Hydropower Sustainability Assessment Protocol to measure and guide decision-making on environmental impacts (IHA 2020).

Beyond hydro-specific frameworks, more general sets of standards have also shaped the development of hydroelectric facilities in the 21st century. Commercial financial institutions adopted standards through the Equator Principles that respond to the social and environmental impacts of project financing, including for infrastructure like hydropower projects, signaling sensitivity to socioenvironmental risk (Scholtens and Dam 2007). Notably, CHEXIM signed on to the Equator Principles in 2022, and several other Chinese banks are also signatories. Perhaps most prominently in terms of social impact, the principle of Free, Prior, and Informed Consent (FPIC) instituted in the International Labour Organization (ILO) Convention 169 in 1989 requires the consultation and consent of Indigenous peoples before undertaking projects that affect their land and resources. FPIC is thus mandatory for governments that have ratified ILO Convention 169, though implementation in practice has been uneven (Cariño and Colchester 2010). Nevertheless, FPIC stands as an important principle that in years since has been advocated for in application to all project-affected people. In relation to hydropower projects, conducting meaningful consultation and obtaining consent from those who would be displaced by reservoirs has clear implications for the feasibility of dam projects for which rising to this standard would be unviable.

In spite of the proliferation of international standards applying to environmentally and socially sensitive projects, the push for a renewable energy transition has led to a renewed drive for hydroelectric dams in the 21st century (Zarfl et al. 2015). As countries seek to reduce carbon emissions and meet climate goals, hydropower is seen as a reliable, non-fossil fuel energy source capable of supporting the intermittency of solar and wind energy (IEA n.d.). Recently, the World Bank announced an "all of the above" strategy for supporting energy projects in developing countries, including natural gas, nuclear and hydropower projects (Shalal 2025). Indeed, in December 2024 the World Bank approved financing for the Rogun Hydropower Plant (3,780 MW) in Tajikistan, indicating a new reopening to megadam support (World Bank 2024). Simultaneously, there has been pushback from environmental and other advocacy groups that question whether hydropower projects, particularly large dams, truly constitute environmentally friendly contributions to a "green" energy transition (Bratman 2014; Gutierrez et al. 2019). This is especially the case given that the flooding of large swaths of land can contribute to carbon emissions as a result of deforestation, in addition to biodiversity loss (Deemer et al. 2016; Lees et al. 2016). Further, hydropower generation is itself increasingly vulnerable to climate change due to altered precipitation patterns and extreme weather events, in some cases leading to energy shortfalls in hydro-dependent countries (Wasti et al. 2022; Guy et al. 2023).

From the perspective of low- and middle-income country governments, however, there remain powerful incentives to build power plants that can replace fossil fuel generation at relatively low cost, especially in countries that face chronic energy shortages. Governments also frequently face political incentives to fast-track such projects to demonstrate their efficacy through visible infrastructure achievements (Mani and Mukand 2007; Wang 2024). As Chinese DFIs became prominent supporters of infrastructure overseas during the 2010s, they represented a new and different option for governments seeking project financing (Chin and Gallagher 2019). Kong and Gallagher (2021) find that countries tend to approach Chinese banks for hydropower projects while turning to non-Chinese sources for solar and wind. These demand-side "pull" factors coming from borrower countries coincide with the "push" of Chinese state-owned enterprises in the hydropower sector mandated to "go out" with the support of the CDB and CHEXIM (Kong 2021). Together, these factors have led to high levels of Chinese DFI support for hydropower projects in Africa, Latin America and Asia over the past two decades.

Based on the literature evidencing that first, large hydropower projects are highly environmentally and socially sensitive, and second, MDBs have until recently moved away from financing large hydropower projects for this reason, there are two related but distinct mechanisms that could theoretically mean that Chinese financing for old hydropower project designs can lead to environmental and social risk. Below is a brief description of the logic behind each, which will be examined in three qualitative case studies. Rather than test and select one explanation over the other, this paper proposes that the two mechanisms together reinforce the likelihood that reviving old projects contributes to the likelihood of negative environmental and social outcomes.

The "of a Different Era" Explanation

Whether the historical designs on which Chinese projects are based were originally financed by MDBs or other entities, they were carried out in a different era of development. More concretely, this means they were envisioned in the context of outdated land tenure regimes, technologies for environmental monitoring and risk assessment, and understandings of environmental and social best practice. For projects designed by MDBs, a key turning point would be the early 1990s, when banks instituted environmental and social safeguard policies,[4] partly as a response to resistance against

[4] A key turning point was the passage of the 1989 Pelosi Amendment by the US Congress, mandating that US executive directors at MDBs abstain or vote against any project with significant environmental impacts if a sufficient environmental assessment has not been conducted and made public at least 120 days before a board vote. As the US is a major shareholder at the MDBs, the amendment led to the formalization of environmental standards for MDB projects.

large and controversial dam projects (Khagram 2004). They would also have been conceived prior to the aforementioned WCD report that set the gold standard for a vision of sustainable hydropower development. Further, land tenure regimes in borrowing countries are likely to have evolved significantly over time, especially in countries under colonial administrations when the project was conceived. Land governance is particularly central to planning for large hydropower projects that involve significant displacement of communities flooded by reservoirs.

Given that historical projects originate from distinct policy contexts, this explanation posits that projects "of a different era" are more likely to involve high levels of environmental and social risk that were not accounted for at that time. They were conceived when such risk was either not fully understood or acknowledged as problematic and thus carry these blind spots with them.

The "Cast-Offs" Explanation

A second complementary explanation posits that projects that were "cast off" by MDBs or other development financiers are ipso facto riskier due to a negative selection effect. If the projects were not ultimately built when they were originally designed, it is possible there were sound reasons for their abandonment that would continue to be relevant if they were to be revived in the present day. As will be identified in the project case studies below, there are ample examples of hydropower projects that were actively rejected by MDBs before they were passed on to Chinese financiers. Even in cases where MDBs did not reject projects outright, at any rate they were evidently not prioritized by nature of having not been built. Put differently, the "best" projects with the least environmental and social risk are more likely to have already been financed.

As a result of this cast-off effect, the projects revived by Chinese development banks are more likely to be problematic. This is even more likely given that countries often prefer to borrow from MDBs when they can, given their "softer" lending terms (see Hwang 2021 for an important example of this occurrence in the case of Liberia's Mount Coffee hydropower project). Borrowing countries may even actively choose to bring projects to Chinese banks that had been, or that they anticipate would be, rejected by MDBs (Humphrey and Michaelowa 2019). In this sense, the incentives of borrowers to obtain financing for preexisting hydropower plans do not necessarily align with those of Chinese financiers seeking green, secure investments. Instead, this paper suggests that Chinese investors could meet borrower demand for renewable energy generation by bringing new project designs to the table.

To sum up the principal claims, this paper explores whether the fact that many of the 21st-century Chinese-financed hydropower projects resurrect "fossilized" project designs may contribute to adverse outcomes. Two mechanisms are theorized, likely working in tandem and in interaction with each other. First, the projects were designed before robust environmental and social safeguards were instituted by financiers and companies, and in many cases under different host country legal frameworks. Second, the fact that these projects did not receive funding when they were originally planned may imply that they are more prone to environmental and social risk (if they were rejected or at least deprioritized at that time). However, before exploring the causal link between dams' origins and their outcomes, this paper first turns to verifying the prevalence of this phenomenon and its heterogeneity across different country contexts.

METHODOLOGY

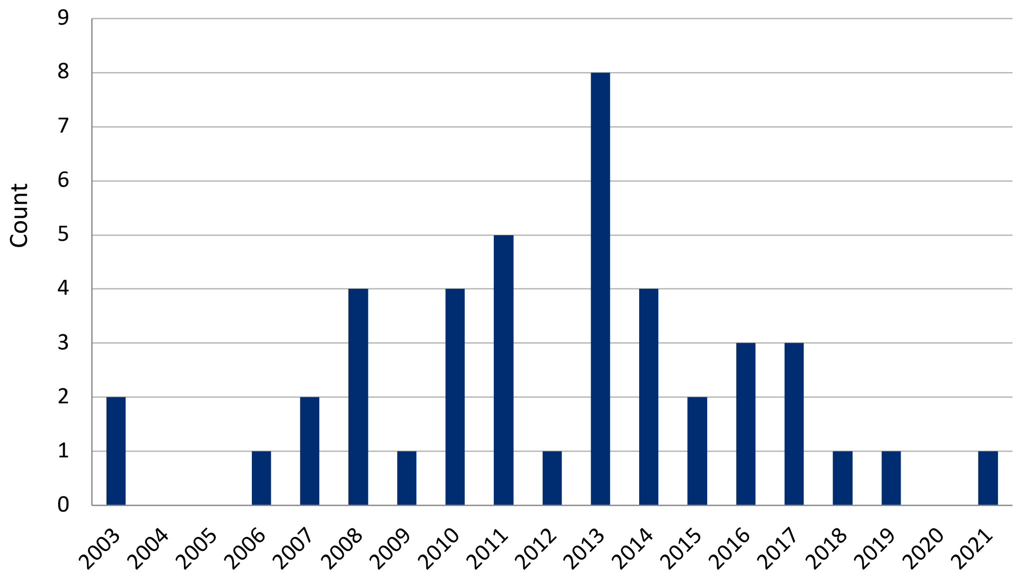
To establish the generalizability of the pattern of historic projects being revived with Chinese finance, this paper is based on a medium-N analysis of the 43 megadams (>100 MW) financed by the CDB and CHEXIM. The list of projects is compiled from the China's Global Energy Finance (CGEF) Database managed by the Boston University Global Development Policy Center (BU GDP Center 2024). The database includes energy projects financed by China's two DFIs—CDB and CHEXIM—and encompasses 2000-2023. Projects labeled as "hydropower" were included, excluding those that were solely for energy transmission and distribution, to focus only on generation. Multiple loans for the same project were consolidated, and single loans for multiple projects were expanded, yielding a list of 73 unique hydroelectric projects.

Large hydropower projects differ qualitatively from small hydro not merely in scale but also in the nature of their planning process and their environmental and social management (Moran et al. 2018; Scudder 2012). Unlike small dams, large dams involve significant river fragmentation and disruption of sediment and nutrient flows, which can permanently alter aquatic ecosystems and downstream livelihoods. If they involve the creation of reservoirs,[5] large-scale displacement of communities and complex resettlement processes can also raise issues of human rights and livelihood restoration. Smaller hydropower projects also have important environmental implications, but those considerations are both distinct and less well studied (Kelly-Richards et al. 2017). Moreover, information on the project cycle and performance of small projects is significantly less readily available without place-based fieldwork. As a result, this study focuses on large hydropower projects defined as having an installed capacity of 100 MW or greater. This eliminated 30 CDB- and CHEXIM-financed projects (which ranged from 7 to 97 MW), resulting in the final dataset of 43 hydropower generation projects (Appendix A).

Among these projects, the majority are financed by CHEXIM (36) rather than the CDB, and all are located in BRI countries. Their generation capacities range from the lower cut-off of 100 MW (Nam Lik 1-2 in Laos) to 2,170 MW (Caculo Cabaça in Angola). Their average capacity is 414.4 MW, with a median of 254 MW. In terms of chronology, the earliest projects are from 2003 (Yeywa 790 MW in Myanmar, Merowe 1,250 MW in Sudan), with the most recent loan in 2021 (Dabar 159 MW in Bosnia and Herzegovina). Figure 1 presents loan distribution by year, with a peak of financing in 2013 followed by a slowdown in subsequent years.

[5] Run-of-river dams, though they may produce large amounts of electricity, do not involve the creation of large reservoirs.

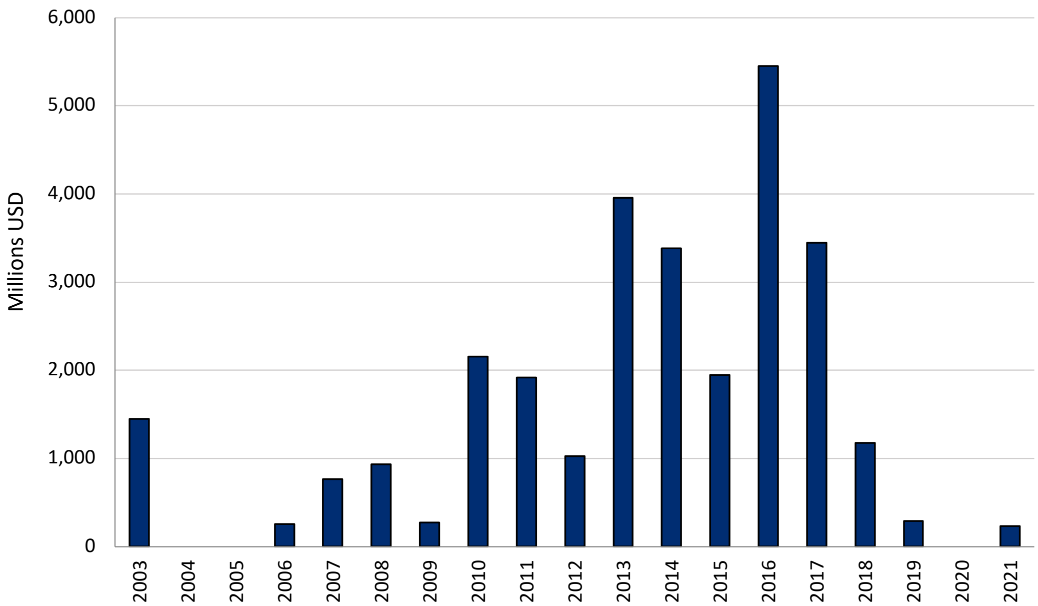
Figure 1: Count of CDB and CHEXIM Loans for Megadams, 2000–2023



Source: China's Global Energy Finance Database, Boston University Global Development Policy Center, 2024.

When accounting for the size of loan amounts, rather than the count, the temporal distribution is somewhat distinct (see Figure 2), with the peak of lending occurring in 2016 with an even more dramatic tapering off in subsequent years. However, this peak should be taken with the caveat that three loans are packaged with transmission line financing for the relevant projects and could not be disaggregated.[6] These loans were made in 2013, 2015 and 2016, meaning that financing for these years appears larger than it would if considering only the generation projects.

Figure 2: CDB and CHEXIM Lending Amounts for Megadams (USD, Millions), 2000–2023

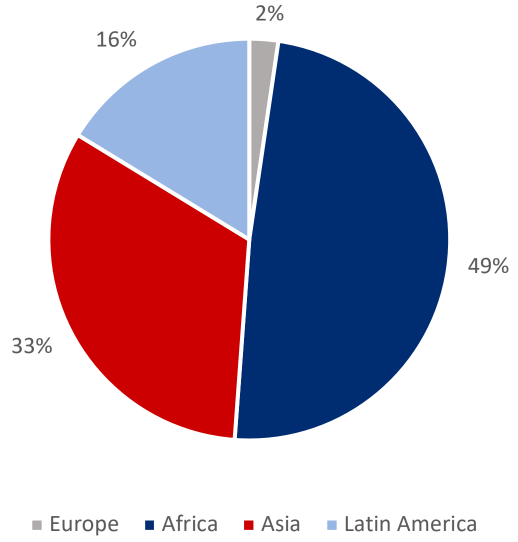


Source: China's Global Energy Finance Database, Boston University Global Development Policy Center, 2024.

[6] The three projects in question are Koukoutamba (294 MW), Caculo Cabaça (2,170 MW), and Karuma Falls (600 MW).

Figure 3 illustrates the regional distribution of megadam projects. They are primarily located in Africa (21), followed by Asia (14) and Latin America and the Caribbean (7), with a single project in Europe (Dabar 159 MW in Bosnia and Herzegovina, which, as previously mentioned, is also the most recent project).[7] Notably, Laos and Ecuador stand out as hosting a sizable concentration of Chinese-financed hydroelectric projects, having seven and four projects, respectively.[8] No other country is host to more than two projects.[9]

Figure 3: Regional Breakdown of Chinese-Financed Megadams



Source: China's Global Energy Finance Database, Boston University Global Development Policy Center, 2024.

To ascertain whether each of these 43 projects was based on historical studies, the author drew on source data from the CGEF database as well as the Global Energy Monitor (GEM) Wiki Global Hydropower Tracker and AidData's Global Chinese Development Finance Dataset (Version 2.0). This source data—including official Chinese and host country announcements, news coverage and project documents—provided information about the projects' timelines that sometimes included mention of the project's historical origins. This "origin story" was confirmed through searches of the relevant MDB websites, namely digitized project documents for all energy sector lending to the relevant host country as well as MDB annual reports. As much information as possible on non-MDB historical origins was gathered via publicly available online archives, including those of bilateral lending agencies, project consultants and river basin management organizations.

To explore the implications of reviving historical MDB studies, qualitative process tracing provides insight into the causal mechanism connecting the use of historical project designs with unfavorable project outcomes in three cases. The analysis draws on projects from Latin America, Africa and Asia to examine regional variation in development trajectories. These case studies aim to establish the plausibility of the two causal mechanisms discussed above, rather than to represent the full range of projects or to prove causality. Therefore, cases are drawn from projects for which feasibility studies were confirmed to have been undertaken with MDB support.

[7] The Latin America projects are located exclusively in South America (Ecuador, Argentina and Bolivia), with no projects in Central America or the Caribbean subregions.

[8] The concentration of projects in these two countries is even more pronounced if smaller dams are also included, with Laos home to 12 total projects and six in Ecuador.

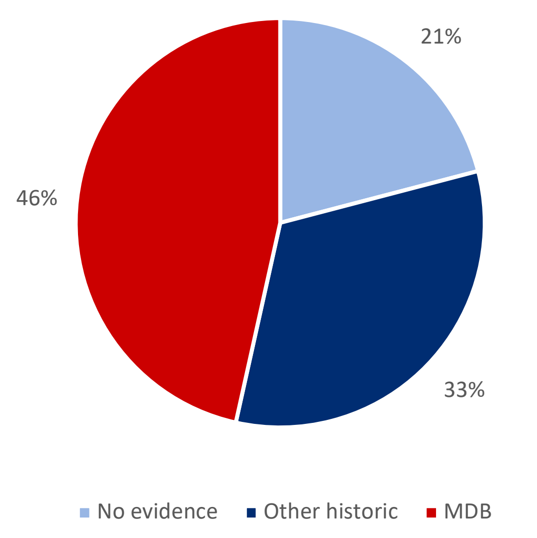
[9] The countries that are host to two projects include Argentina (though the two dams are part of the same complex), Côte D'Ivoire, the Democratic Republic of Congo, Guinea, Myanmar, Uganda and Zambia.

First, Ecuador's CCS project (1,500 MW) is frequently cited in academic and popular discourse as a key example of a Chinese megadam, for which extensive archival project documentation is available via the IDB website. Interviews with stakeholders in the Ecuadorian government, Sinohydro and the IDB supplemented the archival evidence. Second, the Jatigede Dam (110 MW) in Indonesia is the only project in Asia that was confirmed to have MDB project design origins. There is also substantial data available through academic studies on its longer-term impacts. Third, the Souapiti Dam (450 MW) in Guinea was selected as a case with solid data availability that is also illustrative of a regional pattern in Africa in which colonial-era projects were taken up by MDBs and later Chinese banks. It is also closer to the median size of a hydropower project, while the other two cases are closer to the extremes of installed capacity. These case studies support the plausibility of a causal link between the resuscitation of historical studies and the challenges these projects faced during construction and operation.

MEDIUM-N RESULTS

To reiterate, this dataset includes the full set of Chinese DFI-financed large hydropower projects in the 21st century rather than sampling a larger population. Of the 43 projects that fit this criterion, 34 are confirmed to be based on historical studies and/or designs. As shown in Figure 4, twenty of these are linked to original, primary documentation verifying that studies were previously financed by one or more MDBs. The additional 14 projects are based on historical studies either financed by a non-MDB entity or for which no documentation as to their financing could be located. Notably, among these 14 historic projects without verifiable MDB origins, several are based on studies financed by colonial administrations or bilateral loans from former colonial powers.[10] For the remaining nine projects, no evidence was identified that would indicate that they were based on historical designs.

Figure 4: Historical Origins of Chinese-Financed Megadams



Source: Author's elaboration.

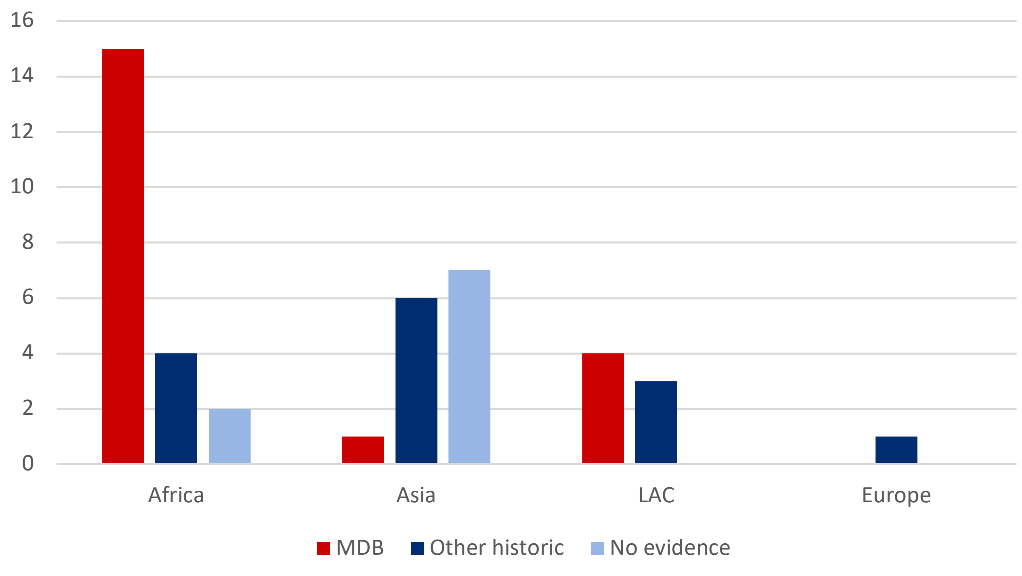
[10] Studies from Électricité de France (EDF) in particular stand out among projects located in francophone Africa.

As an important caveat, not all archival project documents are digitized and publicly available on World Bank, Asian Development Bank (ADB), IDB and AfDB websites. For this paper, only projects for which studies were confirmed to be financed by an MDB in MDB-published documentation were coded as having an MDB origin. Therefore, the findings should be taken as a conservative count with the possibility that additional projects also have MDB origins but for which conclusive evidence was not available. In particular, ADB and AfDB websites often do not include digitized versions of project documents for historical (pre-2000) projects. In some cases, project studies may have been financed by a broad energy sector loan from an MDB but are not mentioned explicitly in the loan entry's name or abstract on the relevant website.[11] As a result, studies that were financed by either the ADB or AfDB without World Bank involvement are likely to be undercounted in this analysis.

Among MDBs, the World Bank is by far the most significant financier of these studies, as might be expected based on its longer history, greater resources and global mandate. The World Bank financed 12 of the 20 projects with verified MDB origins, with the IDB financing four and the AfDB financing three of the project designs in their respective regions (Latin America and Africa). The European Investment Bank (EIB) also financed one of the projects in Africa (Grand Poubara 160 MW in Gabon).

The pattern of reliance on historical project designs also exhibits regional variation (see Figure 5). In Africa, the pattern is particularly pronounced, with approximately three-fourths (15 of 21) of hydropower projects verifiably having MDB-financed studies. In Latin America, projects are more equally distributed between MDB (four) and non-MDB (three) historic origins, though none of the seven projects are based on recent designs. This likely enabled projects to be initiated within a short time frame, given the relative lack of involvement of Chinese entities with the countries of Latin America before the 21st century. Although Chinese aid and support for infrastructure projects has a longer history in Africa (Brautigam 2009), these South-South forms of development cooperation did not extend to large hydropower until the 2000s.

Figure 5: Regional Distribution of Project Origins



Source: Author's elaboration.

[11] For example, the Neelum-Jhelum project (968 MW) in Pakistan is based on feasibility studies carried out in 1983–1987. The ADB was actively supporting the energy sector in Pakistan throughout the 1980s, including through a loan approved in 1981 entitled "Power Development & Tariff Study," among others. However, no documents attached to these projects are available in the ADB online archives, so this project was coded as "Other historic" rather than MDB.

On the other hand, the case of the Asian megadams presents a different picture, with a higher concentration of projects that have no evidence of historic designs and those that are non-MDB historic. Indeed, seven of the worldwide total of nine non-historic projects are located in Asia, and five of these are located specifically in the Mekong River Basin (see Figure 6). Evidently, the pattern of megadam development in the Mekong Basin stands out as an exception to the overall trend of Chinese financing reviving old projects. The remaining two non-historic projects located in Asia (Yeywa and Thaukyegat II in Myanmar) are proximate though not part of the Mekong.

Figure 6: Map of Non-Historic Projects in Asia

Source: Author's elaboration.

Note: Yeywa and Thaukyegat II (Myanmar), Stung Atay (Cambodia), Nam Chiane, Nam Lik 1-2, Nam Ngum 4 and Pak Lay (Laos).

While the World Bank and other international actors such as the U.S. Bureau of Reclamation were deeply involved in developing projects along the Mekong during the 1950s and 60s,[12] international involvement in developing the Mekong was largely paused until after the Cold War due to geopolitical factors relating to the aftermath of the Vietnam War and the Soviet-aligned administrations of Vietnam, Laos and Cambodia (Sneddon 2015; Souvannaseng 2022). Whereas the Soviet Union did plan and execute hydropower projects in Central Asia—including Moynak and Andijan in this dataset—this pattern did not occur in the Mekong. Indeed, between 1973 and 1991, when MDB hydropower lending was at its peak in Asia and Latin America, there were no new dams built in the Mekong Basin.

[12] The Nam Ngum cascade began to be developed during this period, with Nam Ngum 1 executed by the World Bank beginning in 1966. Nam Ngum 4 was later financed by CHEXIM in 2016.

Furthermore, given geographical proximity and the spurt of Chinese domestic dam building on the upper Mekong (Lancang River) beginning in the early 1990s (Middleton 2022), there was likely less need for Chinese entities to rely on external preexisting studies. Interestingly, all of the Laos hydropower projects in this dataset are located in northern Laos, near the border with China's Yunnan Province (see Figure 7). Long-term familiarity with the geography and environmental characteristics of the region may have contributed to Chinese banks' confidence and celerity in designing new projects.

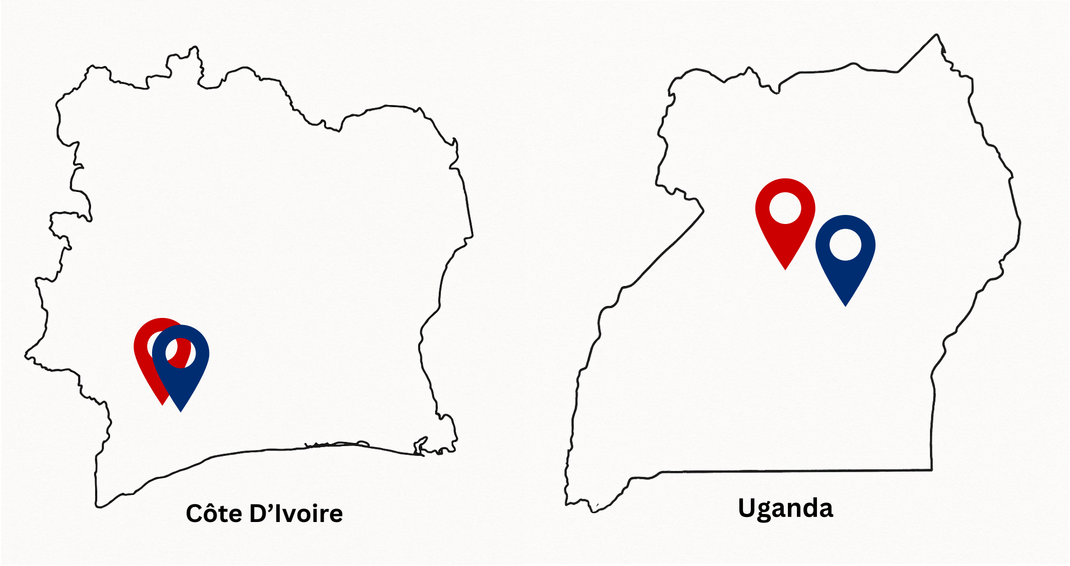
Figure 7: Projects in Laos

Source: Author's elaboration.

Note: Historic projects are shown with red markers and non-historic projects with blue. Historic projects include Nam Khan 2, Nam Ngiep 2 and Nam Tha 1, while non-historic projects include Nam Chiane, Nam Lik 1-2, Nam Ngum 4 and Pak Lay.

Excluding the five non-historic Mekong Basin projects, there are only four remaining Chinese-financed megadams worldwide for which there is no evidence of prior historical studies. These are located in Myanmar (as mentioned previously; see Figure 6), Côte D'Ivoire (Gribo Popoli 112 MW), and Uganda (Isimba Falls 183 MW). It is worth mentioning that the two non-historical projects in Africa are both located near larger Chinese DFI-financed hydroprojects that are based on historical studies: Soubré and Karuma Falls, respectively (Figure 8). They are also located on the same rivers as these larger projects (the Sassandra and the Victoria Nile). It is possible that Chinese companies proposed studies for these smaller projects after having already established a degree of familiarity with the relevant project areas, opting to capitalize on their physical presence and expertise on the ground. However, confirming this phenomenon would require interview-based research due to lack of publicly available documentation on both Gribo Popoli and Isimba Falls.

Figure 8: Projects in Côte D'Ivoire and Uganda



Source: Author's elaboration.

Note: Historic projects are shown with red markers and non-historic projects with blue. Historic projects include Soubré (Côte D'Ivoire) and Karuma Falls (Uganda), while non-historic projects include Gribo Popoli (Côte D'Ivoire) and Isimba Falls (Uganda).

Having shown that Chinese development finance is often channeled toward preexisting hydropower studies, this paper now turns to three cases of Coca Codo Sinclair, Jatigede and Souapiti. A careful tracing of each of these projects' histories demonstrates the risks of relying on discarded studies as the basis for 21st-century hydropower that is intended to fuel green, sustainable development.

ECUADOR: COCA CODO SINCLAIR (1,500 MW)

Coca Codo Sinclair (CCS) is among the most prominent Chinese-built and -financed projects in Latin America. The loan is one of the oldest and largest from the Chinese DFIs in the region and is often the go-to example cited by those that are critical of the influence of China in Latin America (see, e.g., Casey and Krauss 2018; Dubé and Steinhauser 2023; Ellis 2022). Yet the project derives its name from a North American geologist, Joseph Sinclair, who explored the Coca River basin in 1927 (Sinclair 1928, p. 293). His purpose was to "discover" the "theretofore unknown" El Reventador volcano, which today overlooks CCS's installations (New York Times 1928, p. 29; 1946, p. 32). Sinclair ultimately could not reach the volcano: by his telling, this was due to the protests of his starving and ill porters (Sinclair 1929, p. 216). However, he did map its coordinates based on a brief view of the jagged cone of the volcano observed from the farthest point up the Coca River that he could reach. From this vantage, he noted what he surmised to be a bend in the Coca, shaped like an elbow (*codo*, in Spanish) in the river (Sinclair 1929). Hence, the geographical feature came to be known as the "Codo Sinclair."

In 1970 the National Electrification Fund was created to finance the government agency Ecuadorian Institute for Electrification (Instituto Ecuatoriano de Electrificación, or INECEL) projects, funded by a hefty 47 percent of Ecuador's total oil royalties (Acosta 1992, p. 85). Following the export of Ecuador's first barrel of oil in 1972, the Northern Amazon's first major road (the E-45) was built to facilitate the construction of the SOTE (Sistema de Oleoducto Transecuatoriano) pipeline by Texaco. Flush with funds from the Texaco royalties, in 1973 INECEL began to plan studies for a Coca River dam and proposed a loan for feasibility studies to the IDB.

These prefeasibility studies were completed by the Brazilian consultancy Hidroservice in consortium with several Ecuadorian engineering firms. They were published in 1977-1978, concluding that the project was economically and technically feasible (INECEL 1978). Although the outcomes of the Hidroservice studies were positive, the early 1980s brought an international decline in oil prices that ended Ecuador's oil boom, triggering a recession and rise in external debt (Sawyer 2004). It was not until 1986 that INECEL received additional IDB funding for the definitive feasibility studies. At this time, INECEL contracted another consortium of international and Ecuadorian firms led by Italian companies Electroconsult and Rodeo. However, only a year after the studies began, a seismic event triggered a series of avalanches along the steep slopes of the Coca River.[13] Through landslides and flooding, this disaster led to the deaths of an estimated 1,000 people, including engineers, both Italian and Ecuadorian, working on the Coca dam studies (Schuster et al. 1991). Indeed, the most heavily affected area was precisely where the INECEL research camp was located at the base of El Reventador volcano. A report from the IDB-financed INECEL team noted that the project area had been "almost completely cleared of its dense vegetation cover (with trees measuring 30-40 meters in height) and deeply eroded, revealing a completely new landscape" (INECEL 1987).

In 1992, the full feasibility study, consisting of 18 volumes of research, was completed for a two-stage project consisting of 432 MW and 427 MW, totaling 859 MW of generating capacity. The studies proposed that water be diverted via a relatively small dam at the Salado-Quijos confluence and transported through 25 km of underground tunnels to a compensating reservoir. There, it would be dropped via vertical penstocks to the turbines of a powerhouse located underground at the Codo Sinclair (INECEL 1992). It was argued that most of the project's installations (the powerhouse, diversion pipes and penstocks) being underground would protect the project from the impacts of a future eruption of El Reventador or seismic activity. However, by the early 1990s, international development politics had shifted away from supporting megadams, and INECEL's Coca River studies were archived (Entrix 2008).

When the project was reincarnated by the administration of President Rafael Correa in 2007, it would rely almost entirely on data collected during this period. CCS ultimately moved forward with the same basic facilities and in the same location identified by INECEL in 1992. The Correa administration promoted hydropower generation as an opportunity for cheap electricity generation that could both improve quality of life and enable industrial growth (SENPLADES 2009). Simultaneously, Correa looked to China to finance his administration's ambitious development and social spending plans. CCS was the largest of several hydropower projects the Correa administration was to propel forward with Chinese development bank financing.[14]

In February 2009, CHEXIM signed a memorandum of understanding with the Ecuadorian Ministry of Finance indicating their interest in financing CCS (Castro Salgado 2019; Comisión de Fiscalización 2022). Chinese state-owned enterprise Sinohydro signed the Engineering, Procurement, and Construction (EPC) contract for CCS in October 2009, though financing for the project would prove thornier. Alongside CHEXIM negotiations, the Ecuadorian government approached the IDB for partial financing for CCS. IDB leadership was interested in participating, going so far as to register

[13] Provoked by two earthquakes (Richter scale magnitudes of 6.1 and 6.9) on March 5, 1987, with epicenters approximately 25 km north of El Reventador volcano.

[14] Delsitanisagua (180 MW), Minas San Francisco (270 MW), and Paute-Sopladora (321 MW) are also among the Chinese-financed hydropower projects in Ecuador under the Correa administration that are included in this analysis (see Appendix A). Quijos (50 MW) and Mazar-Dudas (21 MW) were also financed by CDB, though they fall below the cut-off size for inclusion here.

the project and assign it a team of staff. However, according to interviews with those involved, the IDB environmental and social safeguard policies required approximately two years of environmental data collection in order to update the prior studies.[15] Although the CCS project involves only a small diversion dam that does not create a large reservoir, unlike the Souapiti and Jatigede cases discussed below, the environmental sensitivity of the project area as well as changes in best practice for environmental and social due diligence necessitated this comprehensive update. According to IDB officials, however, the Ecuadorian administration did not wish to delay this flagship project given its political urgency.

Subsequently, the Ministry of Finance and CHEXIM signed a financing agreement in June 2010, for 85 percent of the project costs. Although an updated Environmental Impact Assessment (EIA) was conducted at the time, it was prepared quickly and without significant additional data collection (Efficacitas 2009; López 2020). Construction began the month after the CHEXIM financing was finalized, and the project's official inauguration occurred in November 2016.[16] However, just over three years later, a major environmental disaster began to sound alarm bells. In February 2020, the San Rafael waterfall collapsed, sparking severe regressive erosion along the Coca River where the dam is located. Although the waterfall was located 19 km downstream from the CCS intake dam, the knickpoint of the erosion (or steep drop in the riverbed) progressed rapidly upriver over the next year and a half, ultimately traveling 11.5 km toward the dam. This created a series of landslides along the banks of the Coca River that greatly impacted surrounding communities and infrastructure, including rupturing oil pipelines and major roadways on several occasions (Radomski 2024).

From July 2021 to 2024, the erosion was stalled approximately 7.5 km away from the CCS dam, but following heavy rains in June 2024 and again in April 2025, the knickpoint or "front" of the erosion began again to gradually move upstream. As of this writing, it is located 4.7 km away from CCS (CERC 2025). A study submitted to the Corporación Eléctrica del Ecuador by the U.S. Army Corps of Engineers in February 2024 estimated that the knickpoint of the erosion was likely to reach the dam between 2026 and 2029 (Orozco 2024). Although this estimate is contested by some geologists and engineers, there is broad consensus that, in the medium to long term, when the front of the erosion ultimately reaches the dam, it will trigger its collapse (Barrera Crespo et al. 2024; Bernal 2024; Creech et al. 2021). Furthermore, the accumulation of sediment in the area of the powerhouse (also a direct result of the regressive erosion phenomenon) threatens to backflood the discharge tunnel.

Scientists studying the Coca River phenomenon are divided as to whether it was provoked by CCS, with the Ecuadorian electricity company and Sinohydro asserting the collapse of San Rafael after CCS began operations is an unfortunate coincidence. Nevertheless, there are widespread criticisms asserting that an environmental assessment that met international standards would have indicated that the dam was located in an excessively risky area. The project's updated EIA and feasibility study do not contain an analysis of impacts that changes to San Rafael could have on the project, though at that time there was evidence that the waterfall had changed shape in the years prior (Efficacitas 2009; Carrasco 2022).

This case illustrates that Chinese development finance enabled the construction of a historic project that was based on outdated data and designs. Chinese lending also enabled an environmentally risky project to go forward that was explicitly rejected by the IDB, pending additional studies. The result

[15] A main purpose of the additional environmental impact studies for this project would have been to accurately determine the environmental flow (e-flow) using contemporary scientific understandings of riverine ecology. An IDB official interviewed by the author noted that the hydrological data used in the actual EIA was 30 years old and that there were insufficient metering stations along the river. The flow rate may also have changed due to climate change and deforestation.

[16] Although the project was inaugurated during a state visit by Chinese leader Xi Jinping, together with President Correa, to date it has not yet been formally turned over to the Ecuadorian electricity company. It remains in the hands of Sinohydro due to several serious construction flaws that are now the subject of an international arbitration case.

was a problematic project that has caused significant reputational harm for Sinohydro, CHEXIM and Chinese infrastructure projects in general. Moreover, the threat to a project that currently provides approximately 25 percent of Ecuador's daily electricity consumption is a poor outcome for sustainable development as a whole.

GUINEA: SOUAPITI (450 MW)

The Souapiti hydropower project in Guinea provides a clear example of how Chinese-financed infrastructure has, in some cases, executed long-dormant project designs rooted in colonial administrations. Souapiti is located on the Konkouré River in western Guinea.[17] Originally conceived in the French colonial period, the Souapiti project was first identified in an inventory study of "French West Africa" by Électricité de France (EDF) between 1948-1958 (EDF 1949; Lasserre 1958). These early prefeasibility studies formed part of a broader plan to harness Guinea's hydropower potential to power aluminum production from locally extracted bauxite—an industrial vision consistent with the extractive logic of French colonial development. By 1958, concrete designs for the Souapiti complex had been prepared (Simon 1959; Tractebel 2018).

However, Guinea's declaration of independence in 1958 and the subsequent rupture of diplomatic relations with France in 1959 abruptly halted the project. For two decades, the designs for Souapiti remained shelved. However, interest in the site was renewed in 1979 following the reestablishment of Franco-Guinean relations in 1978. EDF conducted new feasibility studies between 1979 and 1982, which again proposed the dam as a means of supporting aluminum smelting (World Bank 1980; Dejoux et al. 1983). At that time, the World Bank reviewed the EDF studies as part of Guinea's "First Power Project," approved in 1980. The Bank noted that Souapiti was "the most attractive site identified to date" for Guinean hydropower but also concluded that the project's cost—estimated to be equivalent to the country's entire annual gross domestic product—rendered its viability questionable (World Bank 1980, p. 3). Ultimately, Souapiti was not included in this project or in subsequent power sector investments by the Bank, such as the "Second Power Project" in 1992, and does not appear in the associated performance assessment or completion reports.

EDF returned to the project once more in the late 1990s, completing a new feasibility report for both Souapiti and the neighboring Kaleta Dam in 1999 (Coyne et Bellier and EDF 1999). While it is possible that this round of studies was financed through the AfDB's "Electricity Project I" in Guinea—active during the same period—no publicly available project documentation confirms this connection (AfDB n.d.). Yet again, these updated feasibility studies failed to translate into construction, and the project was shelved once more. It was not until the mid-2010s that Souapiti advanced to implementation.

As part of the World Bank's West African Power Pool (WAPP)[18] Phase 1 project, approved in 2010, funding was allocated for detailed feasibility and technical design studies for Souapiti (World Bank 2012). A 2010 AfDB document also identifies the Souapiti project, stating that Guinea and Senegal proposed the project and that it is a "clean energy project financed by the African Development Bank" (AfDB 2010, p. 4).[19] A World Bank status report on the WAPP project in 2014 notes that "it was agreed, upon request from the Government of Guinea, to concentrate all the resources on the

[17] Although the Konkouré River is not part of the Gambia River Basin, Guinea is a member of the Organization for the Development of the Gambia River Basin (OMVG) regional organization. Souapiti and the other Konkouré River dams (including Kaleta, also financed by CHEXIM and included in this analysis) were designed to provide power to OMVG countries through a regional transmission line and are therefore considered part of the OMVG (OMVG n.d.).

[18] WAPP is an agency of the Economic Community of West African States dedicated toward creating an integrated electricity market for the West African subregion (WAPP n.d.).

[19] Although the AfDB provided a series of loans to Guinea and OMVG during this period targeting the energy sector, it is unclear based on digitally available documentation which and how these loans supported further studies for Souapiti.

preparation of the Souapiti Project in Guinea. This project is supported by the World Bank and is the most promising of the candidates listed under the Grant" (World Bank 2014, p. 2). The World Bank-financed studies were completed by Tractebel in 2015 and identified a project cost of approximately USD 1 billion, with an estimated installed capacity of 515 MW (Tractebel 2018; WAPP 2011). These studies also noted that the design would require the displacement of approximately 40,000 people (APIP Guinée 2015). In parallel, the AfDB financed the Environmental and Social Impact Assessment for the project (AfDB 2014; WAPP 2011).

There is no documentation available making clear why the project was not ultimately financed by the AfDB or the World Bank. The project is also not mentioned in subsequent project status reports by the World Bank after the completion and approval of feasibility studies in 2016. Instead, the Guinean government signed an EPC contract with China Three Gorges Corporation (CTG), acting through its subsidiary China International Water & Electric Corporation (CWE), in 2016. Indeed, a later World Bank report notes that "the review of the feasibility study (FS) for Souapiti was … used by the GoG [Government of Guinea] in negotiations with Chinese contractors, who have since commenced its construction" (World Bank 2017, p. 17). Financing was finalized in 2018, when CHEXIM agreed to provide a loan covering 85 percent of the total project cost of $1.35 billion (WAPP 2019). The project followed a public-private partnership model involving joint ownership between the government of Guinea and CTG. Construction began soon after, and ultimately the dam's reservoir began filling in 2019. Power generation proceeded in two phases: the first and second turbines came online in 2020, followed by the third and fourth in 2021 (CHEXIM 2021). Final project completion was certified and accepted in 2022 (CHEXIM 2022).

Souapiti's implementation raised substantial concerns regarding its social and environmental consequences, particularly its resettlement impacts. Although the design for the dam height was revised downward as a result of the extensive resettlement, the project still displaced an estimated 16,000 people. Most of those affected were subsistence farmers who lost access to arable land and received no livelihood support. Reports based on in-depth field research carried out by international nongovernment organizations (NGOs) described numerous problems with the resettlement process, including the lack of meaningful consultation before, during and after relocation; the legal nonrecognition of customary land tenure; and compensation packages that failed to reflect the loss of productive agricultural land (Human Rights Watch 2020; Ngende 2024). In response to these criticisms, CWE stated that resettlement was the responsibility of the Guinean government, though it acknowledged its role as a shareholder and supervisory entity.

The Souapiti case illustrates the risks embedded in reviving infrastructure designs based on technical studies and development logics inherited from the colonial and early postcolonial periods. Although the project did not originate with MDB backing, it passed through World Bank and AfDB hands on multiple occasions and was never ultimately approved. Its revival from the cutting room floor, as it were, is a hydropower project that reproduces the extractive priorities of earlier eras while imposing disproportionate costs on displaced communities. Furthermore, in drawing the attention to numerous national and international NGOs, the project resulted in reputational harm for both Chinese and Guinean actors involved.

INDONESIA: JATIGEDE (110 MW)

The Jatigede Dam, located on the Cimanuk River in West Java, represents another case in which China's infrastructure financing has enabled the revival of a troubled and controversial project. Jatigede was initially conceived during the colonial period as part of the Dutch East Indies in the early 1900s (Ministry of Public Works 2016). At the time there was a push for modernization in Indonesia (the so-called "Ethical Policy") through investment in education and infrastructure, including irrigation improvements (Ravesteijn 2002). According to secondary literature, even at that time the dam was not constructed because of its impacts on Sumedang villages and archaeological sites (Paendong 2015; Triasdian 2024).

The project was revived in 1963-1967 with an inventory and planning study of the Cimanuk basin by the French engineering company Coyne et Bellier (Ministry of Public Works 2016). It then entered the international development pipeline in the early 1970s when the World Bank financed prefeasibility studies through its Irrigation Project IV loan (approved in 1972). These studies, carried out in 1974 by Dutch and Australian contractors, indicated the project's technical viability (World Bank 1975). The World Bank noted the Government of Indonesia's intention to request Bank assistance for dam construction, conditional on the preparation of a resettlement plan for the populations to be displaced by the reservoir (World Bank 1975). Additional studies were prepared at this time with funding from the Australian government (World Bank 1982). World Bank financing subsequently followed in the early 1980s under Irrigation Project XIII, which supported updated feasibility studies and detailed designs finalized in 1986 (Ministry of Public Works 2016).

Despite these advancements in project planning, concerns about social impacts remained central. A 1986 report by the World Bank's resettlement specialist cited Jatigede as a challenging case in the pipeline, projecting that over 40,000 people would be displaced by the flooding of its reservoir (Cernea 1986, p. 8). Indeed, although the Bank approved the "Jatigede Multipurpose Dam" project in June 1987 (World Bank n.d.), it canceled the loan in 1988. Although no official documentation confirms this, secondary sources state that this was a result of continuing concerns over displacement (Indonesian Commission on Human Rights 2015; Moeliono 2011). A World Bank completion report on the financing for the former studies notes that "the resettlement study ... left several important questions unanswered," and "resettlement is an issue" (World Bank 1989, p. 7, 23). Notably, displacement as a result of large dams had already become a contentious political issue for the World Bank by the late 1980s (Rich 1994).

By this point, however, resettlement processes had already been initiated by the Indonesian government. The 1980s resettlement for Jatigede resulted in the displacement of approximately 4,000 families under questionable conditions, including reports of abuse by armed forces to coerce signatures on resettlement agreements (Jakarta Post 2007; Paendong 2015).[20] Many families returned to their lands over subsequent decades once the project did not proceed (National Commission on Human Rights 2015; Suwartapradja et al. 2019).

For nearly two decades, the Jatigede project remained in limbo—partially due to continued community resistance and partially due to the absence of a financier willing to underwrite the construction. This changed in the mid-2000s, when Sinohydro, the Chinese state-owned hydropower firm, negotiated and ultimately signed an EPC contract with the Indonesian electricity company Perusahaan Listrik Negara in 2007. CHEXIM subsequently approved a concessional loan in September of the same year. Construction began in 2008, reviving the long-dormant blueprint despite protests from Indonesian NGOs (Jakarta Post 2008; Moeliono 2011; Hermawati and Suwartapradja 2016). The flooding of the

[20] These allegations later became the subject of a class action civil lawsuit in 2006, argued by the NGO Bandung Legal Aid (LBH Bandung).

reservoir began in 2015, ultimately displacing a total of 10,924 households across 28 communities (Simangunsong and Kurnia 2018). The inundation had been delayed for a year due to resistance from affected populations, many of whom refused to accept the compensation terms (Jakarta Post 2015a; Hermawati and Suwartapradja 2016). At the time the flooding began, approximately 20 percent of impacted villagers had not received compensation, and thousands had not yet moved (Brummitt 2015; Jakarta Post 2015b).

Although Jatigede Dam's physical infrastructure was completed and the hydropower plant became operational in 2024, the outcomes have proven complex beyond the construction delays and public resistance occasioned by the reservoir (PowerChina 2024; West Java Government Portal 2025). In contrast to Souapiti, whose reservoir was filled more recently, the longer time frame since Jatigede's reservoir inundation in 2015 allows scope for empirical assessment of its long-term social and environmental effects. Survey-based studies indicate that displaced communities experienced a "drastic" decline in economic well-being due to loss of employment, reduced agricultural income and food insecurity stemming from the inability to resume subsistence farming (Andini et al. 2025; Suwartapradja et al. 2024; Suwartapradja et al. 2019). Resettlement also fractured long-standing social ties and introduced intra-community tensions. Destruction of cultural heritage, including Sumedang megaliths and other historical sites, compounded the losses (Simangunsong and Kurnia 2018; Triasdian 2024).

Environmentally, satellite analysis has documented reductions in forest cover around the reservoir that diminish carbon sequestration (Withaningsih et al. 2024). Water quality assessments furthermore show that the reservoir is not consistently potable and is sometimes unsuitable for fishing, contributing to a broader "critical" condition in the Cimanuk watershed (Fakhrudin et al. 2020; Iskandar et al. 2023). The trajectory of the Jatigede Dam thus parallels that of Souapiti: a colonial or postcolonial design originally shelved, subsequently revived decades later through Chinese finance with minimal revision to its underlying logic. In both cases, the marginalization of environmental and social safeguards that had once stalled the project reemerged largely unresolved.

CONCLUSION

Over three-fourths of hydroelectric megaprojects financed by Chinese development banks between 2000-2023 originated from historical projects, many of which were previously funded by MDBs such as the World Bank and regional development banks. Furthermore, this trend was especially pronounced in Latin America and Africa, regions where Chinese entities have historically had less involvement in the energy sector, particularly compared to Asia and the Mekong Basin. This paper maps this trend, providing evidence on the origins of each of the 43 megadams financed by Chinese DFIs. Though these projects produce energy that is not derived from fossil fuels, they are themselves "fossilized" projects from earlier eras of infrastructure development and financing.

In addition to empirically substantiating the pattern of reviving "dinosaur" dam studies, this paper argues that taking on such projects is not in the long-term interest of Chinese development banks, implementing companies or sustainable development outcomes. Low- and middle-income countries may be motivated to seek financing for preexisting hydropower designs given political pressures to fast-track affordable non-fossil fuel electricity generation. However, the short-term expediency of reviving old hydropower plans comes with consequential downsides. As is illustrated with the case of CCS in Ecuador, this practice entails the risk that the projects are not well suited to contemporary environmental best practice (the "of a different era" explanation). Furthermore, by nature of having not received funding from the MDB that financed the studies, they are likely to be riskier or otherwise less attractive investments (the "cast-offs" explanation). Jatigede and Souapiti demonstrate that selecting projects that have already been passed over by MDBs can mean that they carry significant environmental and social impacts, leading to reputational repercussions for the Chinese banks and companies involved.

To avoid taking on undue risk and improve the performance of renewable energy projects, the success of the Green BRI will depend on the development of a pipeline of projects that are designed in line with contemporary legal frameworks and environmental standards. The primary recommendation to emerge from this research is therefore to urge that the BRI supports upstream project development, such that BRI countries and Chinese financiers can carry out more effective renewable energy transitions. Such a pipeline would incorporate robust environmental and social risk management, especially including best practices for assessing the sustainability of any future hydropower projects, in line with the BRI's overall goals (BRIGC 2022). Recent calls for a BRI project development platform (Zhang and Gallagher 2023), or a prefeasibility development facility for renewable energy projects in Southern Africa (Musasike et al. 2024), align with this recommendation. Although the development of new projects from scratch will be time-consuming, this research suggests that the upfront cost will lead to better alignment between the incentives of BRI countries and those of Chinese development financiers.

This paper's findings also hold lessons for country governments that are host to BRI projects. Host country administrations have used the emergence of new development finance actors as an opportunity to propose projects that had previously been shelved. While bringing forward archived projects is understandably attractive given the urgency of existing infrastructure gaps in many BRI countries, this paper shows that the long-term costs may exceed short-term gains in terms of both sustainable development and reputational effects. Second, in practice, responsibility for managing environmental and social risk for BRI projects often falls on borrower countries. Evidence from the three case studies laid out in this paper supports the conclusion that adopting international best practices for environmental and social governance contributes to avoiding problematic long-term outcomes.

Even though Chinese DFIs are no longer lending overseas at the rate seen in the 2005-2020 period, the lessons for project planning and environmental and social risk can be carried forward for BRI projects financed through other means. This paper focuses on CDB- and CHEXIM-financed large hydropower projects, as these projects are largely already completed and allow for their implementation and impacts to be assessed over time. However, future research should explore Chinese FDI in the hydropower sector: do such projects face similar environmental and social challenges? Does the rate of Chinese FDI for hydropower fully substitute for policy bank lending? In what ways are they qualitatively different in terms of their designs, planning and risk assessments? These are empirical questions that could extend the findings of this paper to current and future chapters of the BRI.

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APPENDIX A: MEGADAM PROJECT LIST (ALPHABETICAL BY COUNTRY)

Year	Project Name	Country	Region	Lender	Historical	MDB
2013	Koukoutamba Hydroelectric Project (294 MW)	Subregional	Africa	CHEXIM	2	World Bank
2016	Caculo Cabaça Hydropower Project (2,170 MW)	Angola	Africa	CHEXIM	1	
2014	La Barrancosa Hydropower Plant (360 MW)	Argentina	LAC	CDB	1	
2014	Cóndor Cliff Hydropower Plant (950 MW)	Argentina	LAC	CDB	1	
2021	Dabar Hydropower Plant (159 MW)	Bosnia and Herzegovina	Europe	CHEXIM	1	
2016	Rositas Hydroelectric Power Plant (500 MW)	Bolivia	LAC	CHEXIM	2	IDB
2011	Memve'ele Hydropower Plant (211 MW)	Cameroon	Africa	CHEXIM	1	
2015	Busanga Hydropower Project (240 MW)	DRC	Africa	CHEXIM	2	World Bank
2011	Zongo II Hydropower Plant (150 MW)	DRC	Africa	CHEXIM	1	
2019	Gribo Popoli Hydropower Project (112 MW)	Côte D'Ivoire	Africa	CHEXIM	0	
2013	Soubré Hydropower Plant (275 MW)	Côte D'Ivoire	Africa	CHEXIM	2	World Bank
2010	Coca Codo Sinclair Hydropower Plant (1,500 MW)	Ecuador	LAC	CHEXIM	2	IDB
2011	Delsitanisagua Hydropower Plant (180 MW)	Ecuador	LAC	CDB	1	
2013	Minas San Francisco Hydropower Plant (270 MW)	Ecuador	LAC	CDB	2	IDB
2011	Paute-Sopladora Hydropower Plant (321 MW)	Ecuador	LAC	CHEXIM	2	IDB
2006	Djibloho Hydropower Plant (120 MW)	Equatorial Guinea	Africa	CHEXIM	2	AfDB
2009	Genale-Dawa III Hydropower Plant (254 MW)	Ethiopia	Africa	CHEXIM	2	AfDB

Year	Project Name	Country	Region	Lender	Historical	MDB
2008	Grand Poubara Hydropower Plant (160 MW)	Gabon	Africa	CHEXIM	2	EIB
2007, 2012	Bui Hydropower Project (400 MW)	Ghana	Africa	CHEXIM	2	World Bank
2011	Kaleta Hydropower Plant (240 MW)	Guinea	Africa	CHEXIM	2	AfDB
2018	Souapiti Hydropower Plant (450 MW)	Guinea	Africa	CHEXIM	2	World Bank
2013	Jatigede Hydropower Plant (110 MW)	Indonesia	Asia	CHEXIM	2	World Bank
2010	Stung Atay Pursat Dam (120 MW)	Cambodia	Asia	CHEXIM	0	
2008	Moynak Hydropower Plant (300 MW)	Kazakhstan	Asia	CDB	1	
2017	Nam Chiane Hydropower Plant (104 MW)	Lao PDR	Asia	CHEXIM	0	
2009	Nam Khan 2 Hydropower Plant (130 MW)	Lao PDR	Asia	CHEXIM	1	
2008	Nam Lik 1-2 Dam (100 MW)	Lao PDR	Asia	CDB	0	
2011	Nam Ngiep 2 Hydropower Plant (180 MW)	Lao PDR	Asia	CDB	1	
2016	Nam Ngum 4 Hydropower Plant (220 MW)	Lao PDR	Asia	CHEXIM	0	
2018	Nam Tha 1 Hydropower Plant (168 MW)	Lao PDR	Asia	CHEXIM	1	
2017	Pak Lay Hydropower Plant (770 MW)	Lao PDR	Asia	CHEXIM	0	
2013	Gouina Hydropower Project (140 MW)	Mali, Mauritania, Senegal	Africa	CHEXIM	2	World Bank
2003	Yeywa Hydropower Plant (790 MW)	Myanmar	Asia	CHEXIM	0	
2010	Thaukyegat II Hydropower Plant (120 MW)	Myanmar	Asia	CHEXIM	0	
2013	Zungeru Hydropower Plant (700 MW)	Nigeria	Africa	CHEXIM	2	World Bank
2015	Neelum-Jhelum Hydropower Plant (968 MW)	Pakistan	Asia	CHEXIM	1	
2003	Merowe Hydropower Plant (1,250 MW)	Sudan	Africa	CHEXIM	2	World Bank

Year	Project Name	Country	Region	Lender	Historical	MDB
2014	Isimba Falls Hydropower Plant (183 MW)	Uganda	Africa	CHEXIM	0	
2015	Karuma Falls Hydropower Plant (600 MW)	Uganda	Africa	CHEXIM	1	
2007	Andijan Hydropower Plant (140 MW)	Uzbekistan	Asia	CHEXIM	1	
2017	Kafue Gorge Lower Hydropower Plant (750 MW)	Zambia	Africa	CHEXIM	2	World Bank
2008	Kariba North Hydropower Plant (360 MW)	Zambia	Africa	CHEXIM	2	World Bank
2013	Kariba South Hydropower Plant (300 MW)	Zimbabwe	Africa	CHEXIM	2	World Bank

Source: Compiled by author based on China's Global Energy Finance Database (Boston University Global Development Policy Center, 2024), MDB project document archives, other online sources. Please contact author for specific project-level sources.

Note: Projects are coded as "2" if there is documented evidence of MDB financing for prefeasibility or feasibility studies for the project. They are coded as "1" if there is other evidence that the project is based on historical project designs, but it is not documented that MDB financing was involved. Projects are coded as "0" if no references to historical project designs were found.

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