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for Foreign Coal Power Plants

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Takahiro Ueno, Miki Yanagi, and Jane Nakano¹

Abstract

A call to essentially end public financing for new foreign coal power plants, initiated by the United States and supported by several countries, is gaining momentum as some multilateral development banks (MDBs) have adopted similar policies. Moreover, a carbon emissions performance standard which would significantly limit export credits for coal power plants has been proposed to the OECD Export Credit Group. These policies seem to assume that the public financing by the developed countries and MDBs underpins the deployment of coal power plant in the developing countries and thus curtailing such financing would significantly reduce carbon emissions. This paper aims to quantify the scale of public financing by China, which as a non-member is not bound by OECD policies, through a systematic survey of announcements and media sources. Consequently, we found that China is the largest provider of public financing for foreign coal power plants: Chinese financing accounts for approximately 40 percent of the total amount of public financing provided by major countries, such as China, Japan, Germany, and the United States. This finding implies that, even if the developed countries stopped financing, continued demand for coal power generation in the developing countries would likely be met by Chinese public financing, negating the intended benefit of the proposed OECD effort and, possibly, leading to higher carbon dioxide emission levels as China generally exports low efficient, subcritical coal power plants.

1. Introduction

Over the centuries, coal power generation has played a pivotal role in enhancing public access to energy and supporting economic growth by providing a stable and low-cost supply of electricity and will continue to do so especially in developing countries. According to the International Energy Agency (IEA), non-OECD demand is forecast to

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grow by 1.2 percent per annum, from 1,298 Mtoe in 2011 to 5,170 Mtoe in 2035, driven mainly by non-OECD Asian countries.² On the other hand, there arises a concern that a wide-scale introduction of coal power plants in developing countries would lock in increased future carbon emissions.

To facilitate the reduction of carbon emissions from coal power generation, U.S. President Barak Obama announced in 2013 a policy to end “public financing for new coal power plants overseas” and called for other countries and multilateral development banks (MDBs) to follow suit (Executive Office of the President 2013).³

To date, Denmark, Finland, Iceland, the Netherlands, Norway, Sweden and the United Kingdom have followed suit, and halted public financing for new foreign coal power plants. Among MDBs, the World Bank Group, the European Investment Bank, and the European Bank for Reconstruction and Development adopted similar policies in 2013. Furthermore, the United States, the United Kingdom, and the Netherlands have proposed to the Export Credit Group of the Organization of Economic Cooperation and Development (OECD), which deals with OECD rules on export credits, a “carbon emissions performance standard that limits export credit agency support of high-carbon power plants” (Executive Office of the President 2014). Reportedly, the proposed standard is as stringent as the one proposed by the U.S. Environmental Protection Agency for new U.S. power plants that essentially necessitates carbon capture and storage (CCS) technology for new coal power plants (Volcovici 2014).

Public discussion to date seems to assume that the public financing by the developed countries and MDBs significantly underpins the deployment of coal power plant in the developing parts of the world. The studies on public financing for foreign coal projects by the Environmental Defense Fund (Rich 2009) and the Natural Resources Defense Council (Schmidt 2013) reported that much of public finance had come from the developed countries and MDBs (*see Section 2 for details*). This prevailing assumption has led many policymakers to believe that curtailing such public financing would significantly reduce capital for building coal power plants in the developing countries and lead to the deployment of alternative, non-fossil fuel based power plants. The above-mentioned proposal by the U.S., UK and Dutch governments at the OECD

² These numbers are based on the New Policies Scenario of the World Energy Outlook 2013 by IEA.

³ The U.S. policy provides exceptions for financing to coal power plants “that (a) are located in the world’s poorest countries, utilize the most efficient coal technology available and where no other economically feasible alternative exists, or (b) deploy carbon capture and sequestration (CCS).”

reflects this prevailing thinking.

In reality, however, a significant amount of public financing for coal power projects in the developing countries appears to originate in the developing world, led by China. As trade statistics show, China is the largest exporter of coal power equipment and its key ingredients such as boilers and steam turbines in the world (Figure 1), suggesting a high likelihood that China is leading the world in providing public financing to foreign coal power plants to expand export of Chinese manufactured boilers and steam turbines. If so, coal power plants in the developing countries will not lack needed capital so long as China continues the public financing for foreign coal power plants.

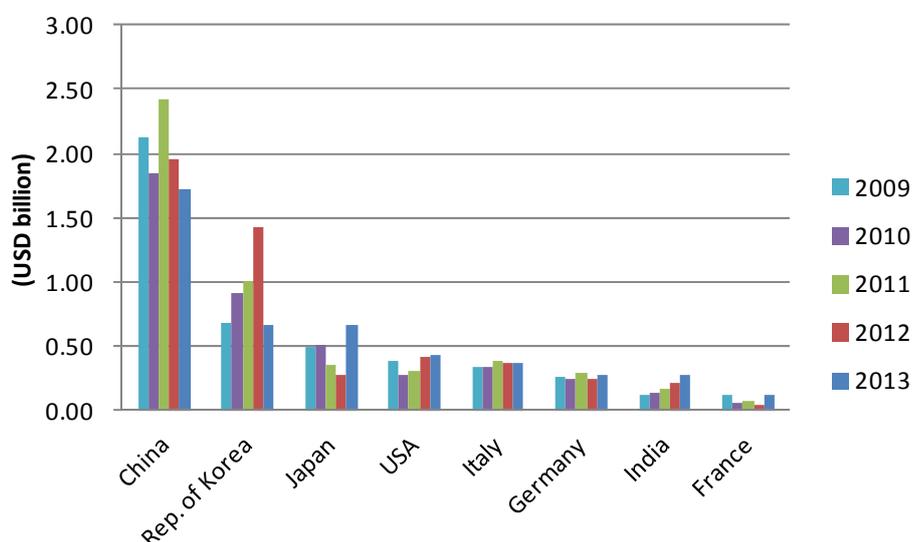


Figure 1: Export of steam or other vapor generating boilers (other than central heating hot water boilers) between 2009 and 2013⁴

Source: UN Comtrade Database⁵

As we discuss in Section 2, there has been no quantification research on the scale of Chinese public financing for new foreign coal power plants that is based on a systematic survey of government and corporate announcements and media sources. The purpose of this study is, therefore, to quantify the scale of Chinese public financing for new

⁴ We used the export data of the commodity code titles “Steam or other vapour generating boilers.” It includes not only boilers for coal power generation but boilers for other types of power generation such as oil-fired and waste-heat-recovery generation.

⁵ UN Comtrade Database is available at: <http://comtrade.un.org/> (last accessed on November 3, 2014).

foreign coal power plants and enhance the understanding on the scale and nature of such public financing. This paper consists of six parts. Section 2 presents our review of the existing literature on public financing for foreign coal projects and of the existing understanding on the scale of Chinese public financing; Section 3 outlines our data collection methodology; Section 4 presents the results of data collection and our analysis of the scale of Chinese public financing for new foreign coal power plants; Section 5 compares the findings on China with the findings on other countries, such as the United States and Japan; and Section 6 illuminates the implications of the Chinese public financing, especially what would happen if the OECD member countries ended financing foreign coal power projects while the Chinese financing stayed its course.

2. Literature Review

The scale of public financing for foreign coal projects has been examined by environmental NGOs in the United States. Among them, *Foreclosing the Future*, authored by Bruce Rich and published by the Environmental Defense Fund (hereafter “Rich (2009)”) and *Way Too Much Public Funding is Going into Coal Projects in Key Countries*, authored by Jake Schmidt and released online by the Natural Resource Defense Council (hereafter “Schmidt (2013)”) are the most comprehensive studies to date.⁶

Rich (2009) reviewed the information on public financing for over 140 coal power plants around the world, mainly in the developing countries. One of the key findings of this study was that 88 coal power plants had received public financing and the total amount was USD 37.04 billion. The data was collected on “new coal power plants and expansions and life extensions of existing plants” for which financing was approved from 1994 to January 2009. The information on power plants gathered for Rich (2009) is available online, including the name, location, annual and projected volumes of carbon dioxide (CO₂) emissions, name of public financial institutions, and amount and type of financing.⁷

Schmidt (2013) presented as preliminary data the scale of public financing for foreign coal projects approved by multilateral development banks, export credit agencies, and aid agencies of the OECD member countries. The total amount of such public financing

⁶ Another well-cited study is Yang and Cui (2012), released from the World Resources Institute; this study relied on the data provided by Rich (2009) with regard to public financing for coal power plants.

⁷ The database is available at http://www.edf.org/sites/default/files/9584_coal-plants-spreadsheet.xls (last accessed on November 3, 2014).

is estimated to be USD 51.47 billion. The scope of research included “coal power plants”, “coal mines”, as well as “others” for which finance was approved from 2007 through 2013. Since the collected data is not disclosed, how the study arrived at the estimate is unknown. For example, it is unclear whether the investments in “coal power plants” concern only new plants or include life extensions or other types of work for existing plants.

Table 1 compares the results of the two studies by listing their estimates of public financing from respective institutions. Among MDBs, both Rich (2009) and Schmidt (2013) estimated that the World Bank Group is the largest provider. With regard to national financial institutions, the studies identified Japan—which provides financing through the Japan Bank for International Cooperation (JBIC), the Nippon Export and Investment Insurance (NEXI), and the Japan International Cooperation Agency (JICA)—as the largest provider of public financing for foreign coal projects. According to Rich (2009), the Export-Import Bank of the United States (US EXIM Bank) ranks as the second largest export creditor and, according to Schmidt (2013), the US EXIM Bank approved more funding to coal mines than to coal power plants. On the other hand, according to Schmidt (2013), Germany—which provides loans through Kreditanstalt für Wiederaufbau (KfW) and insures loans through Euler Hermes—is the second largest provider of public financing in the world.

Table 1: The Amount of public financing estimated by Rich (2009) and Schmidt (2013)
(Unit: billion US dollars)

			Estimate by Rich (2009) (1994-January 2009)	Estimate by Schmidt (2013) (2007-2013)			
			New coal power plants and expansions and life extensions of existing plants	Coal power plants	Coal mines	Other	Total
Amount of public financing	Multilateral Development Banks	World Bank Group	5.315	5.39	0.09	1.06	6.54
		African Development Bank (AfDB)	0.5	2.84	n.a.	n.a.	2.84
		European Investment Bank (EIB)	2.511	1.54	n.a.	0.04	1.58
		Asian Development Bank (ADB)	3.913	0.79	n.a.	n.a.	0.79
		European Bank for Reconstruction and Development (EBRD)	0.869	0.41	0.26	n.a.	0.66
	Japan	Japan Bank for International Cooperation (JBIC)	8.139	7.46	4.22	0.22	11.9
		Nippon Export and Investment Insurance (NEXI)	2.089	4.8	0.2	0.29	5.28
		Japan International Cooperation Agency (JICA)	n.a.	1.73	n.a.	n.a.	1.73
	United States	Export-Import Bank of the United States	3.479	2.22	5.02	n.a.	7.24
		Overseas Private Investment Corporation (OPIC)	0.685	n.a.	n.a.	n.a.	n.a.
	France	Commerce Extérieur (COFACE)	0.475	1.71	n.a.	n.a.	1.71
	Germany	Kreditanstalt für Wiederaufbau (KfW)	1.769	0.69	0.10	1.14	1.93
		Euler Hermes	1.174	2.94	0.36	n.a.	3.31
	United Kingdom	UK Export Finance (UKEF)	0.606	n.a.	0.10	n.a.	0.10
	Italy	Servizi Assicurativi del Commercio Estero (SACE)	0.789	n.a.	n.a.	n.a.	0
	Russia	Russian Development Bank (VEB)	n.a.	0	2.50	0	2.50
	Korea	Export-Import Bank of Korea (Kexims)	0.7	1.92	n.a.	n.a.	1.92
		Korea Trade Insurance Corporation (K-sure)	n.a.	0.30	n.a.	n.a.	n.a.
	China	China Development Bank	1.681	n.a.	n.a.	n.a.	n.a.
		Export-Import Bank of China	0.58	n.a.	n.a.	n.a.	n.a.
Sinosure		0.562	n.a.	n.a.	n.a.	n.a.	

Source: Rich (2009) and Schmidt (2013)

As for their findings on Chinese public financing, Rich (2009) identified that three coal power projects in Indonesia received public financing from such “Chinese policy banks”⁸ as the China Development Bank and the Export-Import Bank of China, and that the total amount was USD 3.131 billion. As for Schmidt (2013), the public financing by Chinese institutions was not accounted for and the study provided the following disclaimer: “We have some data for the Chinese institutions, but this data is

⁸ According to Martin (2012), Chinese policy banks are those wholly or partially owned by the Chinese government and implement the policies set by China’s State Council. “China’s policy banks operate financially by either receiving a capital contribution from the central government or by issuing bonds,” which are presumed to be “backed by the full faith and credit of the Chinese government, with little or no risk of non-payment.”

incomplete so we haven't included this in the totals.” Incidentally, the period covered by Schmidt (2013)—from 2007 to 2013—was when Chinese public financing institutions generally expanded their foreign financing in order to support the “Going Out” policy by the Chinese government;⁹ there has been no indication that Chinese public financing for foreign coal power plants that promote exports of Chinese manufactured equipment and components would have been an exception. The lack of quantification of Chinese public financing for this period had, therefore, meant a significant gap in our understanding of the total scale of public financing for foreign coal power plants.

3. Our Data Collection Methodology

3.1. Difficulty in quantifying Chinese financing and our approach to dealing with the difficulty

Gathering comprehensive data is one of the challenges in quantifying the scale of Chinese financing. While the OECD member countries have obligations to report to the OECD the information on loans, guarantees, and insurance provided by their export credit agencies (ECAs) or their aid agencies,¹⁰ developing countries have no comparable reporting obligation (the Export-Import Bank of the United States 2014). In addition, the public disclosure—such as by press releases and annual reports—of how taxpayer money is spent in the form of loan provisions, insurance or grants by ECAs and aid agencies is a common practice among the OECD member countries. In contrast, Chinese policy banks rarely release such information. The lack of public disclosure by Chinese banks hinders systematic collection of data.

The lack of access to the primary source-information on Chinese public financing forced us to rely on official press releases by recipient countries as well as news articles and research reports.

In order to systematically assemble the information, we took the following three steps. First, we conducted an Internet search where we used queries comprised of a country name and a name of Chinese policy banks—e.g., a combination of “Indonesia” and “Export-Import Bank of China.” The search results were sorted out by project in order to prevent any project from being accounted for more than once. Second, we reviewed the search results for the monetary amount of public financing for each of the projects that

⁹ The explanation of “going out policy” by the Chinese government is available at: http://www.gov.cn/node_11140/2006-03/15/content_227686.htm (last accessed on November 3, 2014).

¹⁰ For information on the OECD reporting guidelines under the OECD, see OECD (2014) and OECD (2007).

were financed by the Chinese policy banks. Third, we compared a list of the Chinese financed projects that we gathered against a list of coal power plants whose boilers or turbines were supplied by Chinese manufacturers. We used the Platts UDI World Electric Power Plants Data Base (WEPP) to determine which plants used Chinese manufactured boilers or turbines. In effort to make the data collection as comprehensive as possible, we repeated the first two steps for the power plants whose boilers or turbines were supplied by Chinese manufacturers but did not show up in our initial Internet search.

Many studies on various kinds of Chinese financing adopted a similar methodology. For example, the Export-Import Bank of the United States (2014) collected news articles through LexisNexis and created a database of projects that received Chinese export finance. Wolf et al. (2013) also utilized LexisNexis to collect information when analyzing the scale, trend, and composition of China's foreign aid and government-sponsored investment activities. In order to track Chinese aid for other developing countries, Strange et al. (2013) developed a web-based data platform called AidData to compile and present news articles in such a way that one can view the database through the Internet.

However, as pointed out by Strange et al. (2013), the information extracted from media sources tends to be less accurate or complete than official statistical data, even if researchers make their best efforts. Recognizing this challenge, we do not claim that our estimates presented in Section 4 are comprehensive or complete. For example, we were unable to find any information on Chinese financing for many power plants that used Chinese equipment. It is impossible for us to know whether the lack of information means the lack of Chinese finance or simply the lack of public disclosure.

3.2. Accounting criteria

When tallying the amount of Chinese public financing for foreign coal projects, we limited the scope of data collection to public loans, guarantees and insurance for new foreign coal power plants whose financing agreements were concluded between 2007 and 2013. Because the new U.S. coal financing policy applies only to new plants, we excluded public financing for retrofitting, maintenance or other investments for existing units of coal power plants. In addition, we excluded finance agreements that were signed before 2007 or after 2014, so as to smoothen the comparison of our findings with—or, possibly to complement—the preliminary findings by Schmidt (2013), which

tallied the amount of financing approved between 2007 and 2013.

Moreover, we counted loans, guarantees and insurance that had reached the level of agreements in order to avoid inflation of our estimate. We only included the projects for which we found information that explicitly mentioned a loan agreement, financial close, or other types of financing agreements; we excluded projects that were only in a planning stage.

3.3. Extracted information

We extracted the following six types of information from the news articles and other sources we gathered: (1) the name of country where the publicly financed coal power plant exists, (2) the name of publicly financed coal power plant, (3) the name of the financial institution that provided a loan, a guarantee or insurance, (4) the amount of a loan, a guarantee or insurance, (5) the installed capacity, and (6) the year in which a financing agreement was concluded.

There are three Chinese public finance institutions that are active in financing foreign coal power plants and they are the China Development Bank (CDB), Export-Import Bank of China (China Exim Bank), and China Export and Credit Insurance Corporation (Sinosure).¹¹ CDB, established by the Policy Banks Law of 1994, originally financed domestic development projects, including the Three-Gorges Dam, but has increasingly financed foreign projects at a commercial rate in recent years¹² in support of the “Going Out” policy of the Chinese government. CDB has been regarded as “a link between the strategic ambitions of the Chinese government and the commercial interests of Chinese firms because the financing it provides to support cross-border deals connects state policy to commercial activity” (Downs 2011). China Exim Bank, also established as a policy bank in 1994, is wholly “owned by the Chinese government and under the direct leadership of the State Council”¹³ and has provided export credits since its establishment. It offers loans both at a commercial rate¹⁴ and at a concessional rate,

¹¹ See Brautigam (2011) and Martin (2012) for further information on these banks.

¹² Details on CDB loans are available on the following website called, “China Power Contractor” operated by China National Machinery Industry Corporation (Sinomach), a state-owned enterprise and one of the major contractors of power plant construction in China and the world: <http://www.china-power-contractor.cn/Special-Commercial-loan-for-foreign-Projects-by-China-Development-Bank.html> (last accessed on November 3, 2014).

¹³ For details, see the following website of the Export-Import Bank of China: http://english.eximbank.gov.cn/tm/en-TCN/index_617.html (last accessed on November 3, 2014).

¹⁴ Details on China Exim Bank buyer’s credits are described on the China Power Contractor website (see footnote 5): <http://www.china-power-contractor.cn/Buyer's-Credit.html> (last accessed on November 3, 2014).

like loans tied to the foreign aid.¹⁵ Sinosure, established in 2001, is a state-owned enterprise that is a “policy-oriented” insurance company that provides export credit insurance in support of China’s “foreign trade and economic cooperation.”¹⁶

4. Results

This section presents the amount of Chinese financing our research discovered; it is organized by recipient countries. The details of data sources and how we discerned the amount are provided in the appended Supplementary Online Material (SOM).

4.1. The amount of Chinese public financing for respective countries

(1) Indonesia

Between 2008 and 2013, China agreed to provide at least USD 4.34 billion to coal power plants in Indonesia through public financing (Table 2). Indonesia launched a program to install approximately 10,000MW of coal-fired power plants in 2006, and awarded most of the projects to Chinese contractors. The large-scale public financing by China coincides with this program. With regard to the Celukan Bawang project in Bali, we found that CBD made a loan agreement with a local power company in which Huadian—one of the five major state-owned power generation enterprises in China—holds a 51 percent share. While the total amount of the investment for the project is reported as USD 0.638 billion, we were unable to find information on the amount of the loan.

¹⁵ According to the China Power Contractor website (see footnote 5), China Exim Bank provides concessional loans (also known as “soft loans”) under the condition of sovereign guarantee by the government of a loan recipient country. For more details, see the following website: <http://www.china-power-contractor.cn/Government-finance.html#b2> (last accessed on November 3, 2014).

¹⁶ For details, see the following website of China Export & Credit Insurance Corporation: <http://www.sinosure.com.cn/sinosure/english/Company%20Profile.html> (last accessed on November 3, 2014).

Table 2: The amount of Chinese financing for coal power plants in Indonesia

Power Plant	Financial Institutions	Amount of loans (billion USD)	Installed Capacity	Year of Agreement
South Smatra Mine Mouth	CDB	0.318	2*150MW	2012
Cilacap	CDB	0.7	660MW	2013
Suralaya & Paiton	China Exim Bank	0.64	660MW+ 660MW	2008
Pelabuhan Ratu	China Exim Bank	0.481	3*350MW	2009
PLTU NAD	China Exim Bank	0.124	2*110MW	2009
Parit Baru	China Exim Bank	0.133	2*50MW	2011
Pacitan	China Exim Bank	0.293	2*315MW	2009
Indramayu	Sinosure CDB	0.562	3*330MW	2008
Tanjung Awar Awar	Sinosure	0.372	2*350MW	2009
Rembang	CDB	0.131	2*315MW	2008
Teluk Naga	Sinosure	0.432	3*315MW	2009
Tanjung Kasam	China Exim Bank Sinosure	0.15	2*55MW	2009
Celukan Bawang	CDB	unknown	3*142MW	2012
Total Amount		\$4.34 billion		

Source: Authors' findings based on various sources listed in SOM

(2) Vietnam

As shown in Table 3, Vietnam received Chinese public financing in the amount of USD 3.89 billion. Vietnam has abundant domestic resources of less flammable anthracite coal, which necessitates particular technologies for ignition. Since 1980s, Chinese manufacturers have obtained licensing from European and U.S. engineering enterprises to produce steam generators that burn anthracite and semi-anthracite coals, and supplied them to many plants in China (Che et al. 2004). Building on the domestic experience, Chinese companies have won engineering, procurement, and construction (EPC) contracts for thermal power plants in Vietnam that burn anthracite coals, including most of the plants listed in Table 3. The Chinese public financing has assisted such equipment exports by Chinese manufacturers.

Table 3: The amount of Chinese public financing for coal power plants in Vietnam

Power Plant	Financial Institutions	Amount of loans (billion USD)	Installed Capacity	Year of Agreement
Vinh Tan 2	China Exim Bank	0.3	2*622MW	2010
Uong Bi	China Exim Bank	0.176	330MW	2009
Vung Ang	CDB	0.571	2*600MW	2011
Duyen Hai 1	China Exim Bank Sinasure	1.008	2*622MW	2011
Duyen Hai 3	CDB Sinasure	1	2*622MW	2012
Hai Phong 2	China Exim Bank Sinasure	0.557	2*300MW	2007
Mao Khe	Sinasure	0.275	440MW	2011
Total Amount		\$3.89 billion		

Source: Authors' findings based on various sources listed in SOM

(3) India

We identified six cases in India for which China agreed to provide public financing that amounted to USD 8.70 billion. Among them are three cases where the status of agreement remains at the level of a Memorandum of Understanding (MoU) and a loan agreement is not signed. Without these MoU level cases, the total amount of Chinese public financing is USD 1.46 billion (Table 4).

Although these financing agreements in the form of an MOU may not have the same legal standing as a formal agreement, Indian power producers who are signatories to these MoUs have already placed procurement orders for major equipment for their plants from Chinese manufacturers. However, the construction of these plants has been either delayed or not commenced due to difficulties in obtaining various necessary approvals, such as coal supply approvals and environmental clearances by the relevant Indian authorities. Once these approvals come through, the construction will likely commence and the loan agreements under the MoU will likely be concluded promptly. In order to solve a chronic electricity shortage that has constrained the country's economic growth for many years, the new Indian Administration under Prime Minister Narendra Modi seeks to expand domestic coal production by reforming the monopolistic state-owned coal producer and encouraging more investments in coal power generation while boosting other electricity sources, especially solar power¹⁷.

¹⁷ For example, the Indian government decided to expedite a regulatory approval for 90 coal mining

Table 4: The amount of Chinese financing for coal power plants in India

Power Plant	Financial Institutions	Amount of loans (billion USD)	Installed Capacity	Year of Agreement
Sasan	CDB China Exim Bank Sinosure	1.1	6*660MW	2010
Various power plants of Reliance Power	CDB China Exim Bank	5.45	30000MW	2010 (MoU)
Anpara II and Himawat	CDB	0.6	2*660MW + 2*660MW	2010 (MoU)
Cuddalore	Sinosure	1.19	3*660 MW	2010 (MoU)
Amarkantak 3&4, Babandh and Vidarbha	CDB	0.2	2*660MW + 2*660MW+2*660MW	2010
Jhajjar	CDB China Exim Bank	0.16	2*660MW	2010
Total Amount (without MoU)		\$1.46 billion		
Total Amount (including MoU)		\$8.70 billion		

Source: Authors' findings based on various sources listed in SOM

(4) Other countries

Table 5 summarizes Chinese public financing for coal power plants in other countries. We found explicit references to loan agreements or financial close for all of the listed projects, except the Kostolac power plant in Serbia. Financing for the 350MW plant in Serbia is assumed to be one of the projects to which China Exim Bank is expected to provide a loan as part of a large-scale credit line China has set for 16 Central and Eastern European countries. The Serbian government has already promised to provide a sovereign guarantee for the promised loan by China Exim Bank.

projects of the Coal India Limited in November 2014 (Dhoot 2014).

Table 5: The amount of Chinese financing for coal power plants elsewhere

Country	Power Plant	Financial Institutions	Amount of loans (billion USD)	Installed Capacity	Year of Agreement
Sri Lanka	Norochcholai 2	China Exim Bank	0.891	2*300MW	2009
Phillipines	Mariveles	CDB Sinosure	0.493	2*300MW	2010
Botswana	Morupule B	Sinosure	0.784	4*150MW	2009
Bosnia and Herzegovina	Stanari	CDB	0.444	300MW	2012
Serbia	Kostolac	China Exim Bank	0.305	350MW	2013 (credit line)
Uzbekistan	Angren	China Exim Bank	0.166	150MW	2013
Brazil	Candiota	CDB	0.356	350MW	2008

Source: Authors' findings based on various sources listed in SOM

4.2. The aggregate amount

In aggregate, our estimate of the Chinese public financing for new foreign coal power plants between 2007 and 2013 is at least USD 13.1 billion on the basis of official loan agreements, and USD 20.6 billion when agreements at the MoU level are included.

As noted in the Section 3.1, we were unable to find information on Chinese public financing for many thermal power plants which had adopted Chinese equipment. We cannot discern whether the lack of information means the absence of finance or simply the lack of public disclosure. Therefore, we believe that our estimate is likely to be lower than the actual amount of Chinese financing. While Schmidt (2013) included financing for both coal power plants and coal mines, our estimate covered only the new coal power plants. Accounting for public financing for coal mining would most likely make the figure much higher.

5. Comparing the Chinese financing with the financing by other key countries

This section presents our estimate on the amount of financing by other countries that provide public financing and are home to coal equipment manufacturer, including Japan, the United States, and Germany, and compares the estimates with our estimate on China.

5.1. Estimates of public financing by other countries

(1) Japan

As we mentioned in Section 2, both Rich (2009) and Schmidt (2013) concluded that

Japan, which provides financing through JBIC, NEXI and JICA, is the largest provider of public financing for foreign coal projects in the world. Schmidt (2013) preliminarily estimated that JBIC, NEXI, and JICA approved financing in the amount of USD 7.46 billion, USD 4.80 billion, and USD 1.73 billion, respectively, for foreign coal power plants between 2007 and 2013; the total per Schmidt (2013) accordingly is USD 13.99 billion. This amount is a slightly higher than the lower end of our estimated Chinese financing (USD 13.1 billion).

However, we suspect that the preliminary analysis by Schmidt (2013) overestimated the scale of Japanese financing. For example, the *List of Coal Power Plants funded by JBIC (2004-2014)*, released through an online brief by Tanabe (2014) of the Japan Center for a Sustainable Environment and Society (JACSES), a Japanese environmental NGO, indicates that the amount of approved JBIC loans between 2007 and 2013 was USD 5.371 billion.¹⁸ The Tanabe (2014) estimate is USD 2.09 billion less than the preliminary estimate by Schmidt (2013). Furthermore, the Tanabe (2014) estimate included a loan for purchase of existing plants in the Philippines. The total loan amount only for new coal plants, according to the Tanabe (2014) estimate, thus is USD 3.81 billion. The Tanabe (2014) estimate, however, appeared to omit loan provision for one project in India and loan guarantees against three politically risky projects in Indonesia, which amounted to USD 1.39 billion (*See Supplementary Online Material 2 (SOM2)*). Therefore, our estimate of the total amount of loans and guarantees by the JBIC is USD 5.2 billion, which is USD 2.26 billion less or roughly 30 percent lower than the preliminary estimate by Schmidt (2013).

The significance discrepancy between Schmidt (2013) and Tanabe (2014) concerning the estimates on JBIC loans compelled us to undertake our own data collection on financing by NEXI and JICA—the two other Japanese public financing institutions—between 2007 and 2013 primarily on the basis of their press releases. The result of our data collection shows that the NEXI insured loans amounted to at least USD 1.16 billion and JICA provided loans USD 1.3 billion (*See SOM2*).

In total, we estimate that JBIC, NEXI and JICA collectively approved USD 7.66 billion of financing for new foreign coal power plants between 2007 and 2013.

¹⁸ The data provided by Tanabe (2014) is available at: <http://sekitan.jp/jbic/wp-content/uploads/2014/01/jbiccoallisten.pdf> (last accessed on November 3, 2014).

(2) The United States

US EXIM Bank releases a list of long-term loans and guarantees authorizations through its annual reports. We identified two cases of the bank financing for coal power plants according to the annual reports: Sasan power plant in India, and Kusile power plant in South Africa.¹⁹ The total amount of US EXIM loans for these projects is USD 1.46 billion, which is smaller than Schimdt estimate of USD 2.22 billion.

(3) Germany

Germany provides loans through KfW and insurance through Euler Hermes. Unlike Japanese and U.S. public financing institutions, KfW rarely discloses details on coal power projects for which it provides loans.²⁰ Recently, it disclosed that the amount of loans committed for coal-fired power plants from 2006 to 2013 was Euro 2.8 billion (KfW 2014). As for Euler Hermes, the Germany government discloses the list of projects covered by Euler Hermes, but not their monetary amounts. We, therefore, collected data on German public financing by surveying the official releases by recipient countries and news articles. As shown in SOM2, we estimate that the German public financing that were agreed upon between 2007 and 2013 amounted to be USD 3.66 billion. This amount is very close to the preliminary estimate of USD 3.63 billion by Schmidt (2013).

(4) France

France provides export loans through Compagnie Française d'Assurance pour le Commerce Extérieur (COFACE). We found only one loan for new coal power plant that was approved by COFACE between 2007 and 2013—a loan for Medupi and Kusile power plants in South Africa. The amount is USD 1.71 billion, which is consistent with the Schmidt (2013) estimate.

(5) South Korea

South Korea provides export loans through the Export-Import Bank of Korea (Korea Exim Bank) and insurance through the Korea Trade Insurance Corporation (K-sure). We compiled the amount of loans by the Korea Exim Bank and insurance by K-sure from their official releases. The loans and the insurance approved between 2007 and 2013 amounted to USD 4.30 billion; this amount is nearly twice larger than Schmidt

¹⁹ Although there were many other cases where the United States provided public loans for turbine-generator exports, we found that these turbine-generators were for gas-fired power plants.

²⁰ The limited public disclosure by KfW may be attributed to the fact that KfW export financing is provided through its 100 percent subsidiary called the KfW IPEX bank, which is regarded as a commercial bank although the German government is a 80 percent shareholder of KfW.

estimate of USD 2.22 billion. This amount was larger than the public financing by the United States, Germany or France. As shown in SOM2, the Korean public financing has expanded since 2010, coinciding with the expansion of the Korean exports of boilers and steam turbines.

(6) India

India provides export credits through the Export-Import Bank of India. The bank reports major contracted projects in its annual reports every year and reported only one coal-fired power plant in the annual reports between 2007 and 2013. Although the amount of the financing for the project was not reported, the amount is likely to be negligible, especially compared to the financing by most of the countries listed above.²¹

5.2. Comparison among countries

Figure 2 summarizes our estimates of public financing outlined above. According to our estimates, China is the largest provider of public financing for new foreign coal power plants, and the financing level is approximately 70 percent more than Japan, which our research suggested to be the second largest provider. Chinese financing accounts for 41.1 percent of the aggregated amount of public financing by China and the other five countries we examined: Japan (24.0 percent), South Korea (13.5 percent), Germany (11.5 percent), France (5.4 percent), and the United States (4.6 percent).

²¹ While India provides export insurance through the Export Credit Guarantee Corporation of India (ECGC), we were unable to find information that ECGC has provided insurance for foreign coal power projects during the target period.

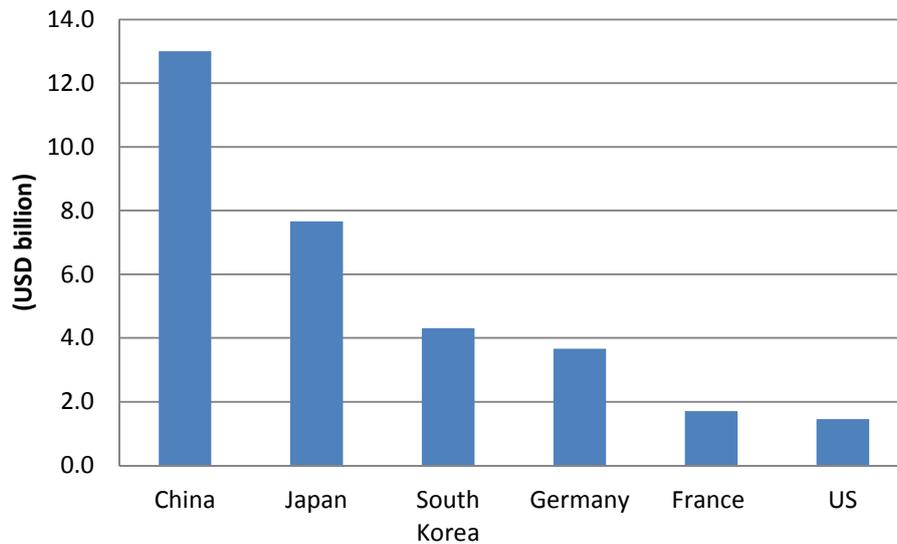


Figure 2: Comparison of public financing for foreign coal power plants between 2007 and 2013 among countries

Source: Authors

6. Discussion

Our quantification of Chinese public financing for foreign coal power plants and comparison of the data with those of other countries have led us to conclude that China is the largest provider of public financing in the world. This is a finding that merits consideration of implications for several policy issue areas.

6.1. Climate implications: What if the OECD stopped providing public financing?

As mentioned in Section 1, the United States, the United Kingdom, and the Netherlands proposed to the OECD Export Credit Group a carbon emissions performance standard that essentially prohibits export credits for coal power plants without CCS. Given high capital costs and other challenges associated with CCS deployment, this proposed standard would likely eliminate export credits for coal power plants by the OECD member countries. Meanwhile, as China is not a member of the OECD, its Chinese provision of export credits for foreign coal power plants would not be bound by the new standard—if adopted by the OECD.

In fact, if the OECD adopted the proposed standard and stopped bilateral public financing, China might simply replace the OECD countries and satisfy continued demand for coal power plants forecasted for developing countries by providing public

financing for foreign coal power plants, thus negating the intended benefit of the new OECD policy. Such development is highly probable in light of growing excess production capacity in Chinese manufacturing sector that is arising from slowing domestic demand for new thermal power plants in China. According to trade statistics by the United Nations, Chinese exports of boilers and steam turbines have rapidly expanded since 2007 although the export level has fluctuated more recently after it peaked in 2011 (Figure 3).²² On the other hand, the annual addition of thermal power generation capacity in China sharply dropped from 62.4GW in 2011, to 36.5GW in 2013²³ (Figure 4). Declining domestic demand leads to redundancy in Chinese manufacturing capacity for coal power generation equipment and components as each of the three major state-owned manufacturers in China—Harbin Electric, Dongfang Electric, and Shanghai Electric—has annual production capacity of approximately 30GW.²⁴ Such capacity redundancy could prompt China to facilitate exports of boilers and steam turbines for coal power plants, with the assistance of public financing by CDB, China Exim Bank and Sinosure, essentially reversing the declining trend in boiler and steam turbine exports.²⁵

²² The monetary amount of the loan agreements we identified in Section 4 peaked in 2009, which is the year when Indonesia awarded many contracts to Chinese manufacturers.

²³ Statistics are available on the website of the China Electricity Council:

<http://www.cec.org.cn/guihuayutongji/tongjixinxi/yuedushuju/2013-12-16/113898.html>

²⁴ Information on production capacity of these manufacturers is available at the following links:

<http://www.harbin-electric.com/en-company2.asp> (last accessed on November 3, 2014),

<http://www.dongfang.com.cn/index.php/business?subCategory=FossilFuelPower> (last accessed on November 3, 2014).

http://articles.economictimes.indiatimes.com/2012-03-29/news/31254847_1_supercritical-equipment-power-equipment-sasan (last accessed on November 3, 2014).

²⁵ Increasing domestic demand for nuclear power plants and combined-cycle gas turbine (CCGT) power plants could absorb a share of redundant production capacity of steam turbines, which are used not only for coal power plants but also for nuclear and CCGT plants. On the other hand, the capacity redundancy for large boilers adapted for thermal power plants would not easily be absorbed by the introduction of alternative sources of energy because such boilers are too large for alternative sources. Since China has by far the largest domestic market for coal power generation equipment, the Chinese manufacturers would need to seek new business domains in addition to foreign coal power projects in order to generate revenue.

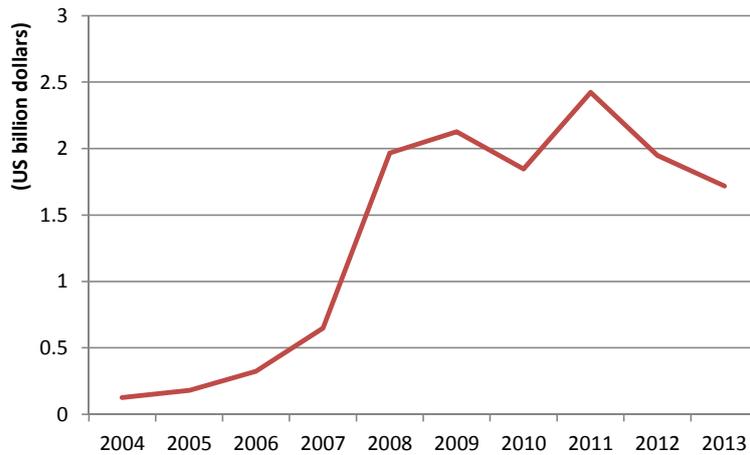


Figure 3: Trend of Chinese exports of steam boilers

Source: UN Comtrade Database²⁶

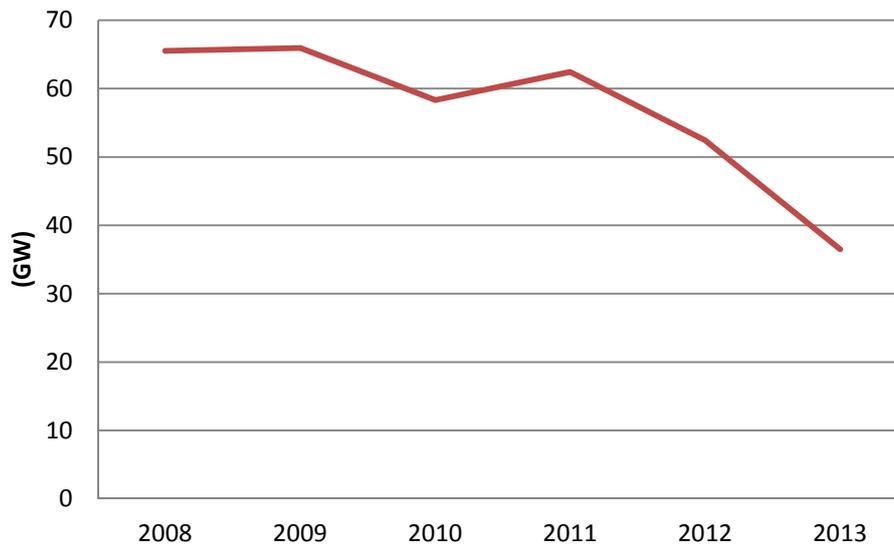


Figure 4: Trend of annual addition of coal power plants in China

Source: The China Electricity Council

If France, Germany, Japan and South Korea—major exporters of coal power generation equipment and components who as of today do not ban the public sector financing for foreign coal power plants—stopped providing public financing and if China decided to replace them in providing export credits for the purpose of export expansion, the amount of Chinese public financing could more than double, as suggested by Figure 2.²⁷

²⁶ UN Comtrade Database is available at: <http://comtrade.un.org/> (last accessed on November 3rd, 2014).

²⁷ One alternative may be private financing. However, we believe that this alternative is much less likely. As shown in SOM and SOM2, foreign public financing for coal power plants prevails in many

We believe that the three Chinese public financing institutions have the capacity to fulfill such a policy objective because—despite the fact that public financing for foreign coal power plants peaked in 2009—the volume of export credits by China Exim Bank and Sinosure has continuously expanded from USD 31.1 billion in 2010 to USD 45.5 billion in 2013 (Figure 5), and the financing capacity will be even bigger when CDB loans are added.

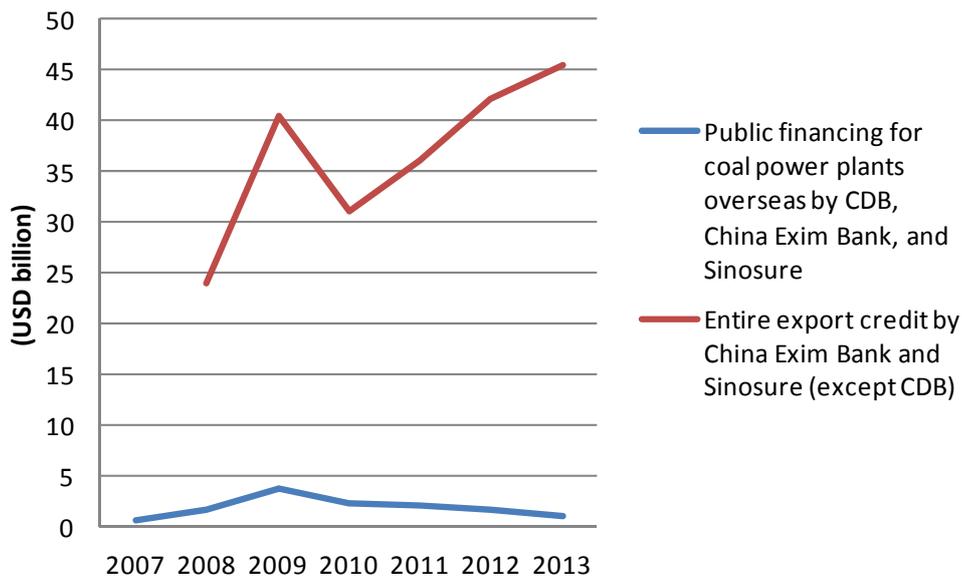


Figure 5: Chinese public financing for foreign coal power plants and the total amount of export credits by China Exim Bank and Sinosure

Source: SOM and the Export-Import Bank of the United States (2014)

Furthermore, accelerating export of Chinese boilers and steam turbines causes an additional climate change concern, as the power plants China exports are relatively inefficient in generating electricity and they emit more CO₂ than more efficient plants. Although China is building energy efficient power plants like supercritical (SC) and ultra-supercritical (USC) plants at home, they generally export plants that tend to use

countries, especially in Indonesia, Vietnam and India, where sovereign rating is not so high and thus public financing plays an important role. We believe that borrowers would prefer relying on Chinese public financing to limiting themselves to private financing. With regard to the role of private financing, Jones et al. (2011) estimates that about 99 percent of coal power plants in the middle income-category countries were financed solely by the private sector between 2000 and 2010. However, Jones et al. (2011) appears to narrowly define public financing as MDB concessional loans and regards the rest as sole private financing. Our paper, as well as Rich (2009) and Schmidt (2013), include loans and insurance by bilateral agencies into the category of public financing and, as shown in SOMs, we found that many coal power plants in the middle income-category countries, such as Indonesia and Vietnam, have received the public financing.

inefficient subcritical technology. Table 6 presents types of boiler technology that were exported by Chinese manufacturers to non-OECD Asian markets in developing countries after 2007, according to the 2012 edition of the Platts UDI World Electric Power Plants Data Base (WEPP). The share of SC and USC boiler technology accounted for less than 40 percent of the total coal power plants supplied by Chinese manufacturers to Asian markets outside China. In comparison, the share of SC and USC boiler technology accounted for over 60 percent in the coal power plants supplied by Japanese manufacturers (including joint ventures with Indian firms that adopted Japanese technologies) to the same markets (Table 7). If we limit the samples to the projects that received public financing, the share of SC is 43 percent for Chinese manufacturers and 65 percent for Japanese manufacturers. South Korean and European manufacturers also tend to export more efficient power plants than do Chinese manufacturers.

Table 6: Types of boiler technology supplied by Chinese manufacturers to Asian overseas markets after 2007²⁸

	Asia (except China, Japan, and South Korea)	India (as a part of the left column)
Subcritical (MW)	55,192	36,983
SC/USC (MW)	29,940	28,080
Share of supercritical	35.17%	43.16%

Source: Authors' calculation based on Platts UDI World Electric Power Plants Data Base (WEPP)

²⁸ We totaled the generation capacity of coal power plants that started commercial operation after 2007 or were under construction at the timing of the release of the database in 2012. We excluded the plants which were still at a planning stage at the timing of the release of the database.

Table 7: Types of boiler technology supplied by Japanese manufacturers (including joint ventures with Indian firms) to Asian overseas markets after 2007²⁹

	Asia (except China, Japan, and South Korea)	India(as a part of the left column)
Subcritical (MW)	5,082	0
SC/USC(MW)	8,390	5,940
Share of supercritical	62%	100%

Source: Authors' calculation based on Platts UDI World Electric Power Plants Data Base (WEPP)

As shown in Table 3, the Chinese manufacturers have recently expanded supply of SC plants in India, which drove up the share of SC in the Asian markets. However, Chinese-manufactured SC plants tend to be less efficient than SC plants manufactured by other Asian manufacturers, because the Chinese boilers supplied in India do not generate main steams or reheat steams that are hotter than approximately 565 degrees Celsius; meanwhile, other manufacturers, including Japanese and Korean ones (as well as an Indian manufacture that has obtained licensing from European enterprises) have manufactured and supplied in India SC boilers producing the steams that are as hot as approximately 565 degrees Celsius for main steams and 593 degrees Celsius for reheat steams—the levels nearly analogous to steam conditions for USC plants (Ueno forthcoming).

If the less efficient coal power plants by Chinese manufacturers fill the gap in plant demand created by the OECD ban on export credits and resultant absence of OECD level technology, more CO₂ would be emitted into the atmosphere. Despite the stated intent of reducing CO₂ emissions, the public finance restriction policy could produce a contrary result, depending on the efficiency of power plants supplied by Chinese manufacturers.

Moreover, the public financing restriction could essentially hamper the advancement in research and development of clean coal technology, which is not limited to CCS, by limiting their deployment opportunities as a combination of market conditions in developing countries and OECD policy direction inadvertently rewards less efficient

²⁹ We totaled the generation capacity of coal power plants that started commercial operation after 2007 or were under construction at the timing of the release of the database in 2012. We excluded the plants which were still at a planning stage at the timing of the release of the database.

technology. Not only would such development challenge the prospect for driving down the cost of clean coal technology deployment, but also handicap future market-based responses in light of growing coal consumption in much of the world.

Furthermore, the momentum to severely limit the public financing for coal power plant projects has emerged at the time when the robust production of shale gas has reversed the levels of U.S. domestic natural gas production and begun facilitating the fuel-switch away from coal in the U.S. electricity sector, compounding economic challenges to the U.S. coal sector. One effect of the U.S. shale revolution is that the now underutilized U.S. coal supplies have become economically competitive in the global marketplace and are shipped abroad in high volume. For example, U.S. coal exports in 2011 grew by 171 percent from 2002, the year that marked the lowest annual export level of 40 million tons in the recent decades (USEIA 2012). Moreover, since 2009, U.S. coal exports have been growing by about 20 million tons annually (USEIA 2012). The major destinations for U.S. coal in 2014 include the Netherlands, the United Kingdom, and China (USEIA 2014). This development calls into question the climate logic behind the U.S. and several importing countries' call for the financing restriction on coal power plants while allowing for coal trade.

6.2. Geopolitical implications: Will the differing energy realities lead to a geopolitical shift?

The momentum to widely promote the ban on public financing for coal power plant projects has coincided with the emergence of new financing vehicles, such as the New Development Bank—commonly known as the BRICS Bank—and the Asian Infrastructure Investment Bank (AIIB).

The creation of the BRICS Bank was agreed upon by Brazil, Russia, India, China and South Africa at the fifth BRICS summit in Durban, South Africa, in March 2013³⁰—only a few months before the U.S. announcement about the coal financing restriction as part of the Climate Action Plan in June 2013. Following the U.S. decision, the policy spread to the World Bank—where China, Brazil and India long opposed such a financing restriction—and the Bank announced its new policy in July 2013 (World Bank 2013,

³⁰ For more information on the Fifth BRICS Summit, see the following link: <http://www.brics5.co.za/> (last accessed on November 3, 2014).

Plumer 2013, Lattanzio 2013). Moreover, even before the BRICS Bank was officially signed off at the sixth BRICS summit in Brazil in July 2014,³¹ Chinese President Xi unveiled his proposal on the Asian Infrastructure Investment Bank (AIIB) during his visit to Indonesia for the APEC Leaders Meeting in October 2013 (Xinhua 2013). A year later, over 20 country delegates who gathered in Beijing signed the Memorandum of Understanding (MOU) to launch the AIIB (Reuters 2014). According to the MOU, the bank, with authorized capital of USD 100 billion, will be formally established by the end of 2015, and headquartered in Beijing—the capital of the country that reportedly promised to contribute much of the initial USD 50 billion in capital, and as such would become the largest stakeholder with a share of up to 50 percent (Feng 2014, Reuters 2014).³²

The emergence of these institutions seems to reflect the under-development of infrastructure and the under-met financing needs to achieve such development in the developing countries. For example, according to the Asia Development Bank, regional infrastructure needs in Asia are estimated to be \$750 billion annually, between 2010 and 2020 (ADB and ADBI 2009).

While the current ban on coal power plant financing by several developed countries and several MDBs was formulated in genuine efforts to reduce the total greenhouse gas emissions in the world, it reflects the widening reality in two camps of energy economies as it relates to the role of coal. On one hand is the United States and several western European countries where addressing the climate change has become the overarching political mandate and the policy pathway is aided by a combination of growing energy production (in the United States) and the moderate level of energy consumption (both the United States and Europe). On the other hand is a collection of countries where

³¹ For more information on the agreement, see the website of the Ministry of External Relations of Brazil: <http://brics6.itamaraty.gov.br/media2/press-releases/219-agreement-on-the-new-development-bank-for-taleza-july-15> (last accessed on November 3, 2014). Reportedly, member disagreements over the voting rights allocation and share structure held up the formal signing until a year later (Wild, Galvao and Arkhipov 2013).

³² As pointed out by several leading experts of political economy, the BRICS Bank seems to reflect a genuine grievance on the part of the developing countries about the “state of global economic governance, including the recurring financial crises emanating from the United States and Europe in recent years” (Goodman 2014) as well as the reluctance of the developed countries to fully adjust institutional governance to reflect the growing prominence of the emerging economies. Meanwhile, the impact of these emerging institutional arrangements on the existing global system that is generally underpinned by rules of law and transparency remains to be seen. For example, the United States has “concerns about the ambiguous nature of the AIIB proposal as it currently stands,” and thus has “strongly urge[d] that it meet international standards of governance and transparency” (Reuters 2014).

coal remains a key part of their energy economics and where economic security drives much of the energy policy agenda as they are generally either highly dependent on energy imports or faced with a robust domestic energy consumption forecast. The latter reality is a strong explanation for continued interest by emerging economies to build coal power plants, provide public financing, and to launch new multilateral financing institutions as they recently have.

In particular, the gap between the reality of energy and economic security in the developing world and the climate vision among the developed countries has widened to the extent that the effectiveness of existing institutions, such as the OECD and the World Bank, as well as the relevance of their missions are now in the domain of public discussion. Even if the developed countries and the existing MDBs halted public financing for coal power plants in the developing countries, financing by emerging nations, such as bilateral financing by China and multilateral financing by the BRICS Bank and the AIIB, could fill the void.

6.3. Conclusion

A call to severely restrict public financing for coal power plants overseas aims to help reduce the global level of CO₂ emissions. While its intended aim is indisputably important, the policy direction has likely been handicapped by the limited understanding of the scale and nature of public financing in this area. Our quantification research shows that China is the leading provider of public loans, credits and insurance for coal power plants overseas and, therefore, suggests that the public financing ban by the developed countries would not lead to significant reduction in carbon dioxide emissions. In fact, this policy development has climate and geopolitical implications that may generate unintended consequences, including a potential increase in CO₂ emission levels and a slow-down in robust deployment of clean coal technologies.

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