The SAIS CHINA★AFRICA RESEARCH INITIATIVE at Johns Hopkins University

POLICY BRIEF

CHINESE-FINANCED HYDROPOWER PROJECTS IN SUB-SAHARAN AFRICA

BY DEBORAH BRAUTIGAM, JYHJONG HWANG, AND LU WANG

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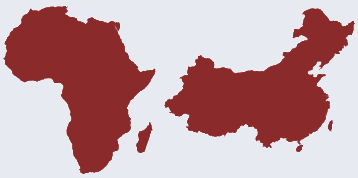

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This policy brief provides an analysis of Chinese practice in financing large—over 50 megawatt (MW)—hydropower projects in Africa between 2000 and 2013. Hydropower energy has benefits as a renewable and local source of power, but there can be significant social and environmental risks. These risks have made international banks and aid agencies reluctant to finance large hydropower projects in recent decades.

China's African hydropower engagement has a long history, with projects carried out in the 1970s and 1980s in Guinea, Congo, and Sierra Leone. This has accelerated considerably in recent years. A lack of transparency in China means that estimates of the scope of its finance vary widely. For example, a British organization writing about the revival of large dams claimed that "Chinese engineers are involved in the planning, heightening and building of more than 100 dams [costing] tens of billions of US dollars" in over twenty countries.[1] A more accurate assessment of the scope of Chinese finance is important for policy makers, whether the goal is to cooperate with Chinese funders, compete with them, or advocate for changes in their practices.

RESEARCH METHODS

Those trying to track the dimensions of Chinese engagement in African hydropower and analyze its implications have found it difficult to move beyond media reports, which can provide a misleading sense of the scale and pace of this engagement. We examined 105 cases of hydropower projects with a reported Chinese connection, gleaned from media stories and lists compiled by others. We investigated each case further using company and client websites, African and Chinese government websites, local newspapers, field visits when possible, and phone calls and contacts with principle stakeholders to ascertain the current status and the nature of Chinese involvement, if any. Given the challenges of project finance in this sector, we only include a project as "financed" by China (as of 2013) if we have firm evidence that a loan has been signed and the project has moved to the implementation stage.

Deborah Brautigam *is Professor and Director of the International Development program at the Johns Hopkins School of Advanced International Studies in Washington, DC.* ***Jyhjong Hwang*** *and* ***Lu Wang*** *are M.A. candidates in the International Development program.*

MAJOR FINDINGS

Since 2000, Chinese construction companies and banks have shown sustained interest in **53 large hydropower projects** across the continent. However, by the end of 2013, **only 17 projects** had secured Chinese finance (Table 3). When complete, these projects will add approximately 6,771 MW of power. The total cost of these projects is about $13.3 billion, of which Chinese finance is believed to contribute $6.7 billion.

Chinese companies are also building **an additional 6 large hydropower projects** financed by others. These add 962 MW of new power. A further **16 large projects remained in active discussion** as of 2013 (Table 1). Some of these may have been financed after the conclusion of our study. We consider **14 additional projects to be inactive**. Some of these have been contracted to a Chinese construction company, but there have been no reports of progress in securing financing since at least the end of 2011.

Although time-consuming, we believe that our methods enable a more accurate count of Chinese-financed projects than other efforts. Table 2 on the following page compares our findings on large hydropower with estimates made by AidData (2014), International Rivers (2013), and Lin and Wang (2013). Each includes a number of projects mentioned in media stories that we determined had not been financed by China (at least as of the end of 2013), or were not hydropower projects.[2]

MAJOR FINANCIERS AND COMMON LOAN TERMS

China's official export credit agency, China Eximbank, provided at least some finance for 15 of these projects, sometimes as sole financier, and sometimes as part of a consortium. China's largest commercial bank, Industrial and Commercial Bank of China (ICBC), provided some finance for an additional project, Gigel Gibe III in Ethiopia. China's other major policy bank, China Development Bank (CDB), has not yet financed any hydropower projects in Africa, although it has been involved in discussions, for example over a public-private partnership proposed for Zambia's Kafue Gorge Lower.

Table 1: Projects under active discussion for Chinese financing (2013)

Country	Project name	MW
Benin/Togo	Adjarala	147
DRC	Inga 3	4,800
Ethiopia	Geba	344
Kenya	High Grand Falls	N/A
Namibia	Baynes/Orokawe	600
Nigeria	Gurara	360
South Sudan	Biden	540
Sudan	Kajbar	300
Tanzania	Masigira	118
Tanzania	Rumakali	222
Tanzania	Mpanga	165
Uganda	Karuma	600
Uganda	Ayago	600
Uganda	Isimba	183
Zambia	Lusiwasi Lower	86
Zimbabwe and Zambia	Batoka Gorge	1,600

FINANCING PRACTICES

China Eximbank has five types of loan instruments: export seller's credits, export buyer's credits, preferential export buyer's credits (PEBC), concessional foreign aid loans (CL), and special state loans. Export buyer's credits are usually issued at competitive commercial interest rates that parallel the rate set for China's government bonds. China Eximbank is the only Chinese bank authorized to provide preferential or concessional loans (i.e. with interest rates subsidized by the Chinese government). Concessional foreign aid loans require a loan framework agreement signed between the two governments, while export buyer's and seller's credits can be signed directly with the agency approved to borrow.

Table 2: Comparing claims of "Chinese-Financed" hydropower projects in SSA, as of the end of 2013 (Blue indicates "Chinese-financed")

No.	Country	Name	CARI	Lin/ Wang	IRivers	AidData
1	Ghana	Bui	■	■	■	■
2	Ethiopia	Finchaa-Amerti-Neshe	■	■	■	■
3	Gabon	Grand Poubara	■	■	■	■
4	R. Congo	Imboulou	■	■	■	■
5	Zambia	Kariba North Bank Ext.	■	■	■	■
6	Cameroon	Memve'ele	■	■	■	■
7	Ivory Coast	Soubre	■	■	■	■
8	DRC	Zongo II	■	■	■	■
9	Nigeria	Zungeru	■	■	■	■
10	E. Guinea	Djiploho	■	■	■	■
11	Zimbabwe	Kariba South Bank Ext.	■	■	■	■
12	Guinea	Kaleta	■	■		■
13	Sudan	Upper Atbara	■	■		■
14	Ethiopia	Genalle-Dawa III	■	■		■
15	Mali	Gouina	■			■
16	Sudan	Merowe	■		■	■
17	Ethiopia	Gilgel Gibe III	■		■	■
18	Mauritius	Bagatelle		■	■	■
19	South Sudan	Biden		■	■	■
20	Zambia	Kafue Gorge Lower		■	■	■
21	Nigeria	Mambilla		■	■	■
22	Ethiopia	Tekeze		■	■	■
23	DRC	Busanga		■	■	■
24	Ethiopia	Chemoga Yeda		■	■	■
25	Uganda	Karuma		■	■	■
26	Uganda	Ayago		■	■	
27	Sudan	Dal-Kajbar		■	■	
28	Ethiopia	Gibe IV		■		■
29	Mozambique	Mphanda Nkuwa		■		■
30	Ethiopia	Halele Werabesa			■	■
31	Malawi	Kapichira II			■	■
32	Cameroon	Mekin			■	■
33	Gabon	Belinga			■	■
34	R. Congo	Bouenza			■	■
35	Angola	Ganjelas			■	■
36	Uganda	Isimba			■	■
37	DRC	Ivugha			■	■
38	Zambia	Musonda			■	■
39	DRC	Semuliki			■	
40	Nigeria	Zamfara			■	
41	Benin/Togo	Adjarala		■		■
42	Sudan	Roseires		■		■
43	CAR	Baoli 3				■
44	Zambia	Lunzua				■
45	Mali	Taoussa				■
46	Namibia	Baynes				■
47	Madagascar	Ambodiroka				■
Total Number of "Chinese-Financed" Projects			17	28	34	43

PREFERENTIAL EXPORT BUYER'S CREDITS AND CONCESSIONAL LOANS

The dominant loan instrument used for hydropower finance in Africa by China Eximbank appears to be the subsidized ("preferential") export buyer's credit, usually offered in foreign currency (US dollars). These loans generally carry fixed interest rates of 2 percent, plus management and commitment fees, and have 20 year terms, usually with a five year grace period.

SPECIAL STATE LOANS

The Chinese government has sometimes provided offers of large lines of credit on pre-arranged terms that can be drawn on to finance various projects. These special state loans are negotiated first between the Chinese banks and China's export insurance corporation, Sinosure. They usually require a sovereign guarantee from the host government's Ministry of Finance. Risks are also lowered with the requirement that repayment be secured via an off-take arrangement, or through exports channeled through an escrow account at the Chinese bank.

Loans issued under these lines of credit are for varying terms, include a grace period covering the construction period, and use an interest rate of LIBOR plus a margin. The advantage is that they allow a much faster approval time, usually six months, as the terms for the finance have been pre-negotiated. However, these large lines of credit are relatively rare in Africa; several projects that proposed to use this mode have been canceled, significantly delayed, or never finalized. Export commodity-secured financing has also been used for individual projects, like the arrangement for Bui Dam (see case study on following page). In 2003, financing for the Imboulou project in the Republic of Congo was apparently secured by Congolese oil exports to China.

EXPORT SELLER'S CREDITS

Chinese contractors can also finance projects through export seller's credits, although this is far less common.[3] Here, the contractor provides the funding directly; a 10 percent advance payment is required. The contractor takes out an insurance policy with Sinosure directly, and sometimes also arranges a guarantee from their parent company. China Machinery Engineering Corporation (CMEC) has used export seller's credits for projects in Sudan, Angola, and the Republic of Congo (Imboulou).

LOAN PROCESSING

Project owners generally negotiate and sign a loan agreement only after the Engineering, Procurement, and Construction (EPC) contract has been signed. Signing an EPC contract does not guarantee financing. Most Chinese financing requires the host government to supply 10 or 15 percent of the project cost up front, and sometimes construction firms begin the preliminary work while waiting for China Eximbank to appraise the project and approve a loan. High profile groundbreaking ceremonies where a cornerstone is laid are not a firm indicator that finance has been secured. Sometimes the host government cannot provide the necessary upfront finance, which can cause a project to be delayed or even cancelled. China Eximbank does not always approve a loan request. All of this can create confusion about the status of the project.

CENTRAL REVIEW AND APPROVALS

Under rules approved in 2014, large projects must be reviewed and approved once the deal reaches the "binding" offer stage. China's National Development and Reform Commission (NDRC) handles projects at $300 million and above, while China's State Council must sign off on projects valued above $1 billion. Investments or loans of any size in "sensitive industries" need to be approved by China's State Council. Cross-border water development is included in the list of sensitive industries.

CASE STUDY: GHANA'S BUI DAM

Bui Dam was financed by Ghana's government and by four Chinese loans. The first two were negotiated successively: a commercial-rate export buyer's credit of $292 million with a 17 year maturity (signed in September 2007), 5-year grace period, and a rate of CIRR plus a margin of 0.75 percent,[1] and a concessional foreign aid loan of RMB 2.1 billion ($306 million), with a 20-year maturity, 7-year grace period, and a fixed interest rate of 2 percent (signed in September 2008).[2] During the grace periods only interest and fees are paid. Two additional loans were later negotiated in 2012 to pay for cost overruns on the dam: $75.4 million at an interest rate of 2 percent for 20 years, with a five year grace period, and $76.2 million at a zero interest rate, for 14 years, with a 2 year grace period.[3]

The Chinese funding has an off-take arrangement or future flow receivables arrangement to secure the finance.[4] Repayment for the Bui Dam finance involves a cocoa sales agreement between Genertec Corporation of China and the Ghana Cocoa Board (Cocobod) for up to 40,000 Mt of cocoa beans (30,000 main crop; 10,000 light crop) annually for the first five years of the loan. The cocoa beans will be sold at the prevailing market price, and the proceeds placed in an escrow account with China Eximbank. If there was negotiation about the price at which the cocoa will be sold, this has not been made public.

China Eximbank also required Bui Hydropower to have a power purchase agreement with the Electricity Company of Ghana: 85 percent of energy sales will be deposited into an escrow account to help repay the loan. The excess funds in the account can be withdrawn by Ghana, or they can stay in the account and earn interest. The price for the future electricity was tentatively negotiated to be in a range between US$0.035 and US$0.055 cents kW/h. According to the World Bank, the average electricity tariff in Africa is much higher—at US$0.13 per kW/h.[5] Although the price appears reasonable now, the details of how the price will be changed over the course of the life of the dam are not transparent.

The project is overseen by the Bui Power Authority, established in 2007 by Ghana's parliament (Act 740). It was designed by the French engineering firm Coyne et Bellier, which also serves as the consulting engineers on the project. The Bui authorities commissioned an environmental and social impact assessment by UK-based consulting firm Environmental Resources Management in 2007, a requirement for China Eximbank financing. Built on the Black River, the dam has trans-boundary issues, with neighboring Ivory Coast exposed to dangers of flooding during heavy rains. The reservoir formed by the dam flooded about 20 percent of Bui National Park, home to the rare black hippopotamus.

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1. *Government of Ghana, Ministry of Finance and Economic Planning, "Budget 2008," Accra, 2008, http://www.mofep.gov.gh/sites/default/files/budget/2008_Budget.pdf [accessed May 25, 2014]; Oliver Hensengerth, "Chinese hydropower companies and environmental norms in countries of the global South: the involvement of Sinohydro in Ghana's Bui Dam," Environment, Development and Sustainability, 15, 2 (2013): 285-300. There is some dispute about the rate for the buyer's credit. Hensengerth puts the rate at 2 percent over CIRR for 20 years with 5 years grace (p. 37). Ghana's Ministry of Finance and Economic Planning lists the rate as CIRR X 107.5 percent (6.13), or a margin of 0.75 percent with a term of 17 years.*
2. *Government of Ghana, Ministry of Finance and Economic Planning, "Budget 2009," Accra, 2009, http://www.mofep.gov.gh/sites/default/files/budget/2009_budget.pdf [accessed May 25, 2014]. The concessional loan has usually been said to be "$270 million" but it was committed in RMB yuan. Though promised in 2007, the concessional loan did not make it into Ghana's 2008 budget. In the 2009 budget, the committed amount was 2.1 billion RMB, or US$306 million. Dividing the reported RMB and USD amounts reveals that the exchange rate used was 6.861 RMB/USD, roughly the average 2009 exchange rate.*
3. *Government of Ghana, Ministry of Finance and Economic Planning, "Budget 2013," Accra, 2013, http://www.mofep.gov.gh/sites/default/files/budget/2013_Budget_Appendix_Tables.pdf [accessed May 25, 2014].*
4. *On future flow receivables frameworks, see: Suhas Ketkar and Dilip Rathahttps, "Securitization of Future Flow Receivables: A Useful Tool for Developing Countries," Finance and Development, March 2001, v.38, n.1, http://www.imf.org/external/pubs/ft/fandd/2001/03/ketkar.htm.*
5. *"Fact Sheet: the World Bank and energy in Africa," http://go.worldbank.org/8VI6E7MRU0 [accessed May 25, 2014].*

CHINESE CONTRACTORS' ROLE IN FUNDING

Chinese companies secure projects through one of three processes: tender negotiations, tender invitations, or public bid invitations. Tender negotiations are private and non-competitive, with the terms negotiated between the two parties. Tender and public bid invitations involve predetermined terms for the contract and technical qualifications. Tender invitations involve targeted invitations to a pre-defined group of qualified engineering contractors. Public bid invitations are open to all contractors.

The public offering of Chinese company CMEC provides some insight into their global experience: 73.6 percent of CMEC's projects were obtained through tender negotiations, 16.0 percent through tender invitations, and 10.4 percent through public bids.[4] Thirty-five percent of CMEC's engineering contracting business comes from Africa. CMEC notes that one of its advantages is that it "can assist project owners in obtaining financing for projects from the PRC financial institutions...which further enhances our chances of winning project bids."[5]

COMMON MISCONCEPTIONS REGARDING CHINESE FINANCING PRACTICES

The Chinese are widely believed to be able to move swiftly to finance and carry out projects. However, our research suggests that there can be significant lags. The first Chinese feasibility study for the Imboulou project was carried out in 1982, for example, and the project was not financed until 2003.[6] Sinohydro first began discussions on the Bui Dam in 1998, but it took a decade to come to the point of construction.

It is also sometimes said that the Chinese do not require environmental or social impact studies before undertaking a project, but this is not borne out by our research, which found that studies are required. In 2007, China Eximbank published its "Guidelines for Environmental and Social Impact Assessments."[7] Influenced by China's "Green Credit" policies, the bank requires an environmental impact assessment (EIA) to be done, based on the host country's environmental policies and standards (if "complete"), China's own standards, or international practice. Contractors should "openly

CASE STUDY: ISIMBA HYDROPOWER PROJECT IN UGANDA

The Isimba Hydropower Project will be a 183 MW hydropower project located on the Ugandan section of the White Nile, 120 kilometers northeast of Kampala. On September 6, 2013, Three Gorges subsidiary China International Water & Electric Corporation (CWE) signed a $568 million EPC contract with the Ministry of Energy and Mineral Development to construct the power plant as well as the associated transmission lines. This is the first contract CWE has won in Uganda.[8]

According to a CWE report, in 2010, CWE had competed for the contract of Karuma hydropower with Sinohydro, Gezhouba, the Italian Salini, and the French Vinci Group. CWE states that they had originally won the contract, but the bidding result was overturned for undisclosed reasons. However, shortly after, the Uganda government undertook a "tender negotiation" with CWE, and the contract for Isimba consequently went to CWE.[9]

The ground breaking ceremony of the project occurred on October 5, 2013, and construction was expected to take 40 months, putting the date of completion at February 2017.[10] By the end of February 2014, site survey, evaluation, geological testing, and other basic pre-construction work had been completed. Yet the project still had not secured funding. Between May 6 and May 9, 2014, Eximbank president Li Ruogu visited Uganda. During the visit, Uganda solicited funding from Eximbank for Isimba, as well as for the 600 MW Karuma hydropower project.[11] Eventually the Eximbank extended a loan of $482.5 million, which was submitted by Uganda's cabinet for approval by Uganda's parliament. Approval occurred on March 5, 2015. CWE took a risk by starting the project before the funding had been approved. Their eagerness could be related to the fact that in 2012, CWE lost the contract for Karuma to Sinohydro amid allegations of corruption.[12]

consult" the public when projects have serious negative environmental impacts. They should handle resettlement "properly."

If necessary, independent experts will be hired by the Eximbank to review the borrower's environmental and social impact assessment report. China Eximbank will sometimes commission a study by a trusted European firm: the Finnish consulting and engineering firm Pöyry, for example. Ghana hired the UK-based consulting firm Environmental Resources Management to do an impact study of the Bui Dam project.

Another misconception is that **Chinese-financed projects use only Chinese workers and experts.** At least some of the Chinese-financed projects have European firms as consulting engineers. For example, the German firm Gauff Engineering were consultant engineers on the Grand Poubara Dam in Gabon. The French firm Coyne et Bellier are the consulting engineers for the Bui Dam in Ghana, and the Imboulou Dam used the German firm Fichtner as consulting engineers. Lahmeyer International are the consultant engineers on the Upper Atbara dam in Sudan.

Likewise, Chinese-financed hydropower projects employ **large numbers of African workers**, while also including a significant proportion of engineers and technical staff from China. The Bui Dam employed 1,676 Ghanaians (including 22 women), at least 100 Chinese, and 60 Pakistanis, while Imboulou had a workforce of 2000 Congolese and 400 Chinese, with 20 German consultant engineers.[13]

Table 3: Details of Chinese-financed projects, 2000 - 2013

#	Year of Loan Signing	Country	Project Name	Added MW	Chinese Lender	Total Cost in US$ mn	Chinese Financing (US$mn)	Contractors	Rivers	Actual Start Date
1	2012	Cameroon	Memve'ele	200	Eximbank	637	541	Sinohydro	Ntem	2012
2	2011	DRC	Zongo II	150	Eximbank	367.5	360	Sinohydro	Inkisi	2012
3	2006	E. Guinea	Djiploho	120	Eximbank	257	257	Sinohydro	Wele	2007
4	2007	Ethiopia	Finchaa-Amerti-Neshe	97	Eximbank	154.67	116	Gezhouba	Neshi	2007
5	2010	Ethiopia	Genalle-Dawa III	254	Eximbank	451	270	Gezhouba	Genalle	2008
6	?	Ethiopia	Gilgel Gibe III	1,870	ICBC	1,888.4	400	Salini Costruttori, China Dongfang	Omo	2006
7	2008	Gabon	Grand Poubara	160	Eximbank	398	300	Sinohydro	Ogooue	2008
8	2007	Ghana	Bui	400	Eximbank	809.6	749.6	Sinohydro	Black Volta	2007
9	2011	Guinea	Kaleta	240	Eximbank	446.2	335	Three Gorges/ CWE	Konkoure	2012
10	2013	Ivory Coast	Soubre	275	Eximbank	600	500	Sinohydro	Sassandra	2013
11	2013	Mali	Gouina	140	Eximbank	430	345	Sinohydro	Senegal	--
12	2013	Nigeria	Zungeru	700	Eximbank	1,300	910	CNEEC & Sinohydro	Niger	2013
13	2003	R. Congo	Imboulou	120	Eximbank	306.8	238	CMEC	Léfini	2004
14	2003	Sudan	Merowe	1,250	Eximbank	2,945	608	Alstom; CWE/ Sinohydro/ CWHEC, Harbin Electric	Nile	2003
15	2011	Sudan	Upper Atbara	135	Unclear	1,575	104	Three Gorges, CWE	Atbara, Setit	2011
16	2007	Zambia	Kariba North Ext.	360	Eximbank	420	315	Sinohydro	Zambezi	2009
17	2013	Zimbabwe	Kariba South Ext.	300	Eximbank	355	320	Sinohydro	Zambezi	2014
		Totals		6,771		13,341.2	6,668.6			

ENDNOTES

1. "Big is Beautiful: Megadams, African water security, and China's role in the new global political economy," Oxford University China Africa Network, October 2012.
2. The AidData comparison is based on data downloaded from China AidData on July 14, 2014, including all hydropower projects above 50 MW with status "Completion, Implementation, Pledge or Commitment." The International Rivers' comparison includes only projects stated to have Chinese financiers in their online "Dam Building Overseas by Chinese Companies and Financiers International Rivers" spreadsheet, last saved on December 27, 2013. We also included Justin Yifu Lin and Yan Wang's Table A2: Chinese-Funded Power Projects in Africa 2010-2013 in "Beyond the Marshall Plan: A Global Structural Transformation Fund - Background Research Paper," United Nations High level Panel on the Post-2015 Development Agenda, May 2013, p. 43.
3. CMEC notes that as of 2012, only two of 50 ongoing contracts were financed by export seller's credits. China Machinery Engineering Corporation (CMEC), "Global Offering," Hong Kong Stock Exchange, December 11, 2012, p. 151.
4. CMEC, "Global Offering," p. 144.
5. CMEC, "Global Offering," p. 144.
6. Wolfgang Bartke, The Economic Aid of the PR China to Developing and Socialist Countries, 2nd ed., Munich: K. G. Saur, 1989.
7. Issuance Notice of the "Guidelines for Environmental and Social Impact Assessments of the China Export and Import Bank's (China EXIM Bank) Loan Projects," [in Chinese], translated by International Rivers, http://www.internationalrivers.org/resources/guidelines-for-environmental-and-social-impact-assessments-of-the-china-export-and-import [accessed May 25, 2014].
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12. Agather Atuhaire and Joan Akella, "Questions over Karuma Dam," The Independent [Uganda], October 4, 2013, http://www.independent.co.ug/news/news-analysis/8296-questions-over-karuma-dam.
13. "Congo Republic hails successful dam turbine test," Reuters, January 29, 2010, http://af.reuters.com/article/investingNews/idAFJOE60S0HW20100129; Kwabena Nyarko Otoo, Nina Ulbrich, Prince Asafu-Adjaye, "Unions Can Make a Difference: Ghanaian Workers in a Chinese Construction Firm at Bui Dam Site," Ghana Trade Union Congress, Labour Research and Policy Institute, 2013, http://www.ghanatuc.org/Unions-Can-Make-a-Difference_Employment-Ghanian-Workers-in-a-Chinese-Construction-Firm-at-Bui-Dam-Site.pdf.

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