China’s Role in the Global Development of Critical Resources

Case Studies in Coal Power, Electricity Transmission, and Seabed Mining
About This Report

China’s extensive and expanding foreign investment and financing activities over the past approximately 20 years have garnered substantial attention and raised several concerns. The purpose of this report is to explore Chinese investment and financing activities in energy infrastructure and critical minerals.

RAND National Security Research Division

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Summary

China’s extensive and expanding foreign investment and financing activities over the past two decades have garnered substantial attention and raised several concerns. Such concerns are diverse and include

- paying insufficient attention to internal politics, global relations, environmental regulations and controls, and human rights, worker safety, and health records of host nations
- engaging in unfair contracting practices
- using overseas investments and financing to attain access and influence in strategic locations
- using disinformation to influence markets.

For this report, we examined Chinese foreign investments and financing in critical resources and energy infrastructure for evidence of these types of behaviors. We used a case-study approach in which we examined investments and financing in coal power plants in Indonesia, Pakistan, and South Africa; electricity transmission and distribution infrastructure associated with the global energy interconnection (GEI) initiative in Brazil, Chile, Argentina, Peru, and Mexico; and seabed mining globally. These case study topics and the regions of focus were selected at the behest of the sponsor. Our research did not turn up many clear examples of the behaviors noted above but did identify some other topics of concern that have important implications for host nations.

Chinese Support for Overseas Coal Power Plants

By most measures, China appears to be moving away from its historical support for the development of overseas coal-fired power plants. Still, questions persist regarding whether China intends to fully adhere to the pronouncement by President Xi Jinping and the established Belt and Road Initiative guidelines, which categorically assert that China will not build new coal plants abroad. Since Xi’s announcement in September 2021, China has initiated two new coal plants supporting industrial parks in Indonesia. Further, since the time of Xi’s speech, several plants have moved forward in the development process, and it remains unclear exactly how China will follow through on its promulgated guidelines for plants in the very early stages of development. Under a strict interpretation, such plants should be canceled, though it is likely that some will move forward.

Our research led to several recommendations for nations that have built or are considering building Chinese-financed coal power plants.

First, it will be critical for industrial parks in Indonesia and elsewhere to replace existing or planned coal plants with renewable energy sources. The international community will need to
hold China accountable in following through on its promises to not build new coal plants abroad, and it will be critical to persuade host countries, such as Indonesia, that further development of coal for such parks will undermine their net-zero commitments.

Second, the international community should seek greater clarity from China on plans for continuing to support coal plants with financing and permits that have not yet begun construction. Although the Chinese National Development and Reform Commission guidelines unambiguously call on Chinese firms to “completely stop new overseas coal power projects,” it seems that such firms are continuing to move forward on at least a selection of permitted and financed projects, which the Center for Research on Energy and Clean Air considers to fall within a gray area. The international community should consequently engage Chinese authorities to gain greater clarity on China’s intention for such plants.

Third, the international community should help host countries transition from coal. The international community (particularly, China, with its dominance in solar panel and wind turbine manufacturing) should offer direct financial and construction support for the development of solar and wind energies. Diplomatic engagements and capacity-building initiatives should also be undertaken to help countries, such as Indonesia, address significant bureaucratic impediments to renewable energy. Initiatives such as the Just Energy Transition Partnership in South Africa, in which the United States, Germany, the United Kingdom, and the European Union will contribute $8.5 billion to help South Africa retire coal plants early, support coal-dependent regions, and turning to renewable energy may also be critical in helping such countries as Indonesia and Pakistan move away from coal.

Electricity Transmission and Distribution in Latin America

The GEI case study documented relatively few concerns associated with Chinese ownership or control over power transmission and distribution companies in Brazil, Chile, Peru, and Argentina. Most of the concerns raised by those interviewed for this project addressed the nontransparent means in which such projects are financed and the fact that Chinese state-owned enterprises (SOEs) have a competitive advantage over private competitors from other countries in terms of access to finance under nonmarket conditions. In our review of open-source data and in the interviews conducted for this case study, we did not uncover any major episodes involving Chinese government pressure or attempts at projecting influence that were specifically tied to Chinese investments or financing in power transmission and generation.

In the five Latin American countries we focused on for this report, Chinese companies did not appear to engage in predatory lending practices similar to those that have been associated with Chinese firms operating in African and Southeast Asian countries. Chinese investments and financing in Brazil’s, Chile’s, and Peru’s power transmission and distribution sectors consisted

1 In Mexico, there are no Chinese investments in power transmission and distribution.
of Chinese SOEs buying local companies, with Argentina considering financing options from Chinese banks to expand the power transmission lines in the Buenos Aires area. In Mexico, Chinese companies established new and acquired existing companies in power generation. Neither the government in Beijing nor the Chinese SOEs and private companies on the ground draw an explicit connection between GEI implementation and the investments and financing they conduct in these five Latin American countries.

In line with these observations for this case study, we offer the following recommendations for countries in Latin America, as well as for those in other regions of the world that consider Chinese investment and financing options in the power sector. First, it is important for such countries to develop regulatory frameworks for the integration of renewable energy into the overall power grid. Second, these countries should develop regulatory frameworks to address technological and informational components of smart grids. Third, there is a need for more-transparent public tenders. Having a transparent public tender system that meets international best practices and respects local laws may advance the free-market environment and encourage competition among foreign investors.

There is also a need to implement screening mechanisms for foreign investments and financing. Local governments should be able to review the financing terms and conditions of foreign investment and financing activities, including asking foreign investors to disclose the source of their capital, and screen for offers that show a preference for including a local component (labor and materials) and for local laws governing the final contract.

As part of such efforts, it will be critical for these countries to nurture the development of a professional and reputable public contracting officer corps in hopes that such professionals can be protected against political pressures. Likewise, it will be important to diversify investment and financing partners because overreliance on investors from one country increases the economic and political vulnerability of the host country to foreign pressures.

**Seabed Mining**

China has quickly advanced its technology for deep-sea exploration and did so with little outside collaboration. Some observers emphasize the dual civilian-military use aspects of such capabilities and warn that China’s involvement in seabed mining exploration serves as a means to legitimize various forms of deep- and distant-sea activity and cover for pursuing military objectives. However, we found no evidence to support the notion that China’s seabed mining program is intended as cover for military purposes. Given the potential risks, however, we urge continued monitoring of (1) Chinese seabed mining exploration technology development and use and (2) Chinese ship activity for signs of anomalous activity.

China has shown a propensity to infringe on territory that belongs to other nations, which raises concerns for the security of seabed mining contract areas. It will hence be critical to develop and implement methods to monitor contractors’ seabed mining activity. It may be
necessary, for example, for authorities to require operators to announce and describe seabed mining exploration cruises in advance and insist that all ships participating in seabed mining activities always use their automated identification system beacons. It may also be necessary to use sea-based patrols and inspection regimes to verify operators’ ships’ locations and activities.

Over the past few decades, China has come to dominate the global market for the processing of several critical minerals. Given the start-up costs of developing mineral processing facilities, China’s large processing capacity puts it at an advantage in securing processing contracts from commercial seabed mining operators. Non-Chinese operators recognize that partnering with China for such mineral processing will significantly undercut profits. Consequently, nations that sponsor seabed mining activities in their exclusive economic zones and home nations of mining operators should create incentives to develop their domestic processing capabilities. Examples of such incentives include financing for the construction of processing facilities and revising environmental requirements for the permitting of such processing facilities.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIS</td>
<td>automatic identification system</td>
</tr>
<tr>
<td>BRI</td>
<td>Belt and Road Initiative</td>
</tr>
<tr>
<td>CCZ</td>
<td>Clarion-Clipperton Zone</td>
</tr>
<tr>
<td>COMRA</td>
<td>China Ocean Mineral Resource Research and Development Association</td>
</tr>
<tr>
<td>COVID-19</td>
<td>coronavirus disease 2019</td>
</tr>
<tr>
<td>CPEC</td>
<td>China-Pakistan Economic Corridor</td>
</tr>
<tr>
<td>CREA</td>
<td>Center for Research on Energy and Clean Air</td>
</tr>
<tr>
<td>EEZ</td>
<td>exclusive economic zone</td>
</tr>
<tr>
<td>GCPT</td>
<td>Global Coal Plant Tracker</td>
</tr>
<tr>
<td>GEI</td>
<td>Global Energy Interconnection</td>
</tr>
<tr>
<td>GEIDCO</td>
<td>Global Energy Interconnection Development and Cooperation Organization</td>
</tr>
<tr>
<td>ISA</td>
<td>International Seabed Authority</td>
</tr>
<tr>
<td>MEE</td>
<td>Ministry of Ecology and Environment</td>
</tr>
<tr>
<td>MOFCOM</td>
<td>Ministry of Commerce</td>
</tr>
<tr>
<td>MoU</td>
<td>memorandum of understanding</td>
</tr>
<tr>
<td>NDRC</td>
<td>National Development and Reform Commission</td>
</tr>
<tr>
<td>SGCC</td>
<td>State Grid Corporation of China</td>
</tr>
<tr>
<td>SME</td>
<td>subject-matter expert</td>
</tr>
<tr>
<td>SOE</td>
<td>state-owned enterprise</td>
</tr>
<tr>
<td>UHV</td>
<td>ultra-high voltage</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
</tbody>
</table>
Chapter 1. Introduction

Background and Motivation

China’s explosive economic growth over the past two decades has been accompanied by extensive foreign investment and financing. According to the China Global Investment Tracker (American Enterprise Institute and Heritage Foundation, 2021), the total of China’s foreign investment and construction from 2005 to 2021 is $2.2 trillion. Until about 2017, Chinese foreign investment and financing had been growing steadily and, in 2022, began increasing again.

This foreign investment and financing is driven by a combination of demand for resources (China has the world’s largest population and has been the biggest energy consumer since 2009; U.S. Energy Information Administration, undated), desire to employ Chinese underutilized industrial capacity and workers, and deliberate policy decisions to expand China’s global trade and influence. The two most important such policies are the 1999 Go Out Policy, or the Going Global Strategy, and the 2013 One Belt, One Road, or Belt and Road Initiative (BRI; Chatzky and McBride, 2020; Page, 2018).

China’s foreign investments and financing have raised concerns among Western nations for multiple reasons (Lew and Roughhead, 2021; Sutter, Schwarzenberg, and Sutherland, 2021). One is China being relatively less discriminating about the internal politics, global relations, environmental regulations and controls, and human rights, worker safety, and health records of the countries it invests in. Another is claims of unfair contracting practices: Many Chinese firms that bid on foreign investment and financing opportunities are state-owned enterprises that have the backing of the central government and can raise capital more cheaply and offer contract terms that are more competitive than non–government-backed firms from other countries. Still other concerns center on the belief that many Chinese investments and financing are driven less by direct economic returns than by attaining access and influence to wield strategic “soft power” or, in at least one case, establish military footholds. And, recently, evidence of China using disinformation campaigns to influence global critical resource markets has emerged (Mandiant, 2022).

The objective of our research was to characterize Chinese foreign investments and financing in critical resources and energy infrastructure, emphasizing the extent to which Chinese investors engaged in any of the practices described above, and to develop recommendations to build capacity among host nations to diversify their sources of investment and financing in order to minimize the potential negative impacts of an overreliance on Chinese investments and financing. Our research did not turn up many clear examples of such behaviors, but we did identify some other topics of concern that have important implications for host nations.
Research Approach

Our analysis involved a case study approach in which we examined Chinese foreign investments and financing in three subsectors. The subsectors we examined are coal-fired power plants, electricity transmission and distribution infrastructure associated with the Global Energy Interconnection (GEI) initiative, and seabed mining. These case study topics and the regions of focus were selected at the behest of the sponsor, the U.S. Department of State’s Global Engagement Center. The GEI and seabed mining case studies were selected as relatively understudied examples of Chinese investment and financing activities, whereas the coal case study was selected because China announced in 2021 that it would stop supporting overseas power plants abroad, raising questions about China’s intention to follow through. The case study topics and countries are listed in Table 1.1.

Table 1.1. Case Study Topics and Countries

<table>
<thead>
<tr>
<th>Investment Subsector</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal power plants</td>
<td>Indonesia, Pakistan, South Africa</td>
</tr>
<tr>
<td>Electricity transmission and distribution infrastructure</td>
<td>Brazil, Chile, Peru, Argentina, Mexico</td>
</tr>
<tr>
<td>Seabed mining</td>
<td>Global</td>
</tr>
</tbody>
</table>

We used a multimethod approach that consisted of a review of relevant literature, an analysis of available databases on Chinese foreign investments, and in-depth interviews with representatives from a variety of types of stakeholder organizations. Interview participants were identified through various means, including referrals from State Department staff, identification from the literature, and referrals from interview participants. Given the sensitive topic of the analysis, all interviews were conducted on a not-for-attribution basis to encourage candid responses. Consequently, we report interview statistics at an aggregated level among six stakeholder organization types (Table 1.2).
Table 1.2. Interview Statistics

<table>
<thead>
<tr>
<th>Organization Type</th>
<th>Coal Power</th>
<th>Electricity Infrastructure</th>
<th>Seabed Mining</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intergovernmental</td>
<td>5</td>
<td>1</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>U.S. government</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Other government</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Industry</td>
<td>3</td>
<td>6</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Expert*</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Watchdog/press</td>
<td>4</td>
<td></td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>18</td>
<td>19</td>
<td>52</td>
</tr>
</tbody>
</table>

* Expert = think tank, academic, consultant, trade group, non-watchdog/press nongovernmental organization.

As part of our approach to select interview participants, we deliberately aimed to include the Chinese perspective. As a result, we reached out to Chinese experts and stakeholders (including several Global Energy Interconnection Development and Cooperation Organization [GEIDCO] officials and Chinese investors in the energy sector in Latin America for Chapter 3), but they did not respond to our requests for interview.

Organization of This Report

Chapters 2–4 present our case studies. In Chapter 2, we present a review of Chinese foreign investment and financing in coal power plants and how those have changed since China announced a moratorium on such investment and financing. In Chapter 3, we present an overview of the GEI initiative overall and at the local level in Brazil, Chile, Argentina, Peru, and Mexico, followed by the main Chinese investments and financing in the power sector in these countries and concerns associated with them. In Chapter 4, we examine China’s deep- and distant-sea exploration and seabed mining activities and the concerns that these activities have raised. In Chapter 5, we provide our conclusions and recommendations.
Chapter 2. Chinese Support for Overseas Coal Power Plants

Introduction

On September 21, 2021, Chinese leader Xi Jinping, speaking before the United Nations (UN) General Assembly, promised that China would no longer build new coal plants abroad. Xi noted specifically, “China will step up support for other developing countries in developing green and low-carbon energy, and will not build new coal-fired power projects abroad” (Volcovici, Brunnstrom, and Nichols, 2021).

This pronouncement, reportedly hailed in Chinese state-funded media (Carbon Brief, 2021), set the climate world abuzz because China had served as the world’s foremost financial backer and builder of coal plants abroad. At the time of this writing, China has helped build 382 coal-fired power plants, with a total of 124,196 MW (or 124 GW) of power (see Figure 2.1). Of these plants, 231 (representing 56,956 MW of power) were developed with subcritical technology, which provide the least amount of power per coal expenditure and produce the highest CO₂ emissions when compared with supercritical or ultra-supercritical plants (International Energy Agency, 2020).
Figure 2.1. Total Operating Power from Chinese Supported Coal-Fired Power Plants, 2022

![Chart showing total operating power from Chinese supported coal-fired power plants, 2022]

SOURCE: Center for Research on Energy and Clean Air (CREA) China Master List data set, which is based on the Global Energy Monitor Global Coal Plant Tracker (GCPT) data set (Global Energy Monitor, undated). The GCPT catalogs every operating coal-fired generating unit, every new unit proposed since 2010, and every unit retired since 2000.

NOTE: Countries with 300 MW of China-assisted coal power or less are not shown and include Bosnia and Herzegovina, Guatemala, Kyrgyzstan, Zambia, Nigeria, Chile, Brunei, Kazakhstan, Uzbekistan, Madagascar, Myanmar, Poland, and Mongolia.

As major policy pronouncements often go, many details of the Chinese policy shift were absent from Xi’s speech, with many analysts speculating as to the meaning of the key words of the speech: “will not build new coal-fired power projects abroad.” First, does the phrase “will not build” include financing coal-fired power projects as well as construction? Does “new” only include plants that that were not announced as of Xi’s speech, or does it include plants that were announced but are awaiting financing or permits (Baxter, 2021)? At the time of the pronouncement, an analysis of the Global Energy Monitor’s Global Coal Project Finance Tracker by Tom Baxter identified 44 coal-fired power plants across 20 countries that had not yet entered construction nor secured financial loans.² These plants represented 42.2 GW of capacity (Baxter, 2021).

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² As explained in Baxter, 2021,

In their analysis released this week, GEM [Global Energy Monitor] estimated that the cancellation of all 44 plants would see cumulative lifetime savings of over USD 130 billion, USD 50 billion of which would come from construction costs and over USD 80 billion from fuel and operational costs over the lifetime of the plants. They argue that the USD 130 billion saved should be redirected into renewable energy investments.

Lastly, GEM estimated that cancellation of the plants would reduce global coal demand by 30 million tonnes per year. Over the plants’ lifetime that would equal 1,100 million tonnes, which would prevent an estimated 8,000 million tonnes of carbon dioxide being emitted into the earth’s atmosphere. That’s great news for the climate, but awful news for coal miners.
In this case study, we seek to further explore this issue and examine how and to what extent China plans to follow through with Xi’s September 21 pledge. We examine the history of Chinese support for coal-fired power plants and the potential future ramifications in three countries: Indonesia, Pakistan, and South Africa.

The case study primarily draws on a review of the literature and on analyses of the Global Energy Monitor GCPT data set and a variation of this data set developed by CREA. We also interviewed 15 experts on Chinese support for overseas coal-fired power plants. These interviews helped provide direction for analysis, though (with a few exceptions) we supplanted citations of the interviews with citations of published documents.

A Downturn in Coal Power Development

Even before Xi’s announcement, a movement was afoot in China to limit support for overseas coal-powered energy. In 2021, although three overseas power plants were announced by the Chinese government before Xi’s speech, no new overseas coal projects received BRI financing or investment (Nedopil Wang, 2022). And in 2020, China did not make any new announcement for Chinese-financed coal projects (Nedopil Wang, 2021).

In addition, many of the coal-fired power plants backed by China had been subject to cancelations and delays. Energy analyst Christoph Nedopil Wang notes that from 2014 to 2020, there were about $160 billion of Chinese-backed coal-fired power plants being planned or announced outside China; of those, however, more than $65 billion were shelved, mothballed, or canceled, with other projects seeing delays in construction (Nedopil Wang, 2021). In addition, from 2017 to 2021, 4.5 times as much coal-powered energy capacity was shelved or canceled than was entered into construction (Suarez, 2021). On top of these reversals, 2020 was the first year that saw a majority of China’s energy investments and financing turn to renewable sectors of solar, wind, and hydro (Nedopil Wang, 2021).

These changing trends have been attributed to a variety of causes. According to Nedopil Wang, 2021, solar power costs, for example, have dropped by 80 percent in ten years, while financing cost for coal has increased by 38 percent. In addition, the growth of carbon pricing initiatives has made coal financing even less competitive, and electricity from new coal-fired power stations is 500 percent more expensive than that from new solar-powered plants (Nedopil Wang, 2021). Nedopil Wang, 2021, notes that “Institutions engaged in coal-related assets see themselves increasingly exposed to stranded asset risks: it simply becomes cheaper to produce electricity with alternative sources and less competitive to produce it with coal” and that, in many cases, it is “cheaper to mothball existing coal-fired power plants and invest in new solar and wind energy, rather than burning more coal and—with it—cash” (Nedopil Wang, 2021, p. 14).
Chinese regulatory authorities have also steadily moved away from supporting the overseas development of coal-fired energy. On July 16, 2021, the Chinese Ministry of Commerce (MOFCOM) and the Ministry of Ecology and Environment (MEE) issued the “Green Development Guidelines for Foreign Investment and Cooperation.” Both MOFCOM and the MEE reportedly play central roles in overseeing Chinese overseas projects, with the MOFCOM serving to regulate Chinese projects overseas and the MEE providing a supportive role to policy development.3

The guidelines stipulate, “We must stay committed to the new development concept, striving for the strong awareness of green development, efficient use of resources, strict protection of the environment and effective control of carbon emissions” (Ministry of Commerce and Ministry of Ecology and Environment of the People’s Republic of China, 2021).4 The guidelines specifically encourage Chinese businesses to “embed the ‘green development concept’ throughout the entire process of foreign direct investment and cooperation” (Nedopil Wang and Tang, 2021). It also “encourage[s] companies to adopt international or Chinese standards in investing activities where local laws and regulations are non-existent or too lenient” (Ministry of Commerce and Ministry of Ecology and Environment of the People’s Republic of China, 2021). This indicates a movement away from Chinese support for building high-polluting subcritical power plants, which are permitted in many of the overseas countries that China supports but, notably, are not permitted in China, which has much stricter environmental standards.

Six months later (in January 2022), MOFCOM and the MEE issued another set of recommendations, named the “Guidelines for Ecological and Environmental Protection of Foreign Investment Cooperation and Construction Projects” (Ministry of Ecology and Environment of the People’s Republic of China, 2022). These guidelines further pushed Chinese companies to forgo overseas subcritical coal power, noting that “where local regulations are insufficient, companies are encouraged to apply international or Chinese environmental rules and standards” (Nedopil Wang, De Boer, and Danting, 2022).5

On March 28, 2022, the Chinese National Development and Reform Commission (NDRC), an economic planning agency in the Chinese government, issued a policy that offered the “first real clarity” regarding how the Chinese would implement Xi’s 2021 pledge (Boston University Global Development Policy Center, 2022). The policy, titled “Opinions on the Joint Implementation of

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3 The MEE’s stated mission is to “improve environmental quality and build a beautiful China which enjoys blue skies, green land and clean water” (Ministry of Ecology and Environment of the People’s Republic of China, undated). It provides what Nedopil Wang and Tang, 2021, describes as “concepts and knowledge.”

4 In characterizing “green” energy, the document specifically refers to “clean energy such as solar, wind, nuclear and biomass energy,” as well as “low-carbon, secure and efficient energy mix.”

5 These previous guidelines were entitled “Guidelines for environmental protection in foreign investment and cooperation,” issued by the ministries of commerce and of ecology and environment.
Green Development in the Belt and Road Initiative,” was released by joint statement from the NDRC and the Chinese Ministry of Foreign Affairs, MEE, and MOFCOM on greening the BRI. The policy reinforces Xi’s September 2021 statement, emphasizing a goal to “completely stop new overseas coal power projects” (China Energy News, 2022). It also encourages relevant enterprises to strengthen the clean and efficient utilization of coal, adopt advanced technologies such as efficient desulfurization, denitrification, dust removal, and carbon dioxide capture, utilization and storage, and upgrade energy-saving and environmental protection facilities. (China Energy News, 2022)

The policy also offers a broad and expansive goal of supporting overseas green energy infrastructure and development.

Highlighting the importance of this new policy statement, Kevin Gallagher, director of the Boston University Global Development Policy Center, noted that the policy came “from the highest levels and is mainstreamed across all the leading Chinese agencies engaged in overseas economic activity” (Boston University Global Development Policy Center, 2022). Isabella Suarez at CREA observed that the NDRC Guidelines should signal the end of new overseas coal, and bring host countries and developers to the table to renegotiate. It marks another strong signal that the tide has fully turned on coal, and that the losses that could be associated with further developments are likely to outweigh the short term gains. (Suarez, 2022)

What Is the Impact of President Xi’s Policy Statement?

To understand the impact of Xi’s September 2021 announcement, we analyzed the Global Energy Monitor’s GCPT, which tracks the development of individual coal plants and is updated biannually in January and July. This data set allows us to assess changes in the status of developing plants from the time Xi made his September statement. Findings from this data set have been reported by Isabella Suarez and CREA (Suarez, 2022).

Figure 2.2 lists the change in status since Xi’s statement for coal plants that have not reached full operation. Note there are five phases that plants undergo in the development process. These are announced, pre-permitted, permitted, construction, and operational. Further attesting to China’s movement away from support for overseas coal, more than 16,110 MW of planned coal-fired power (from a total of 40 plants) had been shelved, canceled, or decommissioned. Most of this planned power was deducted from the planned inventories of Vietnam, India, and Indonesia. In addition, 3,739 MW of power from 17 plants transitioned from the construction phase to

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6 The policy provides “the impetus for Chinese and host country financial institutions and developers to reexamine the 86 GW (81 plants) of Chinese-backed overseas coal that are currently in the construction and pre-construction pipeline” (Suarez, 2022).
operation. This is not surprising because it is accepted among many analysts interviewed for this study that China’s pledge would not shutter plants in the construction phase.

However, several other plants have continued to move forward in the development phase despite Xi’s pledge. For example, 7,200 MW of power (15 plants) entered the pre-permit phase, and 5,590 MW of power (13 plants) entered the construction phase. The vast majority of the newly pre-permitted power hailed from Bangladesh, while the vast majority of the new in-construction power hailed from Bangladesh and Indonesia. Most significantly, China has initiated two new projects since Xi’s announcement. Both of these projects are taking place in Indonesia.

**Figure 2.2. Changes in Status for Chinese-Supported Coal-Fired Power Plants, 2022**

![Bar chart showing changes in status for Chinese-supported coal-fired power plants.](image)

**SOURCE:** CREA China Master List data set, which is based on the Global Energy Monitor GCPT data set. The GCPT catalogs every operating coal-fired generating unit, every new unit proposed since 2010, and every unit retired since 2000.

**South Africa**

China has helped develop more than 7,100 MW of supercritical coal-fired power in South Africa, with another 2,380 MW currently under construction and 3,000 MW listed in the pre-permit phase, though this pre-permit project appears all but certain to be canceled (Figure 2.3).
Figure 2.3. Chinese Support for South African Coal Power

Source: CREA China Master List data set, which is based on the Global Energy Monitor GCPT data set. The GCPT catalogs every operating coal-fired generating unit, every new unit proposed since 2010, and every unit retired since 2000.

South Africa ranks seventh in the world in terms of domestic consumption of coal. Although scholarship addressing the reasons for the high coal consumption rates in South Africa is limited, its large domestic coal reserves likely play a major factor. South Africa has the eighth largest coal reserves in the world, with 35 billion tons of coal reserves, as of 2016 (Worldometer, undated). Close ties between the coal industry and South African political elites, as well as the influence of domestic unions, have helped limit coal phaseouts (Williams, 2020; Yaowen, 2021).

South Africa has been described as the world’s 14th largest carbon polluter, drawing more than 80 percent of its electrical power from coal (Yaowen, 2021). In a region of South Africa called Highveld, where many of the country’s coal plants are located, estimates suggest that the pollutants sulfur dioxide and nitrogen dioxide are ten times higher than what is considered safe by the World Health Organization (Andrew Gray, 2019). The pollution reportedly causes hundreds of premature deaths a year (Williams, 2020). Although the country has significant wind and solar reserves, renewables accounted for only 16.1 percent of its energy development in 2020.

One major international initiative may play a critical role in helping South Africa kick the coal habit. In November 2021, the United States, Germany, the United Kingdom, and the European Union announced the Just Energy Transition Partnership, which would contribute $8.5 billion over the next three to five years to help South Africa reach the goals of the Paris Agreement. The plan would help South Africa retire coal plants early, support coal-dependent regions, and turn to renewable energy (Plumer, 2021; Yaowen, 2021).
Impact of Xi’s Statement and NDRC Guidelines for South Africa

Figure 2.4 summarizes the potential impact of the NDRC guidelines on Chinese support for South African coal-powered energy, as coded by CREA analysts.

Nearly 2,400 MW of power is under construction in South Africa at Kusile Power Stations 4, 5, and 6. It is unlikely that China will break its contract and cease production. However, the NDRC guidelines give Chinese firms the opportunity to withdraw from projects if sufficient reason exists, and the guidelines could spur upgrades to the plants.

The CREA data set also suggests that 3,000 MW of power at the Musina-Makhado power station should be stopped, according to the NCRC guidelines, and China appears to be doing so.

The Musina-Makhado power station was intended to serve the Musina-Makhado Special Economic Zone, which operates various heavy industries (Bega, 2021). On November 9, 2021, China indicated that it would withdraw funding for the new plant. The Chinese ambassador, in a letter to South African leadership, directly referenced Xi’s announcement of no new overseas coal projects at the UN General Assembly in announcing China’s decision to withdraw funding from the plant. The ambassador also stated that China would “vigorously support African countries, including South Africa, in developing green and low-carbon energy” (Bega, 2021). In late February 2022, the plant was granted permits necessary for it to begin construction, but it remains presumed canceled and potentially will be replaced by solar power plants (Cronje, 2022; Global Energy Monitor, 2022; Sguazzin, 2022).

Figure 2.4. Potential Impact of the NDRC Guidelines on Chinese Support for South African Coal-Powered Energy

SOURCE: CREA China Master List data set, which is based on the Global Energy Monitor GCPT data set.
NOTE: The x-axis categories are drawn from CREA analysis and are based on CREA’S interpretation of Chinese policy. These data are based on an analysis of the status of Chinese-supported power plants in January 2022.
Indonesia

China has helped develop 21,657 MW (with 97 power plants) of coal-fired power in Indonesia, of which 12,376 MW is of the high-polluting subcritical technology. Another 29 power plants offering 8,760 MW of power are under construction, 31 plants (5,520 MW) are in the pre-permit phase, and another two (1,320 MW) are in the permitted stage. More than 12,500 MW have been canceled (Figure 2.5). Indonesia ranks as the eighth largest carbon emitter and has nearly 39 billion tons of coal reserves (Nangoy and Surroyo, 2021). Less than 12 percent of Indonesia’s power generation comes from renewable resources.

The National Electricity General Plan calls for Indonesia to reach 23 percent power generation from renewables by 2025, though the number is less than 12 percent now. According to Indonesia’s ten-year energy plan, renewables will account for half of total power capacity, and coal will be reduced to 34 percent (Tam, Faroi, and Batih, 2021).

Figure 2.5. Chinese Support for Indonesian Coal Power

Numerous factors contribute to this dependence on coal. Like South Africa, Indonesia has high reserves of coal, estimated at 30 billion tons. And the country has policies that favor coal over other forms of energy. One policy, for example, requires that coal miners provide one-

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7 Overall, these high domestic reserves of coal have helped protect the Indonesian energy market from high international prices of energy commodities, such as liquified natural gas and coal. However, high prices for oil, brought about partly by the Russian war in Ukraine and the resultant international sanctions, have hurt Indonesia (Made Raditya Margenta and Yusgiantoro, 2022).
fourth of their annual production to the state utility provider, PLN, at below market rates (Nedopil Wang, Yue, and Volz, 2022). Indonesia further requires that 40 percent of the materials and services for solar projects be made or produced in Indonesia. It also caps the purchase price for renewable energy at 85 percent of the average cost of overall energy generation (which includes coal); hence, as Gallagher et al., 2021, Appendix C, p. 4, notes, it will “never be possible for renewables to compete on a level playing field in the Indonesian electricity market.”

China is seen as the ideal provider of loans and expertise. China’s BRI has created willing Chinese investors (Tritto, 2021), and China has been willing to provide the low-cost subcritical technology that is allowable under Indonesia’s lax environmental standards. China is also willing to provide Indonesia with what Indonesia asks for. As one Indonesian government official said to Gallagher et al., “If we ask for coal, they [China] will sell us coal. If we ask for solar, they will sell us solar” (Gallagher et al., 2021, p. 4). A similar observation has been made for Pakistan as well (see below) and suggests that Chinese support for coal is driven by host country demand rather than being pushed by China.

The development of coal-powered energy in Indonesia has created several challenges. Coal power generation contributes to 35 percent of Indonesia’s 1,262 gigatons of CO$_2$ emissions annually (Nangoy and Surroyo, 2021). The rapid expansion of coal power, particularly in Java, has created excess power capacity (Hamdi and Adhiguna, 2021a), and the loans accrued to develop this energy resource have been described as a “financial straightjacket” (Hamdi and Adhiguna, 2021b).

**Impact of Xi’s Statement and NDRC Guidelines for Indonesia**

Figure 2.6 summarizes the potential impact of the NDRC guidelines on Chinese support for Indonesian coal-powered energy.

Xi’s announcement that China will stop building new coal plants abroad, together with the new NDRC guidelines, provide a new opportunity for Indonesia to limit further expansion of coal-powered energy and turn to cheaper renewable energy. CREA has observed that this should result in the scrapping of 600 planned megawatts of power for two new plants associated with the Jambi power station that are in the early stages of planning and have neither the financing nor the necessary permits (Suarez, 2022).

There are another 8,610 MW of power that are in construction. As noted, China is unlikely to break contract on these in-construction plants, though NDRC guidelines give Chinese firms the opportunity to withdraw from projects if sufficient reason exists, and the guidelines could spur upgrades to the plants. Such guidelines, if enacted, could play a significant role in revising or potentially scrapping 11 (1,930 MW) subcritical coal power plants currently under construction.

There are another 9,850 MW of power that have received the appropriate permits and financing but have not entered construction. CREA refers to such projects as representing a “gray” category because it is unclear whether China will consider these projects to be “new.” Nearly 8,000 MW of power in this category represent captive coal plants that are tied to
industrial developments (Suarez, 2022). Overall, the clouded status of these projects should provide an opportunity for the international community to seek clarity from the Chinese government and to urge that such projects do not go forward.

**Figure 2.6. Potential Impact of the NDRC Guidelines on Chinese Support for Indonesian Coal-Powered Energy**

![Bar chart](chart.png)

**SOURCE:** CREA China Master List data set, which is based on the Global Energy Monitor GCPT data set. **NOTE:** The x-axis categories are drawn from CREA analysis and are based on CREA’S interpretation of Chinese policy. These data are based on an analysis of the status of Chinese-supported power plants in January 2022.

**Two New Chinese-Supported Coal Plants in Indonesia**

Critically, it appears that China is supporting two new projects for which no public record existed as of the time of Xi’s September UN speech. As Isabella Suarez notes, these projects “risk crossing the red line” of Xi’s pledge to not build new coal plants overseas (Suarez, 2022).

On February 14, 2022, Tianjin Electric Power Construction signed an agreement to build a 1,520 MW power plant on Indonesia’s Obi island that would support an industrial site focused on laterite nickel ore processing. In its analysis, CREA noted that specific information on the call for tenders or the submission of the bid was unavailable but that it typically takes only one to two months from the time of the submission to the selection of tenders. This would suggest that Energy China’s bid was “submitted and accepted well after Xi’s announcement” (Suarez, 2022).

In addition, China Energy procured a tender for a steel and nickel processing site at Morawali Industrial Park in December 2021. This project, located at the Sulawesi Laporta Power Plant, would serve three plant units that each provide 380 MW of power. The project was limited to an engineering and equipment procurement, though CREA reporting suggests that full engineering, procurement and contracting firm involvement may not be far off.
One analysis by *China Dialogue* contributor Ian Morse notes that three major nickel industrial parks—Obi island, Morowali, and Weda Bay—seek a total of 14 coal power plants with 71 turbines and will double the nickel-supporting coal power in the country. Such projects are often hailed as environmental, given the role of nickel and aluminum in supporting production of lithium-ion batteries and solar panels, respectively. The financing for such projects often lack transparency because the produced electricity remains off the public electrical grid (Morse, 2022). Further, although coal power is a preferred energy source for industrial plants because of its ability to provide consistent 24-hour-per-day power, the potential does exist to draw instead on a mix of solar and hydropower energy (Morse, 2022).

**Pakistan**

In Pakistan, China has supported a total of 4,600 MW of coal power capacity from eight power plants, with another 7,200 MW of power from 14 plants in some form of development. More than 8,200 MW of Chinese-supported coal power from 18 plants have been canceled, shelved, or postponed. Only 600 MW of the in-capacity coal power come from subcritical technology, with the vast majority coming from supercritical technology (Figure 2.7).

![Figure 2.7. Chinese Support for Pakistani Coal Power](image)

**Pakistan**

Pakistan coal power has its roots in the 2013 national election. By 2013, Pakistan was suffering from a nationwide energy crisis (Kazmi, 2013), and Nawaz Sharif and his Pakistan Muslim League–Nawaz party won that year’s national election with a campaign heavily grounded on promises to deliver badly needed electrical power to the general populace (Pakistan
Muslim League Central Secretariat, 2013). Coal was considered an ideal way to deliver on these campaign promises. Pakistan holds the 16th largest repository of coal in the world and was even heralded as an energy source of choice by the U.S. Agency for International Development, which helped discover the coal deposits (Advanced Engineering Associates International, 2010; Weynand, 2007). When China’s BRI reached Pakistan through the China-Pakistan Economic Corridor (CPEC) initiative, coal-powered energy was at the top of the Sharif administration’s wish list. China offered funding, engineering know-how, labor, and ongoing technical support, and coal provided a way to quickly deliver on Sharif’s campaign promises (Bhandary and Gallagher, 2022).

One challenge confronting Pakistan’s use of coal is the quality of the coal itself. Feasibility studies for the first CPEC-supported coal power plant showed that the coal reserves for the planned 1,320-MW supercritical plant were too polluted with sulfur and lime. This has required Pakistan to import coal from Indonesia, South Africa, or Australia and to develop new plans for subcritical power plants that can make use of the lignite coal (Port Qasim Electric Power Company, 2014).

As of 2020, wind and solar contributed to only 4 percent of Pakistan’s total energy capacity. Initial CPEC support for renewable energy has suffered some challenges, such as desert sands coating the solar panels of a 400-MW plant in Bahawalpur, Pakistan. However, feasibility studies conducted by the World Bank suggest that Pakistani access to sun and wind make the country ripe for expanded renewable energy (Reuters, 2016; World Bank, 2020a). The report concluded that solar and wind power should make up 30 percent of Pakistan’s power supply by 2030 and that doing so could save Pakistan $5 billion over the next 20 years (World Bank, 2020b).

The Pakistani reliance on Chinese-supported coal has produced several challenges. First, Chinese lenders, in an effort to mitigate the financial risk of the loans, included special terms that increased cost (Bhandary and Gallagher, 2022). As of April 2021, Pakistan’s debt to China has ballooned to $24.7 billion, with the debt accounting for more than one-quarter of its overall debt load (Younus, 2021). The growing coal-related debt has been described as an “economic disaster” (Nicholas, 2022), and Pakistan has asked China for debt relief (Rana, 2021). In addition, coal accounts for 19 percent of Pakistan’s carbon emissions, which is a challenge because Pakistan has been ranked as the fifth most affected country by climate change (Butt, Myllyvirta, and Dahiya, 2021).

Amid these factors, Pakistan is experiencing an energy crisis. Partly influenced by the war in Ukraine, prices for imported oil, coal, and liquified natural gas have risen significantly. These price hikes, combined with currency lows (compared to the dollar) and rising debt have resulted in a significant gap between energy supplies and demand, with daily power outages in urban areas last four to six hours (Rana, 2022; Shahzad, 2022). Such a crisis, if it continues, may

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8 Interview with academic expert, March 31, 2022.
incentivize Pakistan to continue development of subcritical coal power plants that can feed off Pakistan’s abundant resource of lignite coal.

**Impact of Xi’s Statement and NDRC Guidelines for Pakistan**

Figure 2.8 characterizes the standing of Pakistan’s in-development coal plants. Six plant units representing 3,300 MW of coal are under construction and will likely be completed, though new NDRC guidelines leave open the possibility that China can take steps to improve the emissions quality of these plants.

Another 1,290 MW of power from four power stations is in the gray area category. These plants, though not yet under construction, have the appropriate permits and financing and could presumably go forward. Finally, 2,640 MW of power from four plants should be stopped. These projects are in the early phases of development and appear to meet the NDRC criteria for China to cease development. These include two plants associated with the Keti Bandar power station and two plants associated with the Thar Block VI power station.

**Figure 2.8. Potential Impact of the NDRC Guidelines on Chinese Support for Pakistani Coal-Powered Energy**

![Bar chart showing potential impact of the NDRC guidelines on Chinese support for Pakistani coal-powered energy.](chart.png)

**SOURCE:** CREA China Master List data set, which is based on the Global Energy Monitor GCPT data set.

**NOTE:** The x-axis categories are drawn from CREA analysis and are based on CREA’s interpretation of Chinese policy. These data are based on an analysis of the status of Chinese-supported power plants in January 2022.

Nine months before Xi announced the withdrawal of Chinese support for new coal power plants, Pakistani Prime Minister Imran Khan made his own no new coal pledge. Speaking before the Climate Ambition Summit 2020, Khan stated, “We have decided we will not have any more power based on coal” (Gul, 2020).
Two power plants are worth watching to determine the seriousness of the Pakistani and Chinese pledges. The first is the 300-MW subcritical Gwadar power plant situated on a peninsula of the Gwadar Port in Pakistan’s Balochistan province. The project, which would rely on imported coal, has reached the permit phase, though it has reportedly not achieved financial closure (Pei-Hua Yu, 2021).

The second is two units of the Thar Block VI power station, which is a planned supercritical 1,320-MW coal power plant in Sindh Province and which will accompany another 1,320-MW Thar Block 1, which is under construction (Gul, 2020). Thar Block VI is in the pre-permit phase and is labeled as “should be stopped” by CREA.

It appears, however, that the Gwadar plant may move forward: Imran Khan traveled to China in February 2022, and it is reported that he received assurances from the Chinese government that the plant would continue (Rana, 2021). Continued development of the plant and its imported coal also reportedly goes against Pakistan’s National Electricity Policy plan, which has signaled an intent to shift Pakistan’s energy power supply to more domestic resources (Nicholas, 2022). There are also suggestions that the Thar Block VI station will move forward, though there is limited reporting to confirm this (Nicholas, 2022).

Summary

Overall, China appears to have continued to reduce its support for overseas coal-fired power plants. In addition to its cessation of financing new coal projects in 2020 and the high rate of project cancelations from 2017 to 2021, over 16,000 MW of planned coal-fired power were shelved, canceled, or decommissioned in the months following Xi’s September 2021 announcement. China’s new NDRC guidelines released in spring 2022 provided further evidence that China intends to cease support for new overseas coal power, improve and upgrade existing plants, and shift to a greater reliance on renewable energy. Such policies appear to be in line with the basic economics of coal-powered energy, which has not been able to compete with the dropping prices of renewable energy.

Still, areas of concern remain. First, even after Xi’s September statement, Chinese firms initiated support for two new coal-fired power plants in support of industrial plants in Indonesia. Such efforts appear to directly violate even liberal interpretations of China’s pledge to not build new overseas coal plants.

Second, since Xi’s speech, several plants have moved forward in the development process, with nearly 2,000 MW of worldwide power moving into the pre-permit phase and nearly 3,000 MW moving into the construction phase. It is also remains unclear exactly how China will follow through on its promulgated guidelines. For example, data from CREA identified 11,140 MW of power in Indonesia, Pakistan, and South Africa that have permits and financing but have not yet begun construction. Under a strict interpretation, such plants should also be canceled, though it is likely that some will move forward.
Chapter 3. Electricity Transmission and Distribution in Latin America

From 2010 to 2020, the number of Chinese high-level visits to countries in Latin America more than doubled when compared with the previous decade, rising from 105 to 229.\(^9\) Chinese economic presence in the region also deepened, with China becoming the number one foreign investor in Brazil and the main foreign trade partner for Brazil, Peru, and Chile, replacing the United States (Cariello, 2021).\(^10\) The increased Chinese diplomatic and economic presence in the region over the past decade has raised concerns regarding China’s attempts to gain influence in the region across all four domains of national power: informational, military, diplomatic, and economic.

In this case study, we examine where Chinese enterprises have a presence in Latin America and the Caribbean in power transmission and distribution companies that are relevant to the GEI initiative that Beijing proposed in 2015 to interconnect independent national grids into a global web of power transmission systems (Cornell, 2019; Delina, 2021, p. 1). We also examine how Chinese companies (particularly, state-owned enterprises [SOEs]) have established their presence in the respective countries’ energy sectors (e.g., acquisition of companies, new or greenfield investments, and loans) and identify any concerns associated with the presence of Chinese companies and how they might support the implementation of GEI in Latin America and the Caribbean.

We conducted a review of open-source documents related to GEI, GEIDCO, and Chinese companies that have a presence through investments or loans in power transmission and distribution in Latin America and the Caribbean. During this mapping exercise, we identified Brazil, Chile, Peru, and Argentina as the countries where Chinese companies made and pledged some of the largest investments and financing in power transmission and distribution, as shown in Table 3.1.

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\(^9\) For details, see Table 2.1 in Chindea et al., forthcoming.

\(^10\) For Brazil, see “China Confirms Its Position as the Main Trade Partner of Brazil,” 2021; for Peru, see McDonnell and León, 2021; and for Chile, see Magnet, 2021.
Table 3.1. Summary of Top Chinese Investments and Financing in Power Transmission and Distribution in Latin America and the Caribbean from 2010 to January 2022

<table>
<thead>
<tr>
<th>Investment</th>
<th>Brazil</th>
<th>Chile</th>
<th>Peru</th>
<th>Argentina</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power transmission</td>
<td>$4.7 bln</td>
<td>$1.3 bln</td>
<td>-</td>
<td>$1.1 bln^a</td>
</tr>
<tr>
<td>Power distribution</td>
<td>-</td>
<td>$2.2 bln</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Combined power transmission and distribution</td>
<td>-</td>
<td>$3 bln</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Combined power generation, transmission, and distribution</td>
<td>12.2 bln</td>
<td>-</td>
<td>$3.6 bln</td>
<td>-</td>
</tr>
<tr>
<td>Total value</td>
<td>$16.9 bln</td>
<td>$6.5 bln</td>
<td>$3.6 bln</td>
<td>$1.1 bln^a</td>
</tr>
</tbody>
</table>

SOURCES: For Brazil power transmission, see Plena Transmissora acquisition for $1.72 billion (Global Times, 2010); Xingu Rio Transmissora de Energia, a subsidiary of Chinese state-owned State Grid Corporation of China, construction of Belo Monte II for $2.14 billion (NS Energy Business, undated); and the purchase of 14 transmission lines from the Spanish group Actividades de Construccion y Servicios for $945 million (Batista Barbosa, 2020, p. 27). For Brazil combined power generation, transmission, and distribution, see CPFL acquisition in Batista Barbosa, 2020, p. 7. For Chile, see Ellis, 2021a: China Southern Power Grid purchase of Transelec for $1.3 billion for power transmission, State Grid purchase of Chilquinta Energia for $2.23 billion for power distribution, and State Grid purchase of Compañía General de Electricidad for $3 billion for combined power transmission and distribution. For Peru, China Yangtze Power International purchase of Luz del Sur for $3.59 billion for combined power generation, transmission, and distribution (Sempra Energy, 2020). For Argentina, see BNamericas, 2022.

^a Under discussion as of January 2022.
^b Acquisition included a power generation component.

Furthermore, a recent analysis identified Brazil, Chile, Peru, and Argentina as the locus of strategic competition among the United States, China, and Russia in Latin America (Chindea et al., forthcoming).11 As a result, we focused our analysis on these four countries and Mexico, which we added because of the relevance of the Mexican power grid to the interconnection of North American and Central American power grids in the context of GEI (Lei and Qiankun, 2020). Moreover, in the context of developing GEI, Mexico together with Northern Chile is one of the planned large-scale solar generation bases, with an estimated generation capacity of 250 GW by 2050 (GEIDCO, 2020, p. 5; India Smart Grid Forum, undated, p. 3); in 2020, Beijing stood up a national committee in Mexico to advance GEI implementation (GEIDCO, undated b; National Institute of Electricity and Clean Energies, 2021).

Although we focus our analysis on these five countries where Chinese investments and financing in power transmission and distribution are concentrated, the five countries do not represent independent case studies. This chapter represents a self-standing case study that our sponsor selected based on its interest. Although Chinese presence in the energy sector in Latin America includes power generation as well, we focused primarily on power transmission and distribution at our sponsor’s request.12 However, because of the importance of renewable energy

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11 For details, see Table 2.1 in Chindea et al., forthcoming.
12 The exception is the inclusion of a power generation component associated with the State Grid Corporation of China’s acquisition of Brazilian CPFL, for which it is difficult to untangle the value of individual generation, transmission, and distribution components in the context of the acquisition.
for GEI implementation, we included some references to renewable power generation projects for which Chinese SOEs and private companies have ownership.

In this chapter, we introduce GEI and GEIDCO and then discuss GEIDCO’s presence in Latin America and in Brazil, Chile, Peru, Argentina, and Mexico in particular, including a description of Chinese companies’ presence in power transmission and distribution and the concerns associated with Chinese investments and financing in the energy sector. In the last section, we present our conclusions and recommendations for areas of opportunity for capacity-building initiatives that the U.S. State Department can implement in countries in Latin America that either have hosted or are considering hosting Chinese investments and financing in the energy sector and beyond. Although our findings and recommendations are rooted in research focused on Chinese SOE investments and financing in the energy sector in five key Latin American countries, they are likely to provide useful lessons and insights for other countries in the region and across the world that have or are considering Chinese SOE investments and financing, especially in the power sector.

Overview of GEI and GEIDCO

Beijing announced the GEI initiative in September 2015, followed by the establishment of GEIDCO in March 2016. GEIDCO is an international organization whose main mission is to promote GEI (Cheng, 2018, p. 15; Yang, 2019, p. 8). GEI was incorporated into China’s BRI (Downie, 2020, p. 14; Delina, 2021, p. 2), and it is considered to be a very ambitious Chinese initiative “to bring currently fragmented national grids into a regional-to-global webs [sic] of interconnected electricity transmission systems over the next five decades” and to facilitate “a global energy transition from fossil fuels to a largely sustainable energy system” (Delina, 2021, p. 1). GEI’s vision is that electricity “can be generated, transmitted and consumed anywhere in the world; for example, solar energy can be generated in the Sahara Desert and contribute to the energy mix in Europe, Asia, South America or even Australasia” (Aubertin, 2018, p. 34). Beijing anchored GEI and the standing up of GEIDCO into some of the major challenges that the world faces today, “such as resource constraints, environmental pollution, climate change, population without electricity access, health and poverty,” with “the massive consumption of and excessive dependence on fossil energy” being identified as the root cause behind these challenges (Bo, 2019, p. 2).

In this context, GEI aims to bring together three key elements: a smart grid, an ultra-high voltage (UHV) grid, and clean energy. The main function of the smart grid is to integrate “modern smart technologies with respect to advanced transmission, smart control, new energy integration and new energy storage” and to carry out “the intelligent allocation of power resources” (Bo, 2019, p. 6; Yang, 2019, p. 7). It is considered to represent the foundation of GEI (Bo, 2019, p. 6). UHV power transmission, which is considered to be “a specialty of Chinese utilities” (Downie, 2020, p. 7), represents the “backbone framework” and is considered to be key
to GEI (Bo, 2019, p. 7). Last, clean energy is labeled as a GEI priority, with GEI envisioned to be “a major transmission strategy in the future for wind power in the Arctic, solar power in the equatorial region, and centralized and distributed clean power generated from across different countries, continents” (Bo, 2019, p. 8).

According to various GEIDCO presentations, because solar and wind power are intermittent and unevenly distributed geographically, they can be better exploited by integrating them into a large-scale, globally interconnected power grid (Cheng, 2018, p. 10; GEIDCO, 2020, p. 3). In addition, because key renewable energy resources are often far away from load centers (e.g., hydro resources in Patagonia and the Amazon basin are far away from the densely populated areas of Chile and Brazil) and because increasing the line voltage reduces losses across long distances, UHV systems that deliver current at 800 kV–1,100 kV are highly sought after and have been increasingly deployed in recent years (Downie, 2020, p. 12; International Energy Agency, 2016, p. 6; Jun et al., 2020, p. 2). For these reasons, GEI proposes wind, solar, and hydropower generation with transmission across long distances by way of UHV lines interconnected in a grid spanning the entire globe (Bo, 2019, p. 11).

Beijing’s vision regarding the implementation of GEI is a long term and very costly one. Estimated to exceed $50 trillion, GEI implementation is divided into three stages spanning three decades: promoting, by 2035, domestic and intracontinental interconnection; by 2050, intercontinental interconnection; and by 2070, global interconnection (Bo, 2019, pp. 21–22; GEIDCO and Research Center for Sustainable Development, undated, p. 6; Yang, 2019, pp. 13–14). By 2070, all power grids of all countries in the world would be integrated, forming the backbone grid for GEI (see Figure 3.1), which will have nine horizontal and nine vertical (or “9H-9V”) main grids that integrate “large scale clean energy bases and load centers to achieve global allocation of clean energy resource across different time zones and seasons” (GEIDCO, 2020, p. 9) and that draw on the differences in clean resource availability and electricity prices of different regions of the world (GEIDCO and Research Center for Sustainable Development, undated, p. 2).
Some of the benefits associated with GEI include cost efficiencies for the consumer caused by economies of scale;\(^{13}\) resolution of issues traditionally associated with renewable sources, such as volatility, intermittency, temporary power shortages, and surplus power offering (Cheng, 2018, p. 13); economic growth; and promotion of clean energy, reducing global warming. Some of the downsides of GEI include a decrease in energy self-sufficiency and an increase in dependency and risk of disruptions for countries that rely on electricity imported from unstable regions of the world (Aubertin, 2018, p. 36). Especially in light of the Russo-Ukrainian War, there are increasing reservations about becoming dependent on power generation from other countries, which poses problems for cross-border interconnectivity. Although Beijing’s GEI vision is attractive and has obvious advantages, it becomes less attractive when considering its implementation, and some energy sector experts perceive it as too risky.\(^{14}\) More details of the advantages and disadvantages of having a globally integrated grid based on UHV transmission lines are provided in Appendix A.

Although China’s efforts to promote GEI have been very active, GEI implementation has been more modest than what China’s promotional efforts might suggest. More political coordination across various regions of the world is needed to advance plans for regional and global interconnection. Such coordination would require a significant change in governments’, utility companies’, and civilian societies’ view of the cross-border trade in electricity to “a means

\(^{13}\) Interview with U.S. government official, February 25, 2022.

\(^{14}\) Interview with energy sector experts, May 6, 2022.
of improving energy security by expanding sources of supply rather than a threat to their control over a key piece of national infrastructure” (Downie, 2020, p. 30).

Additional challenges that China is likely to face in the context of GEI implementation are related to individual countries’ comfort with (1) allowing China to invest in building UHV power transmission lines and bring the expertise and (2) how the bidding processes are structured. Chinese SOEs that have their government’s backing are able to access capital at nonmarket rates (which are very low or zero) and are likely to feel less pressure than private companies do to make a profit (Sanchez-Badin, Ratton, and Morosini, 2021, p. 124). This government backing allows Chinese SOEs to make bids at lower prices than those of other international competitors, which access capital at market rates and are accountable to shareholders who expect a profit; ultimately, Chinese SOEs end up controlling large parts of some countries’ energy sectors. In the case of large Chinese SOEs that are considered to be “national champions” and too big to fail (e.g., State Grid Corporation of China [SGCC], Huawei, Alibaba), the government in Beijing is more likely to intervene on their behalf with loans and other forms of financial support when needed. In this way, the bidding process often ends up skewed in favor of Chinese government–backed SOEs, with some of the core principles of free market competition eluding some bidding processes. Also, when Chinese SOEs outbid repeatedly other international competitors, they are likely to end up establishing a de facto monopoly in some countries’ economic sectors, further eroding the principles of free market competition and narrowing the pool of foreign investors in the respective countries.

GEI and GEIDCO in Latin America

GEIDCO signed several memoranda of understanding (MoUs) and cooperation agreements with UN agencies (e.g., the UN Economic Commission for Latin America and the Caribbean), other international and regional organizations (e.g., the Latin American Energy Organization, also known as OLADE), governments (e.g., Brazil and Chile), and corporate entities, including major utility providers, such as Brazil’s main utility company, Electrobras (Bo, 2019, p. 20; Delina, 2021, p. 2). According to one of the presentations made to introduce GEI and GEIDCO, Electrobras and the Chinese SOE SGCC are among the founding members of GEIDCO (Yang, 2019, p. 8). SGCC is “the largest utility company in the world” and is “a leading player in energy interconnection promotion and international cooperation,” with the largest network of UHV lines in the world (Cheng, 2018, p. 1; Yang, 2019, p. 19).

According to the documents and literature we reviewed and the interviews we conducted in the region with subject-matter experts (SMEs) in the energy sector, Chinese ownership or presence in power generation, transmission, and distribution in Latin American countries is

15 Interview with U.S. government official, April 20, 2022.
16 For a brief overview on how monopolies erode free market competition, see Amadeo, 2021.
rarely directly associated with GEI or GEIDCO. Although Chinese ownership and involvement in power generation, transmission, and distribution companies can advance Beijing’s GEI agenda in Latin America, the connection between the two is rarely, if ever, made explicit in the context of the public statements that GEIDCO and Chinese officials and investors make. The overall impression among many of the SMEs with whom we spoke for this study is that few local experts and industry professionals in the energy sector in Latin America are aware of GEI and GEIDCO’s existence and activities and that no overt connection is being made with Chinese investments and financing in power generation, transmission, and distribution.

In Latin America, similar to other regions of the world where it has a presence, GEIDCO has a regional committee that oversees several country-based committees (GEIDCO, undated b). The regional committee is located in Santiago, Chile, and the national committees are in Argentina, Brazil, and Mexico (GEIDCO, undated a; GEIDCO, undated b). According to the interviews we conducted and the information available in English on GEIDCO’s website, the national committees promote technical cooperation and the exchange of knowledge and expertise among “leading organizations, enterprises, universities, and research institutions of energy and power sector” (GEDICO, undated b), with GEIDCO producing many technical studies about interconnectivity but not actually playing a direct role in implementing those projects. Overall, GEIDCO seems to be nothing more than a high-level dialogue platform, with the implementation on the ground left to such companies as SGCC and other Chinese SOEs. Many of the Chinese SOEs in Latin America engage with the respective countries independently of GEIDCO; although GEIDCO is, at times, perceived as potentially paving the way for Chinese SOEs, this is not always the case. One of the SMEs we interviewed raised the concern that GEIDCO was not just interested in sharing information but actually was more interested in accessing technological information from the various actors it has associated with in Latin America and other regions of the world, using such information to China’s benefit.

According to the interviews we conducted, even if Chinese investments and financing in the region were not directly connected to GEI and GEIDCO, GEIDCO was active in Latin America from its inception in 2016 until around 2020, when its engagement with the region seemed to stall. The reasons behind the slowdown in engagement are unclear, but they could be related to the outbreak of the coronavirus disease 2019 (COVID-19) pandemic; a change in Chinese

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17 Interview with Brazil energy sector expert, April 13, 2022; interview with U.S. government official, March 1, 2022; and interview with U.S. government official, February 25, 2022.
18 Interview A with Latin America energy sector SME, March 4, 2022.
19 Interview with U.S. government officials, March 18, 2022.
20 Interview with energy sector experts, May 6, 2022; and interview with regional energy sector SME, March 8, 2022.
21 Interview with regional energy sector SME, March 8, 2022.
22 Interview A with energy sector expert, March 4, 2022; and interview with energy sector experts, May 6, 2022.
priorities vis-à-vis investments and financing in Latin America (especially in the context of domestic pushback against foreign investments and loans at a time when some regions of China are still underdeveloped; Soutar, 2022); potential lack of attractive investment opportunities in power transmission and distribution beyond those companies that have already come under Chinese control; and potential pushback from some countries in the region.

Some of the challenges that Beijing is likely to face in the implementation of GEI in Latin America concern

- the extremely ambitious goals and the high level of financial investment needed
- the fact that the interconnection of the South American grid to the global one is projected to happen through its connection to the Central and North American grids
- at a regional level, the fact that political divisions and long-standing local rivalries among countries (e.g., Chile, Peru, and Argentina) are unlikely to allow for a smooth transition to an interconnected regional grid
- the strong determination of countries in the region to defend their national sovereignty and to remain independent.

Although there is value in creating an interconnected grid at a regional level that allows countries such as Chile to export the excess renewable energy to countries such as Argentina, and there have been some attempts in South America for bilateral and regional electric grid interconnection efforts, such as SIESUR (La Integración Energética Regional Del Cono Sur; Yepez and Malagón, 2018), they have been pretty modest and are advancing slowly. So far, only SIEPAC (Central American Electrical Interconnection System), which connects the electric grids of six Central American countries, has been successfully implemented and extended to connect its Central American participants to Mexico to the north and Colombia to the south. The Commission for Regional Energy Integration based in Uruguay is a nongovernmental organizational that works in favor of energy sector interconnection at the regional level and promotes technical cooperation among member states (Comisión de Integración Energética Regional, undated), along similar lines to GEIDCO. In recent years, the Commission for Regional Energy Integration has started to perceive GEIDCO as a rival that is interfering in its

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23 Interview with energy sector experts, May 6, 2022; and interview with expert on Chinese financing activities in Latin America, June 6, 2022.

24 Interview with Chile foreign and economic policy SME, May 9, 2022.

25 Interview with U.S. government official, March 1, 2022; and interview with U.S. government official, February 25, 2022.

26 Interview with regional energy sector SME, March 8, 2022.

27 Interview A with Latin America energy sector SME, March 4, 2022.

28 According to the International Energy Agency, SIEPAC is a supranational initiative developed by six Central American nations (Panama, Costa Rica, Honduras, Nicaragua, El Salvador and Guatemala) that resulted in the development of a regional electricity market (MER) and the construction of nearly 1800 km of transmission infrastructure to increase transfer capacity at all borders in the region. (International Energy Agency, 2016, p. 16)
area of operations.\textsuperscript{29} According to Latin America energy sector experts, political resistance from many of the countries that GEIDCO is interested in engaging with represents a key problem for the advancement of the organization.\textsuperscript{30}

Some concerns related to GEI, GEIDCO, and the presence of Chinese SOEs and private companies in Latin America that some interviewees expressed are related to the fact that, if the GEI initiative were to proceed, it would provide an economic opportunity for Chinese businesses, most likely at the expense of local ones. According to one SME, GEI is perceived to represent an economic strategy for China to position its companies that would build the infrastructure underlying GEI with Chinese equipment;\textsuperscript{31} for another SME, GEI is a grandiloquent idea, with China aiming to project influence at the global level through its energy companies.\textsuperscript{32} However, one expert who focuses on China’s energy sector observed that Chinese SOEs and energy sector companies act less monolithically and in a manner less orchestrated by the government in Beijing than what is generally believed in the West. According to this SME, there is much more fragmentation and less coordination between the aims of the government in Beijing and what the Chinese SOEs are doing on the ground in Latin America and other regions of the world, with Beijing’s political leverage usually being overestimated.\textsuperscript{33}

\textbf{Brazil}

\textit{GEI and GEIDCO in Brazil}

Brazil is one of the three countries in Latin America where GEIDCO has a national committee, and it was one of the organization’s first associates (GEIDCO, undated b). GEIDCO and Brazil’s Ministry of Mines and Energy have signed an MoU, but there is very little information available about the most recent GEIDCO activities in Brazil. It is unclear, for example, what concrete progress GEIDCO has made toward reaching the GEI goal stated in its global power flow map, according to which Peru, Chile, Bolivia, and Argentina are expected to deliver 50 GW to Brazil by 2050 (GEIDCO, 2020, p. 8). Also, in the context of GEI, the Amazon basin is one of the areas Beijing identified as the main location for large-scale hydropower base generation (GEIDCO, 2020, p. 7).

Similar to experts in the other four countries in this case study, SMEs in Brazil’s energy sector had little awareness of GEIDCO’s activities in the country or the region.\textsuperscript{34} According to

\textsuperscript{29} Interview with energy sector SME in Latin America, March 8, 2022; and interview with Brazilian energy sector expert, April 13, 2022.
\textsuperscript{30} Interview with energy sector experts, May 6, 2022.
\textsuperscript{31} Interview A with Latin America energy sector SME, March 4, 2022.
\textsuperscript{32} Interview B with Latin America energy sector SME, March 4, 2022.
\textsuperscript{33} Interview with energy sector experts, May 6, 2022.
\textsuperscript{34} Interview with Brazilian energy sector expert, April 13, 2022.
one SME, although Electrobras, a major Brazilian electric utilities company, has been participating in working groups with GEIDCO, the Brazilian government has chosen not to be directly involved with GEIDCO; in recent years, interactions were mostly governed by SGCC rather than by GEIDCO.\(^{35}\)

**Chinese Presence in the Energy Sector in Brazil**

In Brazil, Chinese SOEs are present in all three areas of the power sector: generation, transmission, and distribution (Batista Barbosa, 2020). China gained a presence in power transmission and distribution through greenfield investments and acquisitions.\(^{36}\) In power transmission, SGCC acquired Spanish Plena Transmissora in 2010 for $1.7 billion. In 2012, SGCC also acquired electricity transmission assets (14 lines) in the company Actividades de Construccion y Servicios for $945 million (Batista Barbosa, 2020, p. 27). In February 2014, a consortium led by SGCC was awarded the contract to build a $2.14 billion ±800-kV UHV transmission line that links the Belo Monte hydroelectric power station in the north of the country to the southeast region (Branford, 2016; NS Energy Business, undated; Rapoza, 2014), where the major consumption centers are (BNamericas, 2014; GEIDCO and Research Center for Sustainable Development, undated, p. 3). The project has two bipoles: Bipole I, or Belo Monte Power Transmitter, which was commissioned in December 2017, and Bipole II, or Xingu Rio Transmissora de Energia (Xingu River Transmitter of Energy), was completed in March–April 2019 (NS Energy Business, undated). This transmission project used Chinese developers to build both bipoles (Downie, 2020, p. 12; Yang, 2019, pp. 21–22). In 2016, SGCC initially acquired a 23 percent controlling stake in CPFL Energia for $1.8 billion, which has assets in power transmission and distribution, as well as in power generation (Teixeira, 2016). SGCC extended to other CPFL stakeholders the option to sell their shares, and SGCC ultimately took control in 2017 of some 94.75 percent of CPFL for $12.2 billion (Batista Barbosa, 2020, p. 7; Sanchez-Badin, Ratton, and Morosini, 2021, p. 109).

China’s presence in power generation in Brazil is mainly focused on renewables, with hydro, wind, and solar representing some 91 percent of Chinese companies’ installed capacity in Brazil.\(^{37}\)

**Concerns Associated with Chinese Investments and Financing in Brazil**

So far, the local concerns associated with Chinese SOEs’ investments and financing in Brazil’s power transmission and distribution have been minimal, mainly because the country’s power sector is heavily regulated, especially when comparing it with other emerging markets.

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\(^{35}\) Interview with U.S. government officials, March 15, 2022.

\(^{36}\) *Greenfield* investments refer to new projects, whereas *brownfield* investments are made through mergers and acquisitions (Batista Barbosa, 2020, pp. 5, 8, 11).

\(^{37}\) Interview with Brazilian energy sector expert, April 13, 2022; and Batista Barbosa, 2020, p. 14.
Brazil has an active federal electricity regulator, the Brazilian Energy Regulatory Agency (or Agência Nacional de Energia Elétrica), that oversees power generation, transmission, and distribution (BNamericas, 2021; Organisation for Economic Co-operation and Development, 2021). For power generation and transmission, the regulations focus mainly on quality and less on economic aspects, which are limited to regulating aspects that occur at the beginning of the concession, such as the procurement and tenders during which the investors are selected.38 According to one of the conversations we had with SMEs in Brazil’s energy sector, the strong regulatory system and the diversification of the electricity market do not seem to pose a risk of market control or of China leveraging its presence in power transmission to achieve other foreign policy goals (Sanchez-Badin, Ratton, and Morosini, 2021, pp. 125–126).39

One aspect that surfaced during our interviews concerned the fact that, at times, China signals a very strong interest in Brazil’s economy and energy sector and that some of the announcements made about future investments and financing do not always materialize or do not measure up to the actual level of investments made. For instance, the Brazil-China Fund was announced with great fanfare in 2015. Its aim was to finance infrastructure development in Brazil, but it has been inactive and does not seem to be an actual investment fund (Maia, 2021). According to one of the SMEs we interviewed, this is an example of China talking big and not delivering much, as well as an example of China’s attempts to project soft power and public diplomacy based on claims of China having achieved more than what it actually has.40

There is, however, the perception in Brazil that China could withhold support or discontinue trade ties if the Brazilian government or other Brazilian actors criticize China, with Brazil not realizing that it has much more leverage in the overall trade relationship with China than it thinks. According to one interviewee, there is a misperception in Brazil that Brazil needs China more than China needs Brazil, when in reality the opposite is true.41

Chile

**GEI and GEIDCO in Chile**

Chile has a tremendous amount of renewable energy available but has modest transmission capacity, making the country a good candidate for implementation of a GEI-like vision. The Chilean Ministry of Energy and GEIDCO have a signed MoU, but the document is not public (Bo, 2019, p. 20). As in the other countries examined in this chapter, there was little awareness among Chilean energy sector SMEs regarding GEIDCO’s activities. Most Chinese investment

38 Interview with Brazil energy sector expert, April 13, 2022.
39 Interview with Brazil energy sector expert, April 13, 2022.
40 Interview with U.S. government officials, March 15, 2022.
41 Interview with U.S. government officials, March 15, 2022.
and financing activities in Chile’s power transmission and distribution sectors occur through SGCC and are not directly connected to GEIDCO. According to one interviewee, many of the statements GEIDCO put forward in Chile and the region are only aspirational and for window-dressing purposes, with very little coming out of them.42

Chinese Presence in the Energy Sector in Chile

In Chile’s energy sector, Chinese companies have gained a stronger presence in the past five to seven years,43 as the following investments show. In 2016, Chinese State Power Investment Corporation purchased $1 billion in power generation assets in Chile from Pacific Hydro (Danning, 2017; Heine, 2021). In 2018, China Southern Power Grid purchased 27.7 percent of Chile’s largest power transmission company, Transelec, for some $1.3 billion (Ellis, 2021a). In 2020, SGCC purchased the third largest power distribution company in Chile, Chilquinta Energía, for $2.23 billion (Ellis, 2021a; Nikolewski, 2020), and SGCC purchased Compañía General de Electricidad, which does both power transmission and distribution, for $3 billion in December 2020. In this way, Chinese SOEs gained control of 57 percent of Chile’s power distribution sector (Ellis, 2021a). China also has a strong presence in Chile’s renewable energy sector, especially in solar and wind, with Chinese firms proposing projects and Chinese government banks offering financing options for the respective projects (Koop, 2016).44 For instance, China Three Gorges purchased the energy company Atiaia Energía in 2019 and gained control over several renewable energy projects, including a 90-MW hydropower dam proposed in the BioBio region (Ellis, 2021a). For the companies we identified in this section, Chinese SOEs gained a presence in power generation, transmission, and distribution through public tenders and mergers and acquisition transactions.45

Concerns Associated with Chinese Investments and Financing in Chile

Our review of open-source data and the interviews we conducted, which included Chilean SMEs who were worried about Chinese presence and activities in the country, turned out few concerns in relation to Chinese investments and financing in power transmission and distribution or in relation to power generation, similar to Brazil and the other countries examined in this chapter.46 Transparency and strong institutions and regulatory frameworks in Chile are the main reasons why Chile’s energy sector has experienced limited problems associated with the

42 Interview with U.S. government official, March 1, 2022.
43 Interview with Chile energy sector SME, April 21, 2022.
44 Interview with U.S. government official, March 1, 2022.
46 Environmental and corruption concerns are present in the mining sector, which is outside of the scope of this report (interview with Chile foreign and economic policy SME, May 9, 2022; and interview with Chile energy sector SME, April 21, 2022).
presence of and investments by Chinese SOEs (Ellis, 2021a). One of the concerns voiced by former Chilean officials was very similar to what we heard from other interviewees in other countries regarding the fact that Chinese SOEs that operate in Chile receive loans from Chinese government banks and, because of the nonmarket conditions for financing, can make more-attractive bids than Western investors can. By repeatedly winning tenders because of lower bidding prices, Chinese SOEs end up controlling a higher share of the local assets in some critical sectors (Lew and Roughead, 2021; Sutter, Schwarzenberg, and Sutherland, 2021), which de facto concentrates control over Chile’s critical infrastructure in the hands of the Chinese government, increases Beijing’s economic leverage, and obstructs free market competition.

For instance, Chinese SOEs currently have control over almost 60 percent of Chile’s energy sector, creating a de facto monopoly for the government in Beijing (Ellis, 2021b; Ellis, 2021c). A concentration of Chinese government control over local critical infrastructure assets could grant Beijing (1) more leeway in terms of setting the price and determining the quality of the services provided and (2) the ability to establish barriers to entry to keep new companies out, hence restricting competition and the way in which the free market operates while advancing Beijing’s political and economic goals at the expense of the host country (Lew and Roughead, 2021; Sutter, Schwarzenberg, and Sutherland, 2021).

Chile, by law, has a fragmented energy sector. Under the existing legal framework, power generation, transmission, and distribution companies were deliberately established as separate entities to avoid the creation of a conglomerate with a monopoly over the power sector. However, the Chilean Public Prosecutor’s Office, which reviewed the acquisition deals by Chinese SOEs for any potential interferences with the “promotion, defence and protection of free competition,” deemed the deals acceptable because the Chinese companies involved in power

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47 Interview with Chile energy sector SME, April 21, 2022.

48 According to several of our interviewees, including an expert in Chinese financing in Latin America (June 6, 2022), the Chinese government provides loans to Chinese SOEs through Chinese policy banks at interest rates that allegedly are below market rates and different from the rates for foreign lending, which tend to be close to or at market rate (see Morris, Parks, and Gardner, 2020; and Sutter, Schwarzenberg and Sutherland, 2021). According to our interview with an expert in Chinese financing in Latin America (June 6, 2022), the actual rate at which Chinese policy banks lend to SOEs is unknown and is speculated to be around 1 percent, with hard evidence being difficult to come by because of a lack of official transparency.

49 Interview with U.S. government official, March 1, 2022; and interview with Chile foreign and economic policy SME, May 9, 2022.

50 Chinese SOEs have the support of the Chinese government in ways that the foreign private companies they compete with in Latin America (and in other markets) do not. It is likely that, without subsidized loans or capital injections from the Chinese government, many Chinese SOEs would not be as competitive as they are in various markets, including in Latin America; the backing they receive from the Chinese government gives the SOEs an unfair advantage in terms of price vis-à-vis foreign private companies, which rely entirely on their own forces and the quality of their product or service without receiving any government backing. See Lew and Roughead, 2021; and Sutter, Schwarzenberg and Sutherland, 2021.

51 Interview with U.S. government official, March 1, 2022. On the evolution of Chile’s electricity market, see Serra, 2022.
generation, transmission, and distribution technically are different entities involved in different areas of the power sector (Guzmán, 2021). This technicality seems to overlook the fact that the Chinese government is the main entity behind the SOEs in question. However, the common Chinese government ownership of all SOEs that invested in Chile’s energy sector represents an issue that should not be neglected, and concerns in this regard have prompted Chilean legislators to introduce a bill that limits foreign investments in critical infrastructure sectors (Urdínez, 2021, p. 12).

In some cases, such as tenders for solar parks, the offers China makes come attached with loans. The fact that Chinese investors provide financing options makes their offers more attractive than those received from German or South Korean companies that are bidding on the project but that do not offer financing options.

Concerns over Chinese violation of environmental regulations are also present. For instance, local populations have been very critical of China’s Three Gorges company building a hydroelectric dam in the BioBio region of Chile. The dam threatens the existence of local animal species that inhabit the river (Durante, 2021; Ellis, 2021a). Also, because of environmental concerns and popular resistance related to damage to the local habitat and population displacement caused by the flooding of the Baker and Pascua rivers, the Hidroaysen project was halted in 2014 (Hance, 2014). This was a project planned for Southern Chile and China National Water Resources. The Hydropower Corporation was expected to contribute to building five hydroelectric plants on the Baker and Pascua rivers in Patagonia, and SGCC was to build the transmission lines (Ellis, 2021a; Global Transmission Report, 2012). However, according to one SME, most Chinese companies investing in Chile seem to play by the rules when held to a strict standard and demanded to do so, with local governments actively controlling and monitoring their investment and financing activities and not providing opportunities for Chinese companies to misbehave.

Peru

GEI and GEIDCO in Peru

As opposed to Argentina, Brazil, and Chile, there is no GEIDCO national committee in Peru. The SMEs we spoke with in Peru’s energy sector did not witness GEIDCO being very active in

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52 Interview with Chile foreign and economic policy SME, May 9, 2022.
53 Interview with U.S. government official, March 1, 2022.
54 Interview with Chile foreign and economic policy SME, May 9, 2022.
55 Interview with Chile foreign and economic policy SME, May 9, 2022.
the country beyond the organization’s successful recruitment of some industry actors to become GEIDCO associates.\(^5^6\)

**Chinese Presence in the Energy Sector in Peru**

In 2020, Yangtze Power International, a subsidiary of China Three Gorges Corporation, purchased from the U.S. company Sempra Energia a share in Luz del Sur for $3.59 billion (Nikolewski, 2020). This transaction provided China with access to power generation, distribution, and transmission infrastructure. Other major Chinese investments and financing in Peru took place in power generation. In 2019, Odebrecht divested from Chaglla hydroelectric plant, which was transferred to China Three Gorges Corporation for $1.4 billion; in 2017, China Development Bank decided to inject some $365 million in Peru’s San Gaban III project, which is a joint venture between China Three Gorges and Energias de Portugal (Harris, 2017). Most Chinese companies in Peru have acquired control over companies in power transmission and distribution through mergers and acquisitions, whereas greenfield investments and loans seem to prevail when it comes to power generation.

**Concerns Associated with Chinese Investments and Financing in Peru**

In our review of open-source documents and the interviews we conducted, we identified relatively few concerns related to Chinese SOE control over Peruvian power transmission and distribution assets, similar to the situation in Chile.\(^5^7\) The concerns that interviewees voiced are more general in nature and are related to the country’s perceived economic dependence on China, which is now Peru’s number one trading partner (McDonnell and León, 2021; World Integrated Trade Solution, undated), and how this dependence might translate into political influence and the potential corruption of government elites, if the recent Sinopharm and Chinese construction scandals are any indication (Vera, 2022). According to one Peruvian SME we interviewed, although diversifying foreign trade and the source of foreign investments and financing in the country is an option, doing so is impeded by the low cost of financing for Chinese companies that have government backing, which makes it increasingly difficult for local and other western companies to compete in Peru.\(^5^8\)

\(^{56}\) Interview with U.S. government officials, March 18, 2022.

\(^{57}\) More concerns are present in the mining sector and in hydropower generation, which are more labor-intensive sectors and where more environmental damage is likely to occur than in power transmission and distribution. Many of the Chinese investments in mining are plagued by social unrest by populations evicted from their land, such as in the exploitation of copper mines. However, according to a group of SMEs we spoke with, the social issues affecting Chinese investments in Peru are not unique to China and affect U.S. and Canadian concessions as well. In terms of environmental protections, Chinese investors in the mining and hydropower sectors were not perceived as having as advanced standards as other Western investors (interview with U.S. government official, April 20, 2022; and interview with U.S. government officials, March 18, 2022). For more details, see Rochabrun, 2022, and Sanborn and Chonn, 2015.

\(^{58}\) Interview with Peruvian energy sector expert, April 15, 2022.
Furthermore, to facilitate and speed up the access to finance for Chinese companies that operate in Peru, China has set up two banks through which it finances the operations of Chinese companies in the country. This has created a small ecosystem that includes the Industrial and Commercial Bank of China Peru Bank and Bank of China (Peru) (Andina, 2014; Krmelj et al., 2022). The two banks provide financing letters to the Chinese companies that participate in public tenders, and (according to several interviewees) this process usually unfolds much more quickly and includes more-favorable terms than what the other companies working with regular commercial banks are able to provide. During the COVID-19 pandemic, local companies struggled even more to secure business loans from regular commercial banks, while Chinese companies interested in securing infrastructure projects did not face such hurdles when using the two Chinese banks in the country.\(^{59}\)

**Argentina**

**GEI and GEIDCO in Argentina**

GEIDCO stood up a national committee in Argentina, but it is unclear what its activities in the country are.\(^{60}\) In the context of implementing GEI, Southern Argentina is one of the areas Beijing identified as a future location for establishing a large-scale wind power generation base (GEIDCO, 2020, p. 6). Also, according to GEIDCO presentations on GEI, Southern Argentina is expected to have by 2050 some 135 GW of installed capacity for wind power (India Smart Grid Forum, undated, p. 3).

Most of the Chinese projects on the power generation side in Argentina seem to point toward China developing renewable infrastructure projects that ultimately position China to design the infrastructure needed to expand transmission capacity so that Argentina can integrate the additional renewable energy that the projects generate (Jáuregui, 2021). Overall, Argentina is in deep need of power transmission lines, and it seems that no other country except for China is interested in addressing this need, given the financial risk involved in doing business in Argentina (Politi, 2022).\(^{61}\) Investments and financing in the energy sector are usually long-term, and investors require a stable political and economic environment for their implementation and for a return on investment to be possible. Given Argentina’s troubled political and financial situation, many investors (with the exception of China) shy away from investing in the country, including in its energy sector.\(^{62}\)

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\(^{59}\) Interview with U.S. government officials, March 18, 2022; and interview with Peruvian energy sector expert, April 15, 2022.

\(^{60}\) Interview B with Latin America energy sector SME, March 4, 2022.

\(^{61}\) Interview with U.S. government official, February 25, 2022.

\(^{62}\) Interview B with Latin America energy sector SME, March 4, 2022; Gedan, Uribe-Kessler, and Zhou, 2021; and Jones, 2022.
Chinese Presence in the Energy Sector in Argentina

Currently, Chinese SOEs do not own any assets in Argentina’s power transmission and distribution sectors. In January 2022, discussions about an SGCC subsidiary—China Electric Power Equipment and Technology (DeveX, undated)—building a much-needed extension of the power transmission line for the Buenos Aires area were opened (Politi, 2022). The power transmission project involves SGCC and China Electric Power Equipment and Technology and is estimated to cost some $1.1 billion (Newbery, 2022).

In power generation, China and Argentina signed in February 2022 an $8 billion contract for China National Nuclear Corporation to build a nuclear plant in the province of Buenos Aires (“China Inks $8 bln Nuclear Power Plant Deal in Argentina,” 2022; China National Nuclear Corporation, undated).

In both cases, China and Argentina are discussing financing options with the Bank of China and the Industrial and Commercial Bank of China (ICBC). In the case of the nuclear plant construction, the discussions are for ICBC to finance 85 percent of the project. At the time of this writing, the two parties were only discussing financing options, and there was no information in the public domain about whether any loan agreement was signed (Raszewski, 2022). So far, Argentina has taken commercial loans (not sovereign debt) from China for some power generation projects (solar, wind, and hydropower dams; Koop and Pike, 2019).

As of June 2022, China was financing through loans the building of two hydroelectric plants (the Condor Cliff and La Barrancosa dams project) in Santa Cruz, Patagonia. China Development Bank was supposed to finance 85 percent of the project, with the contract including a so-called cross-compliance clause, which means that the dam’s construction is “a prerequisite for the advance of other Chinese-financed projects in the country” (Lara, 2020).

Concerns Associated with Chinese Investments and Financing in Argentina

Some of the concerns associated with China’s involvement in the power sector in Argentina are related to the financing aspect of these projects, which is fairly opaque, and the fact that there are no public tenders announced in which other companies and countries that are interested can participate besides Chinese ones. The importance of having open and transparent public tenders for all infrastructure projects and the preference for contracts with foreign investors to follow

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63 Interview with U.S. government official, February 25, 2022.
64 Interview B with Latin America energy sector SME, March 4, 2022; and interview with U.S. government official, February 25, 2022.
66 Interview with U.S. government official, February 25, 2022; and interview B with Latin America energy sector SME, March 4, 2022.
local Argentine laws came up in several of the conversations we had with SMEs in the country’s energy sector.\textsuperscript{67}

The Santa Cruz dams project has been plagued by environmental and economic concerns, with one Argentina SME referring to the project as “neither a clean nor an economically sustainable” one (Lara, 2020). The investment was halted as of June 2022 because of changes in the scope of work and reductions in the power generation capacity of dams, which automatically triggered the suspension clause of the financing contract (Harán, 2021; Latinoamérica Sustentable, 2022; Levaggi and Berg, 2022).\textsuperscript{68}

Although there are few concerns about debt-trap behavior in Latin America, and research shows that concerns about Chinese predatory lending practices are not supported by evidence (Brautigam and Rithmire, 2021; Soutar, 2022),\textsuperscript{69} the financial fragility that Argentina experiences is likely to increase China’s political leverage over the country in the case of Argentine default on Chinese loans and result in Argentina potentially siding more often with China in regional and international fora.

**Mexico**

**GEI and GEIDCO in Mexico**

In 2020, the GEIDCO national committee in Mexico was stood up (National Institute of Electricity and Clean Energies, 2021). Its activities seem to be limited to conducting webinars, organizing workshops, and producing technical reports. GEIDCO has also partnered with Mexico’s National Institute of Electricity and Clean Energies (el Instituto Nacional de Energías y Energía Limpia; National Institute of Electricity and Clean Energies, undated).\textsuperscript{70}

GEIDCO was perceived as becoming more active in Mexico between 2016 and 2020,\textsuperscript{71} when the organization conducted a technical study regarding the interconnection of the North American grid (which includes Canada, Mexico, and the United States) and evaluated the benefits of such an interconnection from an economic and environmental perspective (GEIDCO, 2019). GEIDCO’s activities in Mexico slowed down during the pandemic but have recently restarted, with two web events organized in April and May 2022 (National Institute of Electricity and Clean Energies, 2022). Also, it seems that the current administration of Andrés Manuel López Obrador is more reluctant to engage with foreign companies or organizations that are

\textsuperscript{67} Interview with U.S. government official, February 25, 2022; and interview B with Latin America energy sector SME, March 4, 2022.
\textsuperscript{68} Interview B with Latin America energy sector SME, March 4, 2022; and interview with Latin America energy sector SME, March 3, 2022.
\textsuperscript{69} Interview with U.S. government official, April 20, 2022.
\textsuperscript{70} Interview with Mexico energy sector SME, April 22, 2022.
\textsuperscript{71} Interview with Mexico and Latin America energy sector SME, March 7, 2022.
active in the energy sector, which might partly explain some of the slowdown GEIDCO registered in its activities in Mexico in recent years.\textsuperscript{72} Furthermore, some planned projects, such as the interconnection of the Electric System of Baja California with the National Interconnected System (BNamericas, undated; Project Pipeline, undated) and the high-voltage, direct current Oaxaca transmission line (Mexico Business News, 2017) to export renewable energy, were canceled (Ramos et al., 2020, p. 9). Such cancelations might have led to GEIDCO losing some of its interest in Mexico.\textsuperscript{73} According to GEIDCO’s global power flow map, North and South America are expected to exchange 10 GW with Mexico by 2050; therefore, the country represents a linchpin in the global flow of power (GEIDCO, 2020, p. 8).

Most of the energy sector SMEs in Mexico we spoke with were familiar with GEIDCO, but (similar to interviewees in the other countries) they were not familiar with the exact activities of the organization in general nor those of the national committee in Mexico, specifically.

\textit{Chinese Presence in the Energy Sector in Mexico}

In general, Chinese investments and financing in Mexico’s power sector have been rather modest. China does not have any ownership or control in any power transmission and distribution companies in Mexico because these companies are under the control of the Mexican state-owned utility Federal Electricity Commission (Comisión Federal de Electricidad). Most Chinese investments and financing in the power sector in Mexico are on the generation side and focus on private renewable energy, such as solar and wind. In November 2020, China’s State Power Investment Corporation acquired Mexico’s largest independent renewables company, Zuma Energía (Association for Private Capital Investment in Latin America, 2020). Another major player in this field is Envision, a privately owned Chinese company that purchased a local Mexican company in 2015 (Envision, undated)—Vive Energía\textsuperscript{74}—and developed a wind farm project in the Yucatán Peninsula (Djunisic, 2020; Envision Energy, 2020). Even when the investors in solar and wind parks are Mexican, most of these renewable energy parks operate with Chinese equipment, such as solar panels and windmills.\textsuperscript{75} In addition to the physical equipment, China provides the software needed to operate the solar and wind parks and connect them to the grid.\textsuperscript{76} The use of software and digitalization in the operation of smart grids brings to the fore the importance of establishing a strong regulatory framework that governs the control,

\begin{thebibliography}{9}
  \bibitem{72} Interview with Mexico energy sector SME, March 11, 2022.
  \bibitem{73} Interview with Mexico energy sector SME, April 22, 2022.
  \bibitem{74} Interview with Mexico energy sector SME, April 1, 2022.
  \bibitem{75} Interview with Mexico and Latin America energy sector SME, March 7, 2022; and interview with Mexico energy sector SME, April 22, 2022.
  \bibitem{76} Interview with Mexico energy sector SME, April 1, 2022.
\end{thebibliography}
functioning, and maintenance of software and other digital components that operate critical infrastructure assets.  

**Concerns Associated with Chinese Investments and Financing in Mexico**

In the review of open-source documents and interviews we conducted with SMEs in Mexico’s energy sector, very few concerns related to the presence of Chinese companies in the sector came up. Regarding the quality of Chinese technical equipment for Mexican wind farms, one of the SMEs we spoke with mentioned that the assets surpassed expectations and that they were of very high quality, in addition to being more competitive from a price perspective than U.S. or European products. One concern associated with the development of Chinese solar and wind park projects in Mexico that was mentioned was that the Mexican side did not consider developing a local value chain and did not push for more local content out of fear that production costs would increase. However, the SME said that including more local labor in the production chain would benefit Mexico in the long term and that it would mean access to a highly qualified technical workforce.

**Summary**

According to our review of open-source documents and the interviews we conducted, relatively few concerns emerged overall in relation to Chinese ownership or control over power transmission and distribution companies in Brazil, Chile, Peru, and Argentina. Neither the government in Beijing nor the Chinese SOEs and private companies on the ground draw an explicit connection between GEI implementation and the investments and financing they make in the five Latin American countries we focused on. The concerns that are present are mostly related to the way projects are financed and the perception that Chinese SOEs have a competitive advantage that private competitors from other countries do not have in terms of access to finance under nonmarket conditions. None of the concerns we identified in our review of open source data or the interviews we conducted revealed any key episodes present in the informational domain related to Chinese government pressure or attempts at gaining or projecting influence that were specific to Chinese investments and financing in power transmission and generation. However, we did encounter examples of Chinese government attempts to gain and project influence more broadly in the informational domain in Brazil, Chile, Peru, and Argentina and to

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77 Interview with Brazil energy sector expert, April 13, 2022.
78 Interview with Mexico energy sector SME, April 1, 2022.
79 Interview with Mexico energy sector SME, April 22, 2022.
80 Concerns over environmental damage and social unrest in relation to Chinese investments in mining and the construction of hydropower dams, which are more labor-intensive sectors than power transmission and distribution and which are more likely to have a negative impact on the environment, are also present, with mining and power generation being outside the scope of this report.
shape local political discourse in a manner favorable to China. A non-exhaustive summary of some key episodes that came up to our attention is presented in Appendix B.

The Chinese investments in Brazil’s, Chile’s, and Peru’s power transmission and distribution sectors have been acquisitions involving Chinese SOEs buying local companies. If the power transmission deal in Argentina goes through, Argentina would represent an exception to this pattern because the Chinese project to expand the power transmission lines in the Buenos Aires area comes with a financing offer from Chinese policy banks.

In our analysis of Chinese investments and financing in the transmission and distribution sectors in Brazil, Chile, and Peru and of power generation investments and financing in Argentina and Mexico, we noticed that Chinese companies were less likely to be associated with scandals related to predatory lending practices and violations of environmental and labor laws than in African and Southeast Asian countries. Although a more in-depth investigation of why this is the case in Latin America (or at least in the five countries we focused on in this chapter) is outside the scope of this report and would merit further investigation, the five Latin American countries we examined have relatively strong regulatory frameworks, which might have prevented the occurrence of deeper and more numerous economic, labor, social, and environmental issues than those that occurred in other regions of the world where China made infrastructure investments. It is also possible that China learned from its mistakes in other parts of the world and, given that Chinese SOEs came to Latin America later and initially made some poor investment and financing decisions, was more cautious about how to finance deals and paid more attention to political stability than it previously did (Lew and Roughead, 2021).
Chapter 4. Seabed Mining

Although there are multiple types of seabed mining, this case study examines what is often referred to as deep seabed mining, meaning mining resources in the deep ocean, or below 200 or more meters of water (NOAA Ocean Exploration, undated). These resources include polymetallic nodules (sometimes referred to as manganese nodules), polymetallic sulfides (or seafloor massive sulfides), and cobalt-rich ferromanganese crusts. All three resource types are distributed extensively across large portions of the Earth. In this case study, we do not consider more shallow-water mining for such resources as diamonds, methane hydrates, ironsands, or phosphorites.

This case study differs from the prior two case studies in two important ways. First, no commercial seabed mining has yet been undertaken; all activity thus far has been in the form of technology development and exploration in preparation of commercial mining. The commercial seabed mining market does not yet exist, and many aspects of how it will unfold have yet to be determined. So, this case study examines deep seabed mining exploration rather than commercial mining. Because seabed mining has yet to enter the commercial stage, the findings of this case study are not based on the outcomes and implications of formal business dealings but rather on concerns emerging from preliminary, sometimes ambiguous, activities being undertaken that are shaping the emerging commercial market.

Second, the majority of seabed mining exploration is occurring in international waters under the authority of the International Seabed Authority (ISA), meaning that there are few opportunities for Chinese companies to partner on projects in other countries. Rather, most seabed mining projects are unilateral efforts in which state-sponsored companies contract with the ISA. As a result, many of the concerns related to Chinese foreign investments do not apply to seabed mining. In addition, because seabed mining involves few bilateral interactions between countries, it is less obvious to whom recommendations are best directed.

Because of these differences, this case study takes a more descriptive approach, in which we briefly review the history of seabed mining, describe China’s advances in deep and distant sea exploration, describe China’s activities related to seabed mining in particular, and present some of the key concerns related to China’s seabed mining efforts that emerged from our interviews and the literature. We conclude with some recommendations targeted to the ISA and to countries that are or are considering opening their seabed resources to exploration and commercial mining by outside entities.
Context for Seabed Mining

The brief history of the discovery and early exploration of seabed mineral resources in this section is taken from Lipton, Nimmo, and Parianos, 2016, and AMC Consultants, 2021. Seafloor manganese nodules were discovered, and their widespread occurrence across the Earth’s oceans was recognized, by the HMS Challenger on its around-the-world voyage between 1873 and 1876. Little exploration ensued until these nodules were recognized to be rich in nickel, copper, cobalt, and manganese in the 1960s. During the International Decade of Ocean Exploration (1970–1980), several international organizations and consortia conducted extensive exploration campaigns, primarily in the Clarion-Clipperton Zone (CCZ), a region that extends from Mexico to south of Hawaii between the Clarion and Clipperton fracture zones. A variety of seabed mining technologies were developed and experimented with, including seabed mining vehicles and air-powered systems to lift the mined nodules to surface ships, and several successful trial mining operations were conducted. Most of this activity ceased in the mid-1980s to early-1990s, primarily because costs were not competitive with land-based mining.

Closely associated with this exploration activity, the UN was actively debating questions of rights to national and international waters and approaches to govern these rights. One step in this process included a 1969 moratorium on deep seabed mining to last until these rights and governing regimes have been worked out. These debates culminated with the UN Convention on the Law of the Sea (UNCLOS) in 1982, which came into force in 1994. As of 2022, 167 countries and the European Union are parties (the United States is not among them). Key among its provisions are the definition of a nation’s exclusive economic zone (EEZ), where that nation has exclusive access to seabed mineral resources; the definition of the Area, referring to the seabed in the high seas (i.e., outside all EEZs); and the establishment of the ISA, an intergovernmental organization charged with regulating the exploration and exploitation of seabed mineral resources in the Area.

By 2001, the ISA developed regulations governing the exploration for seabed mineral resources and began issuing exploration contracts to government-sponsored mining contractors (see Table 4.1). Several of the members of the various seabed mining consortia from the 1970s are among the “pioneer investors” with the ISA. The ISA has yet to develop regulations for the exploitation of seabed mineral resources, and hence the 1969 moratorium on commercial mining in the Area is still in force.

Although the first phase of seabed mining exploration wound down for reasons of cost, efforts to decarbonize the energy and transportation systems in response to climate change have spurred renewed interest in seabed mining. Polymetallic nodules contain exceedingly high concentrations of nickel, cobalt, copper, and manganese, which are all critical elements needed for batteries for electric vehicles, energy storage systems to support wind and solar power generation, and other technologies associated with decarbonization. Demand for these elements is projected to increase dramatically in the coming decades, raising concerns that current land-
based supplies are insufficient to meet demand. For example, International Energy Agency, 2021, reports that, to meet the Paris Agreement goals, demand among clean energy technologies is expected to increase by over 40 percent for copper, 60–70 percent for nickel and cobalt, and nearly 90 percent for lithium in the next 20 years alone.

**Current Seabed Exploration Contracts and Licenses**

Seabed mining contracts with the ISA require formal sponsorship from an ISA member country. As of June 2022, the ISA has issued 31 exploration contracts to 22 entities (Table 4.1). The United States is not a member of the ISA and so cannot sponsor exploration contracts. Most contracts are for polymetallic nodules. The majority of these contracts (17) are in the CCZ, with one each in the Central Indian Ocean Basin and Western Pacific Ocean. The seven polymetallic sulfides contracts are on the Southwest Indian Ridge, Central Indian Ridge, and the Mid-Atlantic Ridge, and the five cobalt-rich crusts contracts are in the Western Pacific Ocean, Magellan Mountains in the Pacific Ocean, and Rio Grande Rise in the South Atlantic Ocean (ISA, undated).
Table 4.1. ISA Exploration Contracts

<table>
<thead>
<tr>
<th>Contract Holder</th>
<th>Sponsor Country</th>
<th>PMN</th>
<th>PMS</th>
<th>CFC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interoceanmetal Joint Organization</td>
<td>Bulgaria, Cuba, Czech Republic, Slovakia, Poland, Russia</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>JSC Yuzhmorgeologiya</td>
<td>Russia</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Government of the Republic of Korea</td>
<td>Republic of Korea</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>China Ocean Mineral Resources Research and Development Association</td>
<td>China</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Deep Ocean Resources Development Co. Ltd.</td>
<td>Japan</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Institut français de recherche pour l’exploitation de la mer</td>
<td>France</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Government of India</td>
<td>India</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Federal Institute for Geosciences and Natural Resources</td>
<td>Germany</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Nauru Ocean Resources Inc./The Metals Company</td>
<td>Nauru</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Tonga Offshore Mining Limited/The Metals Company</td>
<td>Tonga</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Global Sea Mineral Resources NV/DEME Group</td>
<td>Belgium</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>UK Seabed Resources Ltd./Lockheed Martin UK</td>
<td>UK</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Marawa Research and Exploration Ltd./The Metals Company</td>
<td>Kiribati</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Ocean Mineral Singapore Pte. Ltd./Keppel Group</td>
<td>Singapore</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Cook Islands Investment Corporation/DEME Group</td>
<td>Cook Islands</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>China Minmetals Corporation</td>
<td>China</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Beijing Pioneer Hi-Tech Development Corporation</td>
<td>China</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Ministry of Natural Resources and Environment of the Russian Federation</td>
<td>Russia</td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Government of Poland</td>
<td>Poland</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Japan Oil, Gas and Metals National Corporation</td>
<td>Japan</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Companhia de Pesquisa de Recursos Minerais S.A.</td>
<td>Brazil</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Blue Minerals Jamaica Ltd</td>
<td>Jamaica</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>19</td>
<td>7</td>
<td>5</td>
<td>31</td>
</tr>
</tbody>
</table>

SOURCE: ISA, undated.

NOTE: CFC = cobalt-rich ferromanganese crusts; PMN = polymetallic nodules; PMS = polymetallic sulfides.

Three entities sponsored by China have a total of five contracts, the most of any sponsor country. These contracts include all three resource types and span three locations in two oceans (ISA, undated, Table 4.2). China Minmetals is a large multinational minerals and metals firm and a major Chinese SOE (MMG, undated). COMRA is a research organization established by the former State Oceanic Administration (absorbed by the Ministry of Natural Resources in 2018) to advance and coordinate China’s seabed mining research (COMRA, 2015; Denghua Zhang, 2018). Little information is available about Beijing Pioneer Hi-Tech Development Corporation. An ISA webpage indicates that it is an SOE affiliated with the Ministry of Natural Resources (ISA, 2019).
Table 4.2. ISA Exploration Contracts Sponsored by China

<table>
<thead>
<tr>
<th>Resource</th>
<th>Contractor</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymetallic nodules</td>
<td>COMRA</td>
<td>CCZ</td>
</tr>
<tr>
<td>Polymetallic nodules</td>
<td>China Minmetals Corporation</td>
<td>CCZ</td>
</tr>
<tr>
<td>Polymetallic nodules</td>
<td>Beijing Pioneer Hi-Tech Development Corporation</td>
<td>Western Pacific Ocean</td>
</tr>
<tr>
<td>Polymetallic sulfides</td>
<td>COMRA</td>
<td>Southwest Indian Ridge</td>
</tr>
<tr>
<td>Cobalt-rich ferromanganese crusts</td>
<td>COMRA</td>
<td>Western Pacific Ocean</td>
</tr>
</tbody>
</table>

SOURCE: ISA, undated.

ISA exploration contracts allow contractors to (1) conduct surveys of geological, oceanographic, and biological data and resources and (2) adapt and test technology. Contractors are required to monitor and assess the environmental impacts of their activities and collect a suite of specific environmental baseline data. Contractors are required to submit an annual report to the ISA that details their exploration activities and findings, environmental impacts, and environmental baseline data. The contracts allow the ISA to send its inspectors on board vessels and installations used by the Contractor to carry out activities in the exploration area to: (a) Monitor the Contractor’s compliance with the terms and conditions of this contract and the Regulations; and (b) Monitor the effects of such activities on the marine environment. (ISA, undated)

In addition to obtaining ISA contracts to conduct seabed mining exploration in international waters, any country can explore or mine or invite others to do so within its EEZ. The most well-known example of such activity is the Solwara 1 project in Papua New Guinea’s EEZ (see description in Page, 2018). Solwara 1 was the world’s first, and so far only, commercial seabed mining operation undertaken. Papua New Guinea granted a mining license for seafloor massive sulfides to a Canadian company in 2011. After numerous delays, funding ran out in 2019, and the project was terminated before mining began. At the time the project ended, a purpose-built ship had been constructed by a Chinese shipbuilder, production-scale seabed mining and lift equipment had been built and delivered to Papua New Guinea, and a processing contract had been executed with a Chinese firm. According to multiple interview participants, the mining equipment had just begun wet-testing in the port and had never been fully submerged.

In another example of a country opening its EEZ for seabed mining, the Cook Islands issued exploration licenses to three entities in February 2021 (Table 4.3). One of the three licensees is effectively the same organization that has two ISA contracts (DEME subsidiary Global Sea Mineral Resources). As with the ISA exploration contracts, these licenses allow exploration only.
Table 4.3. Cook Islands Seabed Minerals Authority Exploration Licenses

<table>
<thead>
<tr>
<th>License Holder</th>
<th>Parent Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIIC Seabed Resources Limited</td>
<td>DEME Group, Belgium</td>
</tr>
<tr>
<td>Moana Minerals Limited</td>
<td>Ocean Minerals LLC, USA</td>
</tr>
<tr>
<td>CIC Limited</td>
<td>USA-based consortium</td>
</tr>
</tbody>
</table>


Several other countries have initiated efforts to begin opening their EEZs to seabed mining exploration by internal or outside entities. The extent of actual exploration activity appears minimal, and none have gone as far as Papua New Guinea in granting rights for commercial mining. These include Tonga, Fiji, Solomon Islands, Vanuatu, New Zealand, and Norway (Elbourne, 2021; Deep Sea Mining Campaign, London Mining Network, and Mining Watch Canada, 2019; World Bank, 2017).

Chinese Government Positions and Statements About Seabed Mining

The Chinese government has made some clear public statements indicating the priority of deep and distant sea exploration in general and about harvesting seabed mineral resources specifically. China’s 13th and 14th five-year plans (covering 2016–2020 and 2021–2025, respectively) describe ambitions to increase deep space, deep earth, and deep sea exploration, which has been referred to as the “three-deep” strategy (Dong and Gao, 2018; Zhou, 2016). These plans include goals to strengthen the development of strategic technologies for the deep sea, develop deep-sea mobile and seafloor experimental platforms, “strengthen the survey and evaluation of deep-sea strategic resources and biodiversity” (Government of China, 2021, p. 82), and “take an active role in formulating international rules in areas such as the internet, the deep sea, the polar regions, and aerospace” (Government of China, 2016). Similarly, the Chinese Ministry of Land and Resources’ National Plan on Mineral Resources (2016–2020) states that “China will actively participate in international surveys on deep sea mining and accelerate the exploration and development of ocean minerals” (Denghua Zhang, 2018).

President Xi has made specific statements about seabed mining in speeches. In a 2013 speech during the eighth collective study of the Political Bureau of the Communist Party Central Committee, he stated that China should “promote the construction of a maritime power to continuously achieve new achievements,” “improve the development capacity of marine resources,” and strive to promote the transformation of marine rights protection to a holistic approach. We love peace and adhere to the path of peaceful development, but we must never give up our legitimate rights and interests, let alone sacrifice our country’s core interests. (Juntao and Gang, 2013)
In a 2016 speech at a National Science and Technology Innovation Conference at the Chinese Academy of Sciences, Xi stated, “The deep sea contains treasures that are far from being recognized and developed on the earth, but to obtain these treasures, it is necessary to master key technologies in deep-sea entry, deep-sea exploration, and deep-sea development” (Xi, 2016). These policies and statements clearly indicate China’s desire to increase technology development, research, and exploration associated with the deep and distant sea. As described in subsequent sections, China has made substantial progress in regard to this objective.

Chinese Deep and Distant Ocean Exploration Technology and Activity

Until recently, the state of Chinese deep sea exploration technology substantially lagged behind the state of the art. Starting in earnest in about 2001, China “started to invest intensively in deep-sea investigation and in exploration technology” (Yan, 2019). Concerted efforts over the past 20 years have brought China on par with the most-advanced nations. As recently as 2005, no Chinese submersible had gone below about 600 meters (Li, 2019). In 2002, COMRA began development of the Jiaolong, a crewed submersible designed to descend to 7,000 meters (Li, 2019). It began sea trials in 2009 and reached a maximum depth of 7,062 meters in the Mariana Trench on June 27, 2012 (Li, 2019). After a later sampling expedition, a researcher with the State Oceanic Administration noted, “Such findings will serve as valuable references to the design of deep sea mining” (Subsea World News, 2016).

Much of the technology for the Jiaolong was purchased abroad; in 2009, development began on a new crewed submersible for which 85 percent of the technology was to be independently developed in China (Chen Yu, 2021). Although not designed to go as deep as the Jiaolong, the Shenhai Yongshi incorporated more-advanced capabilities and led to important advancements in Chinese submersible technology (Chen Yu, 2021). It has been active since 2017 (Zhen, 2022).

Development of China’s newest crewed submersible, the Fendouzhe, began in 2016 (“China Focus: China’s Manned Submersible Fendouzhe Returns After Ocean Expedition,” 2020). Designed to descend to the deepest part of the ocean, it touched down at 10,909 meters in the Mariana Trench on November 10, 2020 (Chen Yu, 2021). In sending a crew to the deepest point of the seabed, China joins the ranks of a select few countries with such a capability and “marked China’s entry into the first echelon of deep-sea scientific research” (“China Focus: China’s Manned Submersible Fendouzhe Returns After Ocean Expedition,” 2020). In a congratulatory letter, President Xi “stressed that the development of manned submersible Fendouzhe and its sea trial represented China’s comprehensive strength in the field of marine high technology” (“China Focus: China’s Manned Submersible Fendouzhe Returns After Ocean Expedition,” 2020).

China has also developed and operates a suite of autonomous submersibles capable of exploring the entire ocean (Agarwala, 2021; Minter, 2021; Page, 2018).

China’s rapid development of world-class deep sea exploration capabilities is all the more remarkable in that it was accomplished largely independently: “Few countries were willing to
cooperate with us because we were not on the same level. It was like a gap between a pupil and a PhD” (COMRA, 2019). The development efforts have been described by Don Walsh, an American expert who was part of the first crew to descend the Mariana Trench in 1960, as “a very deliberate program . . . They’re being very cautious. They respect what they don’t know and are working hard to learn” (Broad, 2010).

In 2021, the developer of the *Fendouzhe* announced that the submersible was being handed over to the Institute of Deep-Sea Science and Engineering at the Chinese Academy of Sciences and that the *Fendouzhe* and *Shenhai Yongshi* would be made available for use by scientists from around the world (China Global Television Network, 2021). In the announcement, a representative noted that “scientific research of the deep ocean is a global hot topic, and international cooperation will enhance humanity’s understanding in the field.”

In conjunction with the rapid expansion of its crewed and autonomous submersible capability, China has greatly increased its surface-based exploration capability and activity over the past 20 years. The number of naval, coast guard, merchant, research, and fishing ships that China operates has increased dramatically in the past ten years (Agarwala, 2021). The number of government research vessels operating outside its national jurisdiction far exceeds that of any other country (Asia Maritime Transparency Initiative, 2020). Research cruises are increasingly venturing well beyond Chinese jurisdictional waters, conducting a wide range of meteorological, oceanographic, and bathymetric measurements and technology demonstrations (Agarwala, 2021; Asia Maritime Transparency Initiative, 2020; Martinson and Dutton, 2018).

Although China’s technical capabilities for deep and distant sea exploration are advanced, its capabilities for deep seabed mining are less so. Many ISA contractors can trace their origins to early seabed mining exploration consortia in the 1970s and are affiliated with major ocean engineering companies that are developing the primary components of a deep seabed mining system (seafloor collector, riser system, customized ships). China entered the seabed mining realm later and has relatively less advanced seabed mining technology. In summer 2021, COMRA tested a whole-system pilot nodule collection system at depths of up to 1,300 meters in the South China Sea, which is short of the 4,000–6,000 meters at which several other countries have conducted testing and which is required for accessing nodules in the CCZ (Kang and Liu, 2021).

In 2015, however, the Chinese firm Zhuzhou China South Rail (now CRRC Group) bought Soil Machine Dynamics (“CSR Completes SMD Acquisition,” 2015), a United Kingdom company that built the seafloor nodule collector for the Solwara 1 project in Papua New Guinea (Soil Machine Dynamics, 2016). The only full-sized collector ever built, it was never used because the project failed before testing was completed. With the ownership of Soil Machine Dynamics, China is presumably well-positioned to develop cutting edge seabed mining technology. One industry representative, reflecting on China’s ability to quickly ramp up the rate of technical development, said, “if we’re not careful, everyone will need to buy Chinese mining equipment.” Other representatives disagreed with this assessment, however.
Chinese Seabed Mining Activity

Involvement with the ISA

China was among the first countries to obtain a seabed mining exploration contract with the ISA. China-sponsored COMRA became one of seven “pioneer investors” in seabed exploration under the UNCLOS in March 1991 (Lipton, Nimmo, and Parianos, 2016). These pioneer agreements became formal ISA contracts in 2001 (Lipton, Nimmo, and Parianos, 2016). Although most of the ISA contractors from developed nations “have been descended from major explorers in the region that predate the ISA,” China is a relative newcomer, having conducted very few marine surveys prior to 1991 (Lipton, Nimmo, and Parianos, 2016). Since that time, however, China has vigorously pursued a seabed mining program along several fronts.

China has sponsored five ISA exploration contracts, more than any other country, through three contractors: COMRA, China Minmetals Corporation, and Beijing Pioneer Hi-Tech Development Corporation (ISA, undated). These contracts cover all three resource types regulated by the ISA and are located in the CCZ, the Western Pacific, and the Southwest Indian Ocean (Table 4.2). Five interviewees also noted that a Chinese enterprise applied for an exploration license from the Cook Islands Seabed Minerals Authority in 2022 but that its application was unsuccessful.

China’s relationship with the ISA goes well beyond sponsoring exploration contracts. As summarized in a speech by ISA Secretary General Michael Lodge, China is a member of Group A of the ISA Council (major consumers), and representatives nominated by China have been long-time members of the Legal and Technical Commission and the Finance Committee (Lodge, 2019). In addition, Chinese representatives are on staff in the office of legal affairs and the office of environmental management and marine resources. Further, China is actively involved in drafting exploitation (i.e., commercial mining) regulations. Finally, through a combination of assessed contributions, contract fees, and voluntarily contributions, China is now the largest contributor to the ISA budget. In 2020, China also launched an ISA-China Joint Training and Research Centre in Qingdao “to offer training to aspiring professionals from developing countries in deep-sea related science” (COMRA, 2020).

Legislation

In 2016, China passed legislation establishing a legal regime for seabed mining. To comply with the requirement that ISA contractors pass domestic legislation regulating seabed mining activities, China adopted the Law on the Exploration and Exploitation of Resources in the Deep Seabed Area (Shen, 2021). Although this step is not particularly notable in that several other countries have passed similar legislation, it nonetheless demonstrates China’s commitment to establishing a viable seabed mining program.
Mineral Processing Activity

One important aspect of seabed mining that has received relatively less attention is the downstream processing of materials collected from the seabed. A substantial amount of the value of mineral resources is added in the processing stage, making mineral processing the most profitable stage of the supply chain. China has for many years dominated the world in the processing of many critical mineral ores, including nickel, cobalt, copper, and manganese, the key elements found in polymetallic nodules and cobalt-rich ferromanganese crusts (International Energy Agency, 2021). Although commercial processing methods for polymetallic nodules and other seabed mineral resources are still being developed, one approach being considered involves the modification of rotary kiln-electric furnace smelting approaches used for nickel laterites (AMC Consultants, 2021). Existing Chinese nickel smelting capacity may therefore be able to be adapted to process seabed mineral resources.

All of the seabed mining industry representatives we spoke with (four companies operating eight exploration contracts) confirmed that Chinese industries had approached them offering to establish partnership agreements to process seabed ores, consistent with this potential synergy. One even said, “I don’t know of a single seabed mining contractor that hasn’t been approached by the Chinese.” The explanation for this outreach that they offered is that, given the idiosyncrasies of mineral prices and ore availability, China’s extensive processing capacity is sometimes underutilized, prompting China to seek new sources of ore. This situation for nickel, in particular, has been exacerbated by Indonesia’s cyclic banning of nickel exports. Indonesia, the world’s largest producer of nickel ore and the primary supplier of nickel processing operations in China (International Energy Agency, 2021), banned the export of nickel ore in 2014, lifted the ban in 2017, then implemented it again in 2020 (Huber, 2021). Although China has partially mitigated the unreliable supply of nickel ore by investing in nickel smelting operations in Indonesia (International Energy Agency, 2021), industry and expert representatives noted that it nonetheless has stranded capacity in China for which China seeks a supply source (AMC Consultants, 2021; interviews with industry and expert representatives).

Although exploration contractors have been approached by China to partner, the representatives we met with noted that the state of processing technology and company planning is still in the early stages, and no agreements are in place. All of them argued that, because of the value added in the processing stage, it is important to maintain control of the processing operations and to avoid outsourcing that stage to China or any other country. At the same time, given the substantial capital expenditures required for establishing a processing facility and the relatively lower cost of processing in China, it is tempting to partner with Chinese firms to defer capital expenditures and generate revenue more quickly. As one industry representative put it, “China wants a piece, and it’s tempting, but we are resisting.”

One company indicated in a Securities and Exchange Commission filing that it has provisional plans to work with Chinese nickel smelters for a small-scale commercial start-up
project while it develops a purpose-built process plant of its own (AMC Consultants, 2021). Since that filing, it announced a “pre-feasibility study” for developing a nodule processing plant in India for this start-up project (The Metals Company, 2022). Although the company has not stated whether this plant, if constructed, would replace any partnership with China, the fact that the plant’s capacity of 1.3 million tons of nodules per year is equal to the planned throughput for its start-up project suggests that it would. Representatives from all other companies we interviewed indicated that they have no plans to partner with China.

The only other connection to Chinese processing that we are aware of was on the Solwara 1 project. The mining company for the project had entered into a formal agreement with a Chinese company to sell it 1.1 million metric tons of seafloor massive sulfide ore for processing (Nautilus Minerals Inc., 2012).

**Not Pressing for Commercial Mining**

As described above, China has invested substantial effort and resources in rapidly developing deep sea exploration and seabed mining capabilities. It has been a very active participant in the ISA; in 2019, the ISA Secretary General speculated that China might be the first country to begin commercial seabed mining (“China Leads the Race to Exploit Deep Sea Minerals: U.N. Body,” 2019). In seeming contrast to its resolute effort to develop and implement a seabed mining program, China has subtly conveyed a desire to slow the development of regulations allowing the initiation of commercial seabed mining activity. In 2016, China’s permanent representative to the ISA emphasized that slumping metals prices “means that the possibility of realizing commercial exploitation of deep-sea resources in the near future is quite small” and that the formulation of mining regulations “represent[s] a complex and difficult undertaking which cannot be accomplished overnight or in great haste” (COMRA, 2016). Similarly, during ISA Council deliberations in 2019 about expediting the completion of mining regulations, China, which historically aligned with the pro-mining factions, “uncharacteristically, did not weigh in on the debate” (Woody, 2019). One observer at the proceedings noted that

> China may not be in a hurry to mine the seabed given its access to significant sources of terrestrial minerals. Chinese companies own eight of the 14 largest cobalt producers in the Democratic Republic of Congo, which is the source of 68% of the world’s supply of the mineral.” (Woody, 2019)

That perspective, combined with the fact that Chinese contractors are still technically unprepared to begin commercial mining, may explain China’s unwillingness to join the ranks pushing for rapid development of commercial mining regulations.
Potential Areas of Concern Regarding China and Seabed Mining

Seabed Mining Exploration as Support for Military Capability Development

Some observers have drawn a connection between China’s maritime exploration activities associated with seabed mining and its military capabilities and strategic objectives (e.g., Agarwala, 2021; Alexander Gray, 2021; Martinson and Dutton, 2018; Minter, 2021; and Vats, 2020). A recurring theme in these articles is that deep seabed mining exploration has “a significant military component” (Alexander Gray, 2021).

There is good evidence that deep and distant sea exploration is of great interest to the Chinese military. For example, the Chinese Ministry of National Defense has identified the deep sea as an emerging domain of relevance for combat capabilities (Qianyi Zhang, 2018). Similarly, China’s National Defense University highlights the “military struggle in the deep sea” (Martinson and Dutton, 2018). And China’s National Security Law was revised in 2015 to include international seabed areas to the list of assets and interests for which security must be safeguarded (China Law Translate, 2015).

Beyond these stated objectives, certain actions by Chinese research vessels have been interpreted as threatening. Inspired by the Russian submersible MIR planting a flag on the seabed under the North Pole in 2007, the crew of the Jiaolong planted a Chinese flag on the floor of the disputed South China Sea in 2010 (“Submarine Plants Flag on the Ocean Floor,” 2010). In addition, while making multiple descents to over 7,000 meters in 2012, the Jiaolong crew spoke from the depths of the Mariana Trench to the crew of the Shenzhou-9 spacecraft on its way to become the first crewed spacecraft to dock with the orbiting Tiangong-1 space lab (Xinhua News Agency, 2012).

Multiple interview participants noted that China has conducted several research activities in other countries’ EEZs without obtaining the required permissions, an observation supported in the literature (Agarwala, 2021; Asia Maritime Transparency Initiative, 2020; Martinson and Dutton, 2018). In 2020, China described and named (in Chinese) 55 topographic features in the South China Sea, most in Vietnam’s EEZ (Vats, 2020). In association with the rapid technical development of deep and distant sea exploration capabilities, such acts have been characterized by some observers as “a deliberate attempt by China to assert its sovereignty over the world” and “military muscle-flexing” (Broad, 2010; COMRA, 2019; Lo, 2018; Vats, 2020).

Although the military value of maritime exploration is clear, there are few observations that directly connect Chinese seabed mining exploration with military capability development. However, seabed mining exploration is perhaps the largest component of China’s deep and distant ocean maritime activities and, because many seabed mining exploration activities are of relevance to military capability development, the two endeavors cannot be definitively separated (Martinson and Dutton, 2018). Thus, a claim that seabed mining exploration is deliberately being undertaken to support the military is difficult to support or disprove.
One way the potential military association with seabed mining exploration emerges is in the language that the Chinese government has used to describe it. The State Oceanic Administration described the purpose of a seabed mining exploration cruise to one of its ISA contract areas as “to safeguard China’s mineral resource rights and interests in international seabed areas” (Martinson and Dutton, 2018). China’s rights to these exploration areas are clearly established and undisputed, and its physical presence there is not required to safeguard them (ISA, undated).

Another connection between seabed mining exploration and military goals is the deliberate cooperation and information-sharing between civilian and military maritime research and exploration activities. This close civil-military integration differs markedly from other countries’ approach of clearly separating the two (Asia Maritime Transparency Initiative, 2020; Chen, 2017; Martinson and Dutton, 2018; Zhiwen and Niu, 2018).

Lastly, even without any direct military connection, seabed mining exploration provides a nonthreatening civilian justification for Chinese cruises transiting distant swaths of ocean. As noted by Agarwala, 2021, p. 106, even though “the movement of China in the Indian Ocean is legally legitimate and cannot be stopped or avoided,” such activity is nonetheless cause for concern. China obtaining an ISA contract along the Southwest Indian Ridge makes its “transit and presence in the Indian Ocean legitimate” (Agarwala, 2021, p. 104).

Our interviews provided little additional insight into the question of whether Chinese seabed mining exploration activity is motivated by military objectives. Seabed mining contractors and experts uniformly conveyed that they were unaware of any associations between Chinese seabed mining activity and military objectives or capabilities. As one interview participant commented, “You don’t need an ISA lease to put a submersible down in the middle of a lease block and drive it around and look at things. It’s still the high seas.” When pressed as to why China’s exploration was nonetheless viewed by some as suspicious, one participant said, “I think a lot of that has to do with the legacy of the Glomar project. There is this history of, in the middle of the cold war, major covert ops disguised as deep-sea mining exploration.”

Three Chinese military maritime experts we interviewed about this point supported many of the arguments made above. They emphasized that although there is little doubt that some ostensibly civilian maritime activity (primarily in and around the South China Sea) does directly support the military and that deep and distant sea exploration capabilities are of value to the military, they could not see any justification for the position that China’s interest in seabed mining exploration was motivated by developing deep and distant sea exploration capabilities for military purposes.

**Not Respecting Seabed Mining Contracts and Licenses**

One interview participant described a rather remarkable incident involving a Chinese research vessel and the Solwara 1 project. In 2015, while the Solwara 1 project was actively

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81 The Glomar project, or Project Azorian, was a covert Central Intelligence Agency operation in 1974 to recover a sunken Soviet submarine under the pretense of seabed mining (Thulin, 2019).
engaged in exploration and project development, a Chinese research ship entered the Solwara 1 license area and collected a large number of samples from the seabed without ever having gained permission to work in the Papua New Guinea EEZ or take samples from the Solwara 1 license area. The mining company for the Solwara 1 project attempted to communicate with it to no avail, and it apparently had its automatic identification system (AIS) transponder disabled. The issue was escalated to the Australian military, which assists Papua New Guinea in enforcing its EEZ rights, “and the ship was basically chased out of Papua New Guinea,” according to the interviewee.

The occurrence of this incident, which the interviewee said is “not widely known,” is supported by official dispatches from the Papua New Guinea Mineral Resources Authority describing the incident and several scientific publications from Chinese academic institutions describing the samples and acknowledging the location and date of sample collection and the name of the research vessel (Wang et al., 2017; Zeng et al., 2020; Zhang et al., 2017). 82

This incident demonstrates there is a real risk that entities could conduct seabed sampling activities without having been granted rights to do so, even in areas where other parties have been granted such rights. This risk illustrates the importance of the ability of rights-granting authorities to be able to enforce those rights. ISA exploration contracts state that the ISA has the right to inspect ships and to “ensure that no other entity operates in the exploration area for a different category of resources in a manner that might unreasonably interfere with the operations of the Contractor” (ISA, undated). The ISA has taken steps to deconflict seabed mining exploration and submarine cable industry activities (ISA, 2018), but interview participants confirmed that it has not yet conducted any inspections. Multiple interview participants felt that the ISA would not have the resources for inspection and enforcement activities until commercial mining was underway and the ISA began receiving royalty revenues.

Two interview participants noted that ship inspections are of limited value because there are few onboard activities that would constitute a contract violation. In addition, one noted that “it’s very easy for operators to hide violations or even to reject an inspection altogether by claiming that it’s not safe to bring a boat onside and board.” These interview participants said that the primary way an operator could violate an exploration contract is to conduct seabed sampling or equipment testing in another operator’s contract area. They emphasized the importance of tracking ships’ locations, routes, and sampling activities. The challenge, several participants said, is that generally it is perfectly allowable to travel through and conduct bathymetric and other nonmining-related research activities in the waters above other ISA contract locations and to transit other nations’ EEZs. Another challenge, according to interview participants, is that Chinese ships sometimes deactivate their AIS, which broadcasts a ship’s identity, type, position, course, speed, and other information and is required for any nonmilitary ship over 300 gross tons

82 The vessel identified in these reports is the Kexue Yihao, which is owned by the Chinese Academy of Sciences (Martinson and Dutton, 2018).
when on an international voyage (International Maritime Organization, undated). This claim is consistent with recent news reports (He, 2021).

**Dominating Mineral Processing**

As noted above, China dominates the global processing market for several critical minerals, including those found in seabed mining resources. This dominance has been a global strategic concern for decades and the subject of substantial analysis and policy proposals (e.g., International Energy Agency, 2021; The White House, 2021). A central aspect of this concern is that dominating the downstream processing and product manufacturing stages of the critical mineral supply chain not only affords China an economic and trade advantage (by owning the steps in which the most value is added) but also leaves the rest of the world overly dependent on a single source to supply materials that are critical to an increasingly large portion of the global economy. Physical disruptions, trade restrictions, price manipulation, or political instability could leave manufacturers around the world without access to critical components (International Energy Agency, 2021; The White House, 2021).

Mining operations obviously have a choice about whether to partner with Chinese firms for mineral processing. However, a common characteristic of opportunities to partner with Chinese firms, affirmed by several interview participants, is that Chinese companies supported by the central government are able to develop processing infrastructure at lower costs and offer services at lower prices than mining companies can obtain elsewhere, making the business case for partnering very attractive.

**Summary**

The findings from our analysis can be considered in three parts: the potential linkage between China’s seabed mining program and strategic military objectives, the threat of seabed mining in unauthorized locations, and breaking the cycle of allowing China to continue to dominate the global minerals processing market. For each part, we summarize the key findings and present recommendations for helping ensure that concerns are alleviated.

**Potential Links Between Seabed Mining and Military Objectives**

Relative to many other ISA contractors that have links back to the multinational consortia that conducted extensive exploration in the 1970s and 1980s, China is a newcomer to deep seabed mining. However, explicit prioritization and substantial investment over the past 20 years have brought Chinese deep-sea exploration capabilities on par with the state of the art. Its seabed mining technology is similarly developing quickly. Because Chinese teams were starting from behind and had few contacts with groups in countries with more-advanced technology, China’s progress occurred largely independently.
The combination of attaining advanced deep-sea exploration capability so quickly and doing so with little outside collaboration has drawn attention. Some observers emphasize the dual-use aspects of such capabilities and warn that China’s involvement in seabed mining exploration serves as a means to legitimate various forms of deep- and distant-sea activity and cover for pursuing more-strategic military objectives. This position is at least consistent with China’s clear acknowledgement of the military significance of the deep-sea domain.

At the same time, China’s demand for critical minerals is high; although it currently meets this demand with land-based resources, demand is increasing globally, and some believe that seabed mining will be required to meet future demand. In addition, China is vigorously developing technology specifically for seabed mining, which has no military value. Finally, most of the sea activity ascribed to furthering military objectives is legitimate on its own and therefore does not require a seabed mining program to act as a cover.

Given that many deep- and distant-sea exploration capabilities have value for both purposes and that China has been transparent about having a clear desire for both, it seems most plausible that China is, in fact, pursuing both. The Chinese practice of integrating research and commercial activities with military pursuits means it will always be difficult to definitively ascribe the activities of an individual ship or program to purely commercial, research, or military purposes. But even if a commercial program, such as seabed mining, also supports military objectives, it is not clear that China would benefit from hiding such behavior. There are few restrictions on what is allowed in the high seas, so China is free to openly pursue military objectives. We find no clear support for or evidence against the position that China’s seabed mining program is somehow intended as a diversion or cover for military purposes.

Seabed Mining in Unauthorized Locations

China’s propensity to infringe on territory belonging to other nations raises concerns for the security of seabed mining contract areas. China’s assertive efforts to explore and characterize the South China Sea and elsewhere beyond its jurisdictional waters without permission indicates that it is willing to flout international agreements when it does not agree with them. Although the motivation for the Solwara 1 trespassing incident is unknown, the incident indicates that China’s willingness to infringe on territories granted to others extends to seabed mining as well. This incident, along with Chinese ships’ history of deactivating their AIS beacons and the vast physical expanse of the Area, raises concerns about the possibility of conducting seabed mining in unauthorized locations.

China and Mineral Processing

China has over the past few decades come to dominate the global market for the processing of several critical minerals. The reliance on a single source of supply leaves users vulnerable to supply disruptions resulting from natural disasters, trade restrictions, political instability, or other factors. The impact of this supply risk is expected to increase in the coming decades as the
demand for critical minerals increases with the widespread adoption of electric vehicles and energy storage associated with renewable energy generation. At the same time, because the increase in demand will require new capacity, it represents an opportunity to shift the balance of processing capacity away from China and diversify it among other countries.

A major unknown regarding mineral processing for seabed mining is that most operators are still in the research and development stage for determining the appropriate processing method. Seabed resources have never been processed at a commercial scale, and many unknowns remain regarding the best approach. As a result, operators are unable or unwilling to share much about business plans for mineral processing.

Our research did not reveal any current partnerships related to mineral processing. One former operator had struck a deal with a Chinese processing firm several years ago, but the project was terminated before mining began. A current operator is considering partnering with Chinese processors for a start-up project, though they may have revised that plan to work in India instead.

All the operators we met with (including the one considering partnering with China) were aware of the risks of partnering with China for mineral processing and expressed a desire to avoid doing so. The high capital outlay required to develop processing capacity in-house, however, creates serious challenges, particularly for operators not backed by large multinational corporations. In addition, environmental protection requirements in developed countries make approvals more difficult to obtain than in developing countries.
Chapter 5. Recommendations

We offer the following recommendations for the coal power plant, electricity transmission and distribution associated with GEI, and seabed mining case studies. Unless explicitly stated otherwise, all recommendations target host nations.

Chinese Support for Overseas Coal Power Plants

Promote Renewable Energy Sources for Industrial Parks

A significant issue involves China’s role in supporting coal power at mineral processing centers. There is 8,000 MW of captured coal-related power under development in Indonesia alone, and CREA notes that China has plans to build 50 special economic zones in Asia and Africa (Suarez, 2022). Further development of coal power for such plants would create a significant carbon footprint. Therefore, there is a critical need to develop greener approaches to powering such facilities.

However, industrial parks represent a critical challenge for promoting clean energy. In such parks, coal power is often a preferred energy source, given its ability to provide consistent 24-hour-per-day power in comparison to solar and wind, for which energy output varies in terms of access to the sun and changes in windspeeds. Therefore, the challenge for promoting renewable energy at such parks is to identify ways to generate consistent rates of power. Some reports suggest that it is possible to use a mix of solar, wind, and hydro energy to support Indonesia’s processing centers, though it is beyond the scope of this report to assess the feasibility of such claims (Morse, 2022; Puspitarini, 2021). We note, however, that research and development into such capabilities is underway. Canada Nickel Company Inc., for example, has created a wholly owned subsidiary, NetZero Metals, to conduct research and development of a carbon-neutral processing facility (Green Car Congress, 2020). In the United States, the world’s largest solar-powered steel mill is currently under construction in Colorado. The mill is slated to receive 90 percent of its power from a 300-MW, 750,000-panel solar farm (Kohler, 2021). Ultimately, it will be important to further investigate such opportunities, especially as they relate to Indonesia’s industrial parks, which appear to have ample deposits of wind and solar power (Puspitarini, 2021).

Seek Greater Clarity from China on Plans for Coal Plants with Financing and Permits

Early praise of President Xi for his UN announcement was soon supplanted with questions as to the exact meaning and parameters of the commitment. The NDRC and other guidelines offer more detail, with an unambiguous call to “completely stop new overseas coal power projects.”
But questions persist regarding whether the strictest interpretation of this statement means that projects with financing and permits will be shuttered. In Pakistan and Indonesia (though not in South Africa), a total of 11,140 MW of power fall into this gray zone. Some of these projects are moving forward in the development phase, as evidenced by assurances from Beijing that the Gwadar energy plant in Pakistan can move forward. It may seem that China wants to proverbially have its cake and eat it too. It will therefore be critical for China to offer more clarity on guidelines and its plans for the coal power plants in this category. This should be a consistent focus of diplomatic engagement with China.

**Help Host Countries Transition from Coal**

Beyond these recommendations, it will be important for the international community to offer direct assistance to such countries as Indonesia and Pakistan in making the transition from coal to renewable energy. As highlighted in this report, South Africa, Pakistan, and Indonesia have their own reasons for pursuing coal-fired energy. All three have large reserves of coal, and coal offered these countries a means to rapidly expand energy production. Influential coal mining industries in Indonesia and South Africa have helped perpetuate a reliance on coal, and established Indonesian energy policies have cemented a hold on coal-powered energy and limited the development of renewable energy. The mining industries in Indonesia and South Africa also play a significant role in the local economies.

China should play a critical role in helping with such transitions. Beyond terminating its support for coal-fired power, China should play a leading role in following its NDRC guidelines and supporting overseas green energy infrastructure and development. Two-thirds of all solar panels are made in China, and China has manufactured half of the world’s wind turbines (China Climate Change, undated; Reve, 2021). This resident expertise, combined with an established policy of promoting green energy abroad, should set the stage for China to play a more positive role in promoting the adoption of renewable energy. China should seize this moment.

Policy changes, particularly for Indonesia, will also be critical. As noted, Indonesia’s policies create an unfair advantage for coal with the provision of below-market rates for domestic coal consumption. In addition, Indonesia requires that 40 percent of the materials and services for solar projects be made or produced in Indonesia. The international community should use diplomatic engagements, capacity-building training, and other such efforts to help Indonesia revise its domestic policies that handcuff broad expansion of renewable energy. Diplomatic engagement will be one critical tool, but it may also be necessary to promote capacity-building programs or engage in other exchanges of expertise.

Finally, one potential solution is already in play in South Africa with the 2021 announcement of the Just Energy Transition Partnership, in which the United States, Germany, the United Kingdom, and the European Union will contribute $8.5 billion to help South Africa retire coal plants early, support coal-dependent regions, and turn to renewable energy. Such initiatives may also be critical for Indonesia and Pakistan, which can likely ill afford to early retire their fleet of
coal-fired power plants. The importance of such an initiative for Indonesia was mentioned by several interview participants, and it is a topic already discussed in diplomatic circles.

Electricity Transmission and Distribution in Latin America

Given the importance that strong institutions and regulatory frameworks play, we make the following recommendations for Latin American countries and other countries around the world that have pursued or are considering pursuing investments and financing from Chinese SOEs in power transmission and distribution, as well as in the generation sector.

*Develop Regulatory Frameworks for the Integration of Renewable Energy*

With the proliferation of renewable energy resources, countries that are integrating green energy into their power grids need to consider developing legislation that governs the underlying integration processes, including regulations of the power supply and demand across international borders and over long-distance power transmission lines, how to respond to potential blackouts, and how to approach unstable power supply and demand when violent conflict breaks out.

*Develop Regulatory Frameworks to Address Technological and Informational Components of Smart Grids*

With the increasing importance of software and digitalization in the operation of smart grids and in energy integration initiatives, there is also a need for countries to establish a regulatory framework that addresses the technological and informational layer that accompanies physical assets and governs the control, functioning, and maintenance of software and other digital components that operate critical infrastructure assets.

*Have Transparent Public Tenders*

Having a transparent public tender system that meets international best practices and respects local laws is likely to further a free-market environment and encourage competition among foreign investors, with foreign companies winning on the financial and technical merits of their offer, including the quality of environmental assessments conducted and respect toward local labor regulations.

*Implement Screening Mechanism for Foreign Investments*

Implementing mechanisms that allow local governments to review foreign investments in areas related to the financing of the investment, the presence of a local component, and the law
governing the investment contract is likely to protect the core interests of the host country and increase the quality of foreign investments.\footnote{Although Organisation for Economic Co-operation and Development (OECD) member countries (such as Mexico) have mechanisms to screen foreign investment, this is not the case for many non-OECD countries in Latin America.}

**Screen for Foreign Government Financial Backing**

Local governments have the authority when designing the public tender process to ask foreign companies that invest in the host country to disclose the source of their capital, and they can refuse to entertain bids from companies whose capital is financed through nonmarket conditions, if accepting such bids would open the host country to economic and political pressure from foreign governments and be detrimental to the host country’s interests.

As discussed in Chapter 3, one overarching concern that several interviewees shared was related to the perception that Chinese SOEs and state-backed private companies from China have access to capital at below-market prices and gain an unfair competitive advantage over other international private competitors that do not have the full weight of a government behind them and that access capital at market rates. Such practices are perceived as unfair and as hindering free market competition by undercutting other foreign investors and facilitating the concentration of control over significant percentages of critical infrastructure sectors into the hands of companies controlled by the Chinese government, as in the case of the power sector in Chile. This concentration of control over critical infrastructure assets in Beijing’s hands increases the host country’s vulnerability to economic and political pressure. In this light, the screening mechanism in place should consider the economic and political ramifications for the host country if it were to accept bids from companies whose capital is financed through nonmarket conditions.

**Screen Contracts for Clauses Related to the Inclusion of a Local Component**

Within the limits of World Trade Organization rules and policies, host governments can consider screening offers for the presence of clauses related to local components, such as the winning company employing a certain percentage of local labor, including having local professionals in leadership and management roles next to the foreign investors.

**Screen Contracts for Local Law Governing the Contract**

Host governments can also screen for offers that show a preference for local laws to govern the final contract and third country arbitration of disputes. Ensuring that most, if not all, legal details are agreed in writing at the time when the final contract is drawn is especially important in the context of Chinese executives and officials rotating very quickly in their leadership roles, with verbal agreements unlikely to carry over between rotations.
Have a Professional Public Contracting Officer Corps

To support the development of a transparent and functioning investment screening mechanism and public tender system, public contracting officers should be shielded from political pressure. It is essential for host governments to ensure that public contracting officers have a stable career path and are highly professional, reputable, and unlikely to succumb to questionable professional practices, such as corruption.

Diversify Investment Partners

Overreliance on investors from one single country increases the economic vulnerability of the host country and, over time, might increase the country’s vulnerability to foreign political pressures, as the examples of Chinese diplomats attempting to project influence in the information domain in Appendix B show. Diversifying foreign investors fosters a healthy competition environment, allowing host countries to attract higher quality investments in the long run as foreign investors gain confidence that the country follows and respects free market practices.

Seabed Mining

Continue to Monitor Chinese Seabed Mining Exploration and Technology Development

Although concerns that China may be using its seabed mining activity as a cover or distraction for military activities are difficult support or disprove, the fact that China has used research and commercial activities as a cover for ulterior purposes in and around disputed territories suggests that this could be the case with seabed mining as well. It will be important to continue to monitor Chinese seabed mining exploration technology development and use and Chinese ship activity for signs of anomalous activity. The ISA and other seabed mining authorities (authorities) can require contractors and licensees (operators) to announce and describe seabed mining exploration cruises in advance. Authorities can also require operators to attest that all activity conducted in pursuit of seabed mining is entirely research or commercial in nature and that no military objectives are being pursued.

Implement Methods to Monitor Operators’ Seabed Mining Activity

China has a propensity to infringe on territory belonging to other nations, which raises concerns for the security of seabed mining contract areas. Therefore, it will be important to implement methods to monitor operators’ seabed mining activity. Given the vast expanse of the Area or even of specific contract areas, it is infeasible to patrol such areas with crewed vessels. However, authorities can take steps to increase their situational awareness of operators’ activities. One approach, as recommended in the prior section, is for authorities to require operators to announce and describe seabed mining exploration cruises in advance. Authorities
can also insist that all ships participating in seabed mining activities always use their AIS beacons. Using these and other data (e.g., historical behavior), authorities can develop a risk-based targeting approach to monitor particular locations and times. Such monitoring may take the form of conducting patrols with crewed vessels, placing inspectors on operators’ ships, and, to the extent technically feasible, deploying sea surface drones to monitor operators’ ships. The objective of such monitoring would be to verify operators’ ships’ locations and activities. In addition to increased real-time monitoring, authorities can increase the frequency of required reporting by operators to help better understand operators’ activities and more quickly identify behavior that violates contract terms or otherwise appears irregular.

Create Incentives to Develop Domestic Processing Capabilities

Nations sponsoring seabed mining activities in their EEZs, home nations of mining operators, and any nation with an interest in diversifying the global minerals processing supply chain can create incentives to develop domestic processing capabilities rather than outsourcing them to China. Such interventions include revising environmental requirements for permitting processing facilities; providing grants, loans, and loan guarantees to help finance the construction of processing facilities; incentivizing the use of domestically produced critical materials and products; strengthening ways to enforce the prohibition of unfair trade practices; and raising public awareness of the contribution that such projects play in energy sector decarbonization (e.g., International Energy Agency, 2021; The White House, 2021).
Appendix A. Advantages and Disadvantages of a Globally Integrated Grid Based on UHV Transmission Lines

By placing UHV transmission lines at the heart of GEI, the global expansion of UHV transmission lines allows China the opportunity to become the technical standard-setter in this field. In addition, the active promotion of the globally integrated UHV grid could be seen as an attempt for China to project internationally the image of a clean energy supporter while advancing the financial and technological interests of Chinese companies involved in clean energy transition (Downie, 2020, p. 27). For instance, GEI allows China to promote its solar and wind manufacturing companies in addition to UHV and undersea transmission cable developers, with China aiming to establish its SOEs (such as SGCC) as the primary providers of UHV grids across the world (Delina, 2021, p. 2; Downie, 2020, p. 12).

However, despite the advantages that UHV transmission lines might have at the domestic level, UHV’s applicability to grid integration is still under debate, and it represents an aspect that GEIDCO and its supporters are still trying to grapple with (Downie, 2020, p. 27). Not only are UHV development projects extremely costly—hundreds of millions of dollars—but they might not be the right technical solution in countries and regions of the world where the local and regional transmission networks are not developed sufficiently to incorporate such massive projects. In such instances, several smaller transmission lines might represent a more appropriate solution, especially from an energy security perspective, because it would avoid having a single point of failure (e.g., one massive transmission line) that could result in a widespread blackout. Also, countries that do not have well-developed domestic grids are more likely to struggle to meet “the complex demands of cross-border electricity trade” (Downie, 2020, pp. 26, 30). Such considerations are likely to become even more critical in the context of cross-border electricity trade than they would be in a narrower domestic context.

Furthermore, there also are concerns related to potential overdependency on a single grid. Some of the challenges to GEI implementation concern the need for multilateral political cooperation to be successful “to coordinate the regulatory arrangements and the physical asset build-outs needed” (Downie, 2020, p. 26). Reaching political consensus and building the trust needed for the implementation of a global scale initiative such as GEI are likely to be difficult, given long-standing political rivalries at the regional and international levels; to date, regional efforts to stand up platforms for multilateral electricity exchange have an uneven track record. Also, the economic value and the efficiencies that China estimated could be associated with

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84 Interview with U.S. government official, February 25, 2022.
85 Interview with U.S. government official, February 25, 2022.
installing UHV lines at a global scale are unproven, with current evidence in this area being rather murky (Downie, 2020, p. 30).

Other concerns associated with UHV transmission lines are based on China’s experience so far with its domestic deployment of UHV lines that connect renewable energy sources that are mostly available in the center and western part of the country with the demand areas, which are in the east. Some of these concerns are related to overcapacity resulting from more energy being generated than what the internal market can buy, the potential for country-wide blackouts, and renewable energy curtailment, with one interviewee mentioning that China is having trouble getting its provinces to share power domestically, while another interviewee mentioned China’s need to find a way to export (and monetize) some of its domestic overcapacity.

At the regional level, when several countries rely on the same UHV line for power transmission but have different capacity demand and needs, there is a need to ensure that each national grid remains flexible and that a multi-terminal UHV line can adequately serve each country’s needs, especially in the context of uncertain timing for energy generation using solar and wind. Delina, 2021, identifies additional challenges related to a China’s energy integration with the Association of Southeast Asian Nations, which can be extrapolated to other regions of the world, such as

- the presence of weak and varied national energy regulations
- the absence of a regional energy scheme and strong institutions that support energy interconnection
- the fact that electricity is considered by many national governments to be a vital political asset whose control they are hesitant to entrust to neighboring countries and to China
- concerns related to implementing Chinese-led large hydropower generation infrastructure projects that are usually associated with environmental and social concerns
- concerns related to countries’ ability to trust China’s intentions (Delina, 2021, pp. 3–7).

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86 Curtailment happens when wind or solar energy is not delivered to its intended receiver because grid operators often prefer to meet energy demand by first using coal-operated plants located in close proximity, with the renewable energy generated being lost (Delina, 2021, p. 4).

87 Interview with U.S. government official, April 20, 2022.

88 Interview with energy sector experts, May 6, 2022.
Appendix B. Chinese Attempts to Project Influence in the
Informational Domain in Latin America

As mentioned in the concluding paragraph of Chapter 3, we did not encounter any key episodes related to Chinese government pressure or attempts at gaining or projecting influence in the informational domain that were specific to Chinese investments and financing in power transmission and generation. However, we did encounter examples of Chinese government attempts to (1) gain and project influence in the informational domain in Brazil, Chile, Peru, and Argentina and (2) shape local political discourse in a manner favorable to China.

In several of the five countries we explored in the Latin America case study, we noticed that Chinese government officials became very active in the informational domain in recent years, especially since the outbreak of the COVID-19 pandemic. Under Xi’s presidency, Chinese diplomats have become very active users of social media platforms (such as Twitter), where they have taken a confrontational and provocative approach that is part of the more assertive Chinese attitude in the international arena that has become known as “wolf warrior diplomacy” (Brandt and Schafer, 2020; Phillips, 2020). However, as wolf warrior diplomacy backfired—as some of the following examples show—Beijing began to tone down the approach starting in 2021 (Jing, 2021).

In addition to Chinese diplomats engaging on social media in provocations and overt criticism of some foreign policy statements or of decisions that some Latin American government officials made, Chinese government officials have acted as an echo chamber of anti-American propaganda that Venezuelan government officials and networks (such as TeleSur) and Russian media outlets (such as Sputnik International and RT Español) broadcast (Brandt and Schafer, 2020).

Chinese Attempts to Project Influence in the Informational Domain in Brazil

Brazilian concerns about Chinese backlash when Brazilian actors criticize China are not entirely unfounded, and Chinese attempts to interfere and shape the domestic political discourse in Brazil have become increasingly aggressive in recent years (Youkee, 2020). Brazil, similar to Chile and other countries in Latin America and across the world, has witnessed in recent years an aggressive backlash in the informational domain from the Chinese ambassador and other diplomats in the country, who have verbally attacked those who spoke critically of China or of the government in Beijing (Stuenkel, 2020; Zhai and Tian, 2020). In the context of the outbreak of the COVID-19 pandemic, such episodes resurfaced with increased frequency across the world, including in Brazil. According to one study focused on Brazil, Ecuador, and Grenada, “wolf warrior-type messaging appeared most frequently in Brazil” (Myers, 2021, p. 9).
For instance, Eduardo Bolsonaro—one of the sons of Brazil’s President Jair Bolsonaro and then-chair of Brazil’s House foreign relations committee—entered in March 2020 into a social media spat with the Chinese ambassador, Yang Wanming, after he publicly blamed the authoritarian nature of the government in Beijing for not taking swift action against the novel coronavirus, leading to its global spread (Boadle, 2021; Fonseca, 2020; Myers, 2021, p. 9; Phillips, 2020). In response, Yang called the Bolsonaro family a “huge poison” for Brazil and accused Eduardo Bolsonaro of having contracted a “mental virus” in the context of a recent trip he had undertaken to the United States (Jaishankar, 2020). When Brazilian Foreign Minister Ernesto Araujo publicly called out Yang’s statements as unacceptable, the Chinese Embassy’s response continued the pattern of accusations and verbally aggressive behavior on social media, calling Eduardo Bolsonaro’s statements “absurd, prejudiced . . . [and] irresponsible” (Fonseca, 2020). Furthermore, in response to Eduardo Bolsonaro referring to the novel coronavirus as “the China virus,” the Chinese Consul to Rio de Janeiro, Li Yang, published a widely circulated op-ed in a major Brazilian newspaper, O Globo, in which he referred to Eduardo Bolsonaro as “brainwashed by the United States” and issued a rather threatening statement that “should any country insist on being China’s enemy, we will be its most sophisticated enemy!” (Stuenkel, 2020). In May 2020, the Chinese embassy was active in publishing op-eds that aimed to address “allegations that COVID-19 originated in a lab in Wuhan and that China was not transparent when handling its domestic outbreak” (Myers, 2021, p. 9).

Other points of contention between Eduardo Bolsonaro and the Chinese representatives in Brazil concerned the Clean Network program, whose goals are to protect members from invasion of privacy and data breaches, including by such countries as China. In response, the Chinese embassy in Brazil accused Eduardo Bolsonaro of supporting a program that targets Chinese 5G technology (Caram and Della Coletta, 2020).

Furthermore, the Chinese Embassy accused Brazil of “following the lead of the United States and slandering China” and issued a veiled threat that “negative consequences” would likely follow if Brazil does not give up rehearsing U.S. rhetoric against China (Caram and Della Coletta, 2020). These statements by the Chinese ambassador did not come across well with many Brazilians, including those who do not support President Bolsonaro’s approach to governance. In the context of the statements that the Chinese Ambassador to Brazil made, President Bolsonaro asked Beijing twice to recall its ambassador, with the Chinese government disregarding the request in both instances (Feliciano, 2021). Moreover, the spat divided the Brazilian government, with some politicians criticizing President Bolsonaro and Araujo and accusing them of creating damage to the economic relationship with China and with China playing various factions of the Brazilian government against each other (Boadle, 2021; Stuenkel, 2020). These concerns are not entirely misplaced, given that Chinese diplomats have in recent years not hesitated to inflict economic pain on their detractors in addition to being extremely combative on social media (Phillips, 2020).
Despite these highly visible confrontations in the informational arena, one of the high-level representatives of the Chinese government in Brazil, Qu Yuhui, praised Brazil’s environmental record in August 2019, when the country was experiencing the apogee of the fires in the Amazon, with Brazilian environmental nongovernmental organizations being highly critical of the government’s environmental record at the time (Stuenkel, 2020).

Chinese Attempts to Project Influence in the Informational Domain in Chile

In recent years, the Chinese ambassador to Chile embraced a very active and aggressive stance in the media in the country (Youkee, 2020), attracting local criticism and becoming one of the most controversial diplomatic personalities in the country (Azócar and Fernández, 2020). Chilean officials and the public justly noted the discrepancy between the very active stance of the Chinese ambassador when compared to that of other countries’ ambassadors to Chile. For instance, when Chilean legislators visited some of the leaders of the pro-democracy movement in Hong Kong, Xu Bu, the Chinese ambassador to Chile, published in September 2019 an op-ed in one of the major local newspapers, El Mercurio, attacking the meeting between the two Chilean congressmen and the Hong Kong activist Joshua Wong. In the op-ed, Xu Bu warned the two legislators about “meet[ing] with the right people” instead of “social thugs,” which is Beijing’s way of referring to the pro-democracy protesters in Hong Kong (Hannig, 2020). Similar to Chinese attacks on local government officials in Brazil, Xu Bu’s criticism was not well received, and El Mercurio published a response article by the attacked Chilean legislator Jaime Bellolio (Azócar and Fernández, 2020). One month later, in October 2019, the Chinese embassy purchased eight pages in El Mercurio to commemorate the Chinese Revolution’s 70th anniversary, and the second largest Chilean newspaper, La Tercera, forged a partnership with Chinese state-sponsored media with the purpose of disseminating Chinese culture in Chile in the form of op-eds and direct placement of Chinese news coverage (Hannig, 2020). Newspapers’ financial struggles represent one of the reasons why local newspapers accept paid content from Chinese state media (Ellis, 2021a).

As a result of the Chinese ambassador’s aggressive stance and further miscommunications between Xu Bu and the Chilean government that resulted in a public controversy related to Chinese delivery of ventilators to Chile’s Ministry of Health (the so-called ventilator-gate; Azócar and Fernández, 2020), Xu Bu was forced to step down early from his role in October 2020. After his departure, the new Chinese ambassador in Chile is keeping a very low profile and makes very few public statements.91

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89 Interview with Chile energy sector SME, April 21, 2022.
90 Interview with Chile energy sector SME, April 21, 2022.
91 Interview with Chile foreign and economic policy SME, May 9, 2022.
When the China-based information security company Aisino submitted in 2021 a bid to participate in the tender process to make Chile’s biometric identification cards and passports, complaints from the other national and international competitors were filed with the Chilean government about Aisino not meeting some of the technical and administrative requirements for the process specified in the original request (Burt, 2021; Nash, 2021). Aisino submitted the lowest bid, won the tender, and was supposed to provide the software and hardware involved in the fabrication of Chilean identification cards and passports. However, in November 2021, the Chilean government canceled the public tender contract in light of concerns regarding data protection and as a result of Aisino refusing to provide background information that the Chilean government asked for (Vérité, 2021). Aisino’s bid showed China’s interest in gaining access to the biometric information of citizens of a country that is a very close U.S. partner, with Chile being the only Latin American country that is part of the Visa Waiver Program. Interestingly, a Federal Bureau of Investigation report from 2020 mentioned Aisino as being one of two Chinese companies that created a backdoor in the Chinese government-mandated tax software handing value-added tax (VAT) payments to the Chinese tax authority that all foreign companies active in China are required to install (Cimpanu, 2020; Nash, 2021).

**Chinese Attempts to Project Influence in the Informational Domain in Peru**

The Chinese ambassador to Peru is perceived as very active, especially since the beginning of the COVID-19 pandemic, similar to the cases of Brazil and Chile. However, when the Sinopharm scandal known as “VacunaGate” (or “VaccineGate” in English) broke out, revealing that then-President Martin Vizcarra and several other government officials, businessmen, and their families were vaccinated in secret ahead of the rest of the Peruvian population using some 3,200 vaccine “courtesy” doses that came from China outside of the phase III trials that were still ongoing, the Chinese embassy in the country remained fairly silent, denied any impropriety, rejected the terminology used (“courtesy vaccinations”), and did not offer a public explanation or justification to the Peruvian people regarding this episode (Cabral et al., 2021; “Covid-19: Peru’s Ex-Leader Accused of Jumping Vaccine Queue Tests Positive,” 2021; McDonnell and León, 2021; Sanchez-Perez, Rodriguez-Olivari and Woodward, 2021). The VaccineGate scandal revealed that Sinopharm’s conditional sanitary registry in Peru was awarded under “irregular circumstances,” and serious ethical concerns were raised by Sinopharm offering untested “courtesy” vaccines outside of the clinical trials that were still unfolding (Sanchez-Perez,

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92 President Martin Vizcarra was impeached in November 2021 and removed from office on separate allegations of corruption that were independent of the VaccineGate episode. For more details, see “Covid-19: Peru’s Ex-Leader Accused of Jumping Vaccine Queue Tests Positive,” 2021. However, six of the past seven Peruvian presidents “have either been forced from office amid allegations of wrongdoing or faced charges upon completing their terms” (McDonnell and León, 2021).

93 Interview with Peru energy sector expert, April 15, 2022.
Rodriguez-Olivari and Woodward, 2021), potentially in an attempt by the Chinese government to curry favor with Peruvian elites and secure a deal for Peru to purchase some 38 million doses from Sinopharm (Tegel, 2021a; Tegel, 2021b). Some of the officials who received the “courtesy” doses outside of the clinical trial were individuals who were expected to be involved in awarding contracts once the vaccine was approved (Philip, 2021). Similar scandals regarding under-the-table vaccinations of local elites with doses imported from China outside of those declared for clinical trials broke out in Mexico and Argentina (Cabral et al., 2021; Tegel, 2021b). In Peru, Sinopharm came under investigation “for possible bribery to secure a vaccine contract with the Peruvian government through free vaccine samples” (Bernhard, 2021).

The issue of silence regarding Chinese activities in Peru came up in our interviews, with participants mentioning that rarely are Chinese public projects announced with grand fanfare or widely publicized, making it difficult to track all the investments and financing that are happening in the country. Also, when public announcements are made, the information provided in relation to the project to be developed usually is minimal. This behavior is strikingly different from that seen in Brazil, where Chinese officials are more inclined to overstate the extent of their involvement in the country’s economy.

Although the Peruvian government is rather welcoming of Chinese investments and financing overall (Ratigan, 2021), media outlets that previously favored China ended up being critical of it in the context of recent scandals involving China and corruption among local elites. Also, the Chinese embassy in Peru did not make any major public announcement or lead any counter campaign to explain what happened or try to lessen the impact.

When it comes to Chinese presence in the informational domain in Peru, there have been concerns that state media, such as the Peruvian state news agency and the state-controlled newspaper El Peruano, act “like stenographers of the Chinese embassy” (Smith, 2021). Some reporting that was favorable toward China might have been the result of the influence that Beijing tried to gain in Peru in the informational domain through the Chinese embassy providing financing to modernize newsroom technological equipment (Smith, 2021). China also pushed for content-exchange agreements for television, with CGTN-produced documentaries about China airing during prime time on Peru’s Channel 7 (Cook, 2020). However, when the state-owned Xinhua targeted Peruvian private news outlets and offered them to run its media content for free, the outlets were uncomfortable publishing content from a foreign state-run news agency (Cook, 2020). Furthermore, Chinese officials on social media platforms criticized Peruvian journalists who had been critical of China (Smith, 2021).

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94 Interview with U.S. government officials, March 18, 2022.
95 Interview with U.S. government officials, March 18, 2022.
Chinese Attempts to Project Influence in the Informational Domain in Argentina

In the informational domain, the former Chinese ambassador to Argentina, Yang Wanming, was also very active and tried to insert the official views of the government in Beijing into mainstream media. From 2014 to 2017, the media presence of the Chinese ambassador involved publishing 14 op-eds, granting ten interviews to Argentine media outlets, and carrying out eight visits to local newsrooms. Argentina is also one of the countries where Chinese state media paid for the inclusion of China Watch (a news-like advertising supplement from the government-owned China Daily) in the print edition of some of the country’s major newspapers. Other countries where China engaged in this practice are Peru, the United Kingdom, and Australia, in addition to the United States, with the New York Times, Washington Post, and Los Angeles Times being some of the newspapers featuring paid Chinese state media content (Cook, 2020). However, three Argentine outlets refused “to publish a questionable article that vilified local Falun Gong practitioners as a threat to public health during the COVID-19 pandemic” (Cook, 2021). In the context of its efforts to expand Beijing’s influence in the informational domain, CGTN coproduced with Grupo América (an Argentine network) some mini-documentaries on the topic of Sino-Argentine diplomatic relations (Cook, 2020).

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96 In 2019, Yang was appointed ambassador to Brazil and is the same individual who was involved in the social media spat with Eduardo Bolsonaro described in the Brazil section (Embassy of the People’s Republic of China in the Kingdom of Thailand, 2019).


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China’s extensive and expanding foreign investment and financing activities over the past two decades have garnered substantial attention and raised several concerns. Such concerns are diverse and include paying insufficient attention to internal politics, global relations, environmental regulations and controls, and human rights, worker safety, and health records of host nations; engaging in unfair contracting practices; using overseas investments and financing to attain access and influence in strategic locations; and using disinformation to influence markets.

For this report, the authors examined Chinese foreign investments and financing in critical resources and energy infrastructure for evidence of these types of behaviors. They used a case-study approach in which they examined investments and financing in coal power plants in Indonesia, Pakistan, and South Africa; electricity transmission and distribution infrastructure associated with the global energy interconnection initiative in Brazil, Chile, Argentina, Peru, and Mexico; and seabed mining globally.

The objective of the research was to characterize Chinese foreign investments and financing in critical resources and energy infrastructure, emphasizing the extent to which Chinese investors engaged in any of these concerning behaviors, and to develop recommendations to build capacity among host nations to diversify their sources of investment and financing in order to minimize the potential negative impacts of an overreliance on Chinese investments and financing. The research did not turn up many clear examples of such behaviors, but the authors identified several other topics of concern that have important implications for host nations.