China's Green Cooperation in the Energy Sector: Overview and Analysis

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Introduction

Over the past decade, China has transformed itself into the world's renewable energy powerhouse. China boasts more than 1,100 gigawatts total (GW) of installed solar and wind capacity and accounts for two thirds of projects under construction globally.[1] In 2020, China's leaders pledged to double the nation's renewable energy installed capacity by 2030, and is on track to reach that goal by 2025.[2] On the manufacturing side, China produces 80% of the world's solar panels and 65% of its wind turbines, driving down costs globally and making it cheaper for financially strapped countries to build out renewable energy[3] China's rapid renewable energy expansion is a central platform of its goal to peak greenhouse gas emissions by 2030 and reach net zero by 2060. Indeed, renewables now make up half of China's national energy portfolio, a major change in a country long dependent on coal.

On the global stage, China's leaders are laying claim to renewable energy leadership. In 2021, in a speech to the United Nations General Assembly, Xi Jinping stated that China would not finance any new coal-fired power plants overseas.[4] This was followed by a pledge (with the U.S.

1. Aiqun Yu et al., *China Continues to Lead the World in Wind and Solar, with Twice as Much Capacity Under Construction as the Rest of the World Combined,* Global Energy Monitor (July 2024), https://globalenergymonitor.org/report/china-continues-to-lead-the-world-in-wind-and-solar-with-twice-as-much-capacity-under-construction-as-the-rest-of-the-world-combined [https://perma.cc/MNA5–5QXL].

2. Amy Hawkins & Rachel Cheung, *China on Course to Hit Wind and Solar Power Target Five Years Ahead of Time*, The Guardian (June 28, 2023), https://www.theguardian.com/world/2023/jun/29/china-wind-solar-power-global-renewable-energy-leader [https://perma.cc/A4LF-4PS7].

3. Isabel Hilton, *How China Became the World's Leader on Renewable Energy*, Yale Env't 360 (Mar. 13, 2024), https://e360.yale.edu/features/china-renewable-energy [https://perma.cc/R2D4-PF57].

4. Vincent Ni & Helen Sullivan, *'Big Line in the Sand': China Promises No New Coal-Fired Power Projects Abroad,* The Guardian (Sept. 19, 2021, 21:59 EDT), https://www.theguardian.com/world/2021/sep/22/china-climate-no

and others) to triple renewable energy installed capacity by 2030, both domestically and by investing in projects in other countries.[5] Such pronouncements are part of a broader emphasis among China's leaders on "greening" the country's Belt and Road Initiative (BRI), an all-encompassing investment program aimed at building infrastructure and connectivity. Already, there is evidence that Chinese firms are ramping up solar and wind investment and construction overseas.[6] Moreover, alongside this infrastructure, Chinese state and nonstate organizations are delivering a host of training programs, technology transfer initiatives, and development projects focused on environmental improvement – what Harlan and Lu[7] call "green cooperation." Energy cooperation is a significant and growing share of these new programs but has not been systematically studied.

This short paper analyzes China's new green energy cooperation. Its main aim is to describe the scope, characteristics, and key themes of energy cooperation programming. To do so, I draw upon a systematic review of China's energy cooperation activities in Global South countries (building upon work in Harlan and Lu, 2022) and participant observation in three cooperation programs – two in 2023, and one in 2018. The findings reveal a diverse set of motivations of Chinese actors and organizations that are delivering cooperation activities, but also a shared focus on promoting China's technocratic expertise and innovation in green energy. I then argue that, rather than view China's energy cooperation efforts as "greenwashing," a more effective response is to see them as openings for engagement and collaboration in advancing Global South sustainability transitions.

This paper builds on a growing body of scholarship concerned with China's influence in global environmental affairs. Harlan and Lu (2022) and Rodenbiker (2023) describe this influence as a form of "green soft power"[8], or the discourses, investments, and practices that position China as an environmental leader in the Global South. Renewable energy is a major theme of green soft power because it is central to meeting national and international climate targets, and it is a sector in which China excels. The renewable energy sector is also a showcase of China's technological prowess and long-term policy outlook. Of course, the experiences and technologies that China chooses to promote are not fully representative

-new-coal-fired-power-projects-abroad-xi-jinping [https://perma.cc/EB9P-T8AR].

5. U.S. Dep't of State, Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis (2023), https://www.state.gov/sunnylands-statement-on-enhancing-cooperation-to-address-the-climate-crisis [https://perma.cc/5C3T-UT5X].

6. Christoph Nedopil Wang, *China Belt Road Initiative (BRI) Investment Report 2023*, Green Finance & Development Center (Feb. 5, 2024), https://greenfdc.org/china-belt-and-road-initiative-bri-investment-report-2023 [https://perma.cc/4JU5-VDC3].

7. Tyler Harlan & Juliet Lu, Green Cooperation: Environmental Governance and Development Aid on the Belt and Road 465–500 (2022).

8. *Id.*; Jesse Rodenbiker, Ecological Civilization Goes Global: China's Green Soft Power and South-South Environmental Initiatives 319–351 (2023).

of China's own trajectory – it remains a major polluter and emitter, and its energy rollout has been fraught with booms and busts – but they remain a salient example of China's current and future green development path and its implications for energy transitions elsewhere.

The evolution of green energy cooperation

China's development cooperation with Global South countries dates back several decades, with early efforts focused largely on rural development and agriculture. In the 1970s, Chinese agricultural scientists were deployed to many African countries to conduct training and agricultural extension activities; the Chinese government also funded and constructed railways to connect fields to markets.[9] Energy cooperation was more limited, but beginning in the 1980s, China's Ministry of Water Resources began offering training courses for engineers from developing countries on small hydropower, which China had deployed domestically for rural electrification and rural industrial development.[10] This development cooperation was and continues to be framed as a "win-win" partnership between Global South countries, with China emphasizing its willingness to share experience and expertise.[11]

Only in the last decade has development cooperation been reshaped and reframed as "green." This has accompanied a major expansion of cooperation activities in general. Two key policies are worth mentioning here. The first is a push to green the Belt and Road Initiative (BRI), first announced by Xi Jinping in 2016 and subsequently outlined in strategy documents issued by Chinese state ministries in 2017.[12] This was followed by the establishment of several state-led bodies dedicated to greening different aspects or regions of the BRI, such as the BRI Green Development Coalition, the China-ASEAN Environmental Cooperation Center, and the Green Silk Road Fund. The second policy is more general, aimed at expanding the scope of BRI activities to include "soft" development cooperation alongside "hard" infrastructure investment.[13] A key aspect of this policy was the formation of China's foreign aid agency in 2018, but

9. Deborah Brautigam, The Dragon's Gift: The Real Story of China in Africa (2009).

10. Hangzhou Regional Center for Small Hydropower, Rural Hydropower and Electrification in China (2nd ed. 2009).

11. Xiuli Xu et al., *Science, Technology, and the Politics of Knowledge: The Case of China's Agricultural Technology Demonstration Centers in Africa*, 81 World Dev. 82–91 (2016).

12. CPC Central Committee & China State Council, *Guidance on Promoting Green Belt and Road*, Belt and Road Portal (May 8, 2017), https://eng.yidaiyilu.gov.cn/zchj/qwfb/12479.html [https://perma.cc/G32V-B8DU]; *The Belt and Road Ecological and Environmental Cooperation Plan*, Ministry of Ecology and Env't of the People's Republic of China (June 28, 2017), https://english.mee.gov.cn/Resources/Policies/policies/Frameworkp1/201706/t20170628_416869.shtml [https://perma.cc/8UYW-SDFF].

13. Tyler Harlan & Juliet Lu, *The Cooperation-Infrastructure Nexus: Translating the 'China Model' into Laos*, 45 Singapore J. Tropical Geography 204–24 (2024).

there has also been major growth in activities delivered by other state agencies, corporate firms, and civil society actors.[14] The result is a large and growing set of green cooperation activities across the Global South.

Harlan and Lu's (2022) review of these activities reveals four main types: trainings, dialogues, joint research, and development aid projects.[15] The scope of these activities has moved beyond a focus on rural development and agriculture to include an array of political, economic, and cultural platforms and exchanges. This includes renewable energy. Examples include solar energy training courses for developing country technicians and officials, high-level dialogues on energy transition in Central Asia, a joint Sino-Lao rural renewable energy laboratory, and an aid program called "Africa Solar Belt" offering subsidized solar panels and lighting. These programs are all relatively new and growing.

Importantly, green energy cooperation is not simply the domain of the Chinese government. State and private sector energy firms, renewable energy business associations, and NGOs working on environmental issues are all designing and delivering their own programs, at times in partnership with each other. Moreover, while many programs are initiated by Chinese actors, some are delivered in cooperation with multilateral environmental platforms such as the United Nations Environment Program (UNEP), the Asia Pacific Economic Cooperation (APEC) forum, and the Association for Southeast Asian Nations (ASEAN). All of these organizations and actors have own motivations and goals for engaging in cooperation. Yet, taken together, they have the effect of promulgating a particular narrative of Chinese renewable energy prowess and technological expertise that is made to seem attractive to the Global South. We might call this China's "green soft power" in the energy sector.

The next section highlights and analyzes the characteristics of this green energy cooperation using two case studies: 1) high-level dialogues on green grid interconnection and 2) capacity building on energy transition in mountainous areas. The cases presented here are brief, but nevertheless underscore shared themes that animate China's cooperation in the sector.

Two cases of green energy cooperation

A. *Green grid interconnection*

China boasts the world's highest-capacity electricity transmission system. This is due, in large part, to the prevalence of high-voltage transmission lines that stretch across the country. The first of these lines were built in the late 1990s to bring hydropower from southwest China to the

14. *See generally* Jingdong Yuan et al., *China's Evolving Approach to Foreign Aid*, Stockholm Int'l Peace Research Inst, https://www.sipri.org/sites/default/files/2022–05/sipripp62.pdf [https://perma.cc/T7CA-Z475].

15. Tyler Harlan & Juliet Lu, *Green Cooperation: Environmental Governance and Development Aid on the Belt and Road*, 2021–2022 Wilson China Fellowship: Essays on China and U.S. Policy 475–500 (2022).

urban east coast.[16] New Chinese technology that allowed for even higher capacities (known as ultra-high-voltage direct current transmission, or UHVDC) has been constructed to connect both hydropower mega-projects and a vast array of new solar and wind installations. UHVDC is thus a central component of China's energy transition.

To promote this technology, and China's expertise in grid construction, in 2016 the Chinese government established the Global Energy Interconnection Development and Cooperation Organization (GEIDCO). GEIDCO was established by China's State Grid corporation – the world's largest grid company – and its employees were all initially seconded from the State Grid. Its stated purpose is to "promote the establishment of a GEI system" and "to meet the global demand for electricity in a clean and green way." Put differently, GEIDCO aims to promulgate a system of long-distance and cross-border grid connections to link places rich in renewable energy to places with high power demand. This concept is not unique to China – there are many cross-border interconnections in the European Union, for example – but China and GEIDCO are at the forefront of popularizing it on the global stage.

GEIDCO hosts several high-level forums each year, and I attended three of them in 2023. One forum was held in October as part of the larger Asia Pacific Energy Forum in Bangkok, hosted by the UN Economic and Social Commission for Asia and the Pacific (UN ESCAP). The other two were held as side events at the UN Framework Convention on Climate Change (UNFCCC) 28th Conference of the Parties (COP28) in Dubai in November. All three forums proceeded in a similar way, beginning with an opening speech by a senior GEIDCO executive, an invited keynote, and three or four presentations focused on GEIDCO's research and policy planning. The COP28 events also included several short speeches from representatives of multilateral agencies, energy ministers from Malawi and Egypt, and the well-known American economist Jeffrey Sachs. The breadth of speakers served to showcase the support that GEIDCO and the concept of electricity interconnection have received in the global energy community.

Promoting GEIDCO's expertise in high-voltage transmission technology was a key theme of the forums. Liu Zehong, GEIDCO's executive vice chairman, made the point in Bangkok that the technology "from 110 kilowatts (kW) to UHVDC" is fully developed and that there are no technical barriers to interconnection. Xiao Jinyu, Vice President of GEIDCO's Economic and Technical Research Institute, followed with a presentation on different types of interconnection, noting that there is a solution for every national grid and cross-border link. In his COP28 keynote, Sachs praised the engineering sophistication of GEIDCO's transmission assets, calling this work "extremely important and practical" and noting that GEIDCO has "shown the way for the whole world"

16. *See generally* Darrin Magee, *Powershed Politics: Yunnan Hydropower Under Great Western Development*, 185 China Q. 23–41 (2006).

by researching where smart grids and interconnections should be placed. Moreover, often repeated in presentations (by both GEIDCO and invited speakers) was the idea of interconnection as an *efficient* and *resilient* solution for rapid energy transition, effectively framing GEIDCO's technology as essential to achieving shared climate goals.

The forums also served as a showcase for China's prowess in energy technologies in general. At COP28, the Chairman of the State Grid, Xin Bao'an, opened one of the events by narrating China's experience in deploying synergistic power generation, grid transmission, and storage across the country. China's chief climate envoy, Xie Zhenhua, followed by highlighting China as a "global leader" in renewable energy, batteries, and electric vehicles, stating that "because of our skills development in renewables, the cost of the technology has reduced by 90%." Other speakers lauded the vast scale and rapid growth of renewable energy generation in China that was enabled by investments in long-distance transmission. Taken together, the presentations characterized China's own rapid transition as resulting from of long-term planning and strong technical expertise, with GEIDCO acting as one of the key drivers.

Invited speakers from multilateral agencies and energy ministries unsurprisingly praised GEIDCO's and China's technologies. At COP28, Elena Manajenkowa, deputy secretary of the World Meteorological Organization, stated that China is leading the way in renewable energy transition and innovation and that she "would like to see GEIDCO's innovative technology spread throughout the world and become available to all countries." First Undersecretary of the Egyptian Ministry of Energy Ahmed Mohamed Mohina noted that "global interconnection is a feasible solution for African countries to achieve energy transition" and that the Egyptian government "highly supports the GEI initiative, and we are glad that it has gained prominence in the international community." Various speakers from UN agencies highlighted collaborations with GEIDCO in promoting interconnection for global energy access and affordability, including the Executive Director of the UN Office for Project Services, who stated that "Interconnections like those promoted by GEIDCO must be at the fore." These reactions suggest that GEIDCO's efforts to promote its interconnection expertise as "green" has gained acceptance in many energy agencies and ministries around the world.

B. *Energy transition in mountainous areas*

In addition to being a vast country, China is also mountainous. Some 70% of China's landmass is comprised of mountains, plateau, or hills. This topography long acted as a barrier for energy access. Mountainous villages in China (particularly western China) for decades relied on small-scale hydropower projects to generate off-grid electricity.[17] More recently, some mountain and plateau areas have also made use

17. *See generally* Wuyuan Peng & Jiahua Pan, *Rural Electrification in China: History and Institution*, 14 China & World Econ. 71–84 (2006).

of subsidized off-grid solar.[18] Yet today, these places are known for an entirely different model of energy: mega-scale solar, wind, and hydropower projects that generate power for national energy transition.[19]

This experience was the theme of a capacity building session held in Chongqing in December 2023, entitled "International Forum on Regional Cooperation for Sustainable Development of Green Mountains," which I attended. The session was organized by the Chongqing Renewable Energy Society, a business association primarily comprised of local private energy technology companies. The event was a response to the Chongqing Municipal Government's requirement that local business associations engage in cooperation for building a "green Belt and Road." However, the municipal government did not provide funding for the event, so the Society instead sought and received funding from the ClimateWorks, an environmental foundation with a strong China presence. Approximately fifty people attended the event at a local hotel, including eight international guests from UN ESCAP, UNEP, the International Center for Integrated Mountain Development (ICIMOD), the World Wildlife Fund (WWF), and the Thai Ministry of Energy. In contrast with the GEIDCO high-level forums, most speakers at this event were deputy-level in their organizations.

Like GEIDO, however, a key theme of the event was China's successful experience in green energy, which other countries can learn from. The executive director of ClimateWorks stated that "China's experience in developing renewable energy and progress in tackling climate change has made China a reliable partner." Similarly, the Secretary-General of the China Energy Research Society noted that "China has many experiences to share with the world and that contribute to the Sustainable Development Goals." Chinese speakers pointed both to China's rapid construction of utility-scale installations – the Secretary-General mentioned that "China has been developing hydropower, wind, and solar in the mountains" – as well as China's focus on community-level renewable energy for rural electrification. In short, China's experience was lauded as a successful example of both energy transition and energy access.

Technology, too, was a key theme, and was promoted through both presentations and site visits. Most of these included a strong sales pitch for specific products. A representative from a lighting company, for example, talked about off-grid solar lighting solutions (for rural villages, but also useful for signage and traffic lights) and stated that their company would like to work with Southeast Asian countries on their energy engineering planning. A senior salesperson from an energy storage firm discussed their on- and off-grid battery products and emphasized the ability for factories to store energy when the grid price is low and use it when

18. *See generally* Sam Geall et al., *Solar Energy for Poverty Alleviation in China: State Ambitions, Bureaucratic Interests, and Local Realities*, 41 Energy Research & Soc. Sci. 238–248 (2018).

19. *See generally* Tyler Harlan, *Low-Carbon Frontier: Renewable Energy and the New Resource Boom in Western China*, 255 China Q. 591–610 (2023).

the price is high. Site visits occurred the following day and included tours of a small hydropower company, a solar company, and a battery firm. All of these companies have their own marketing activities, and their company materials promote their products as innovative and green – but it is energy cooperation events like the Chongqing Forum that gave them access to an overseas audience.

Non-Chinese invited attendees praised China's technology and experience in their speeches. They also showed a keen interest in the technologies themselves, asking follow-up questions and requesting company details. Moreover, several attendees asked about the possibility of actual Chinese green energy *investment* in the region. A representative from the WWF Vietnam office stated that there is "huge potential for enterprises who want to invest in EVs in Vietnam" and noted that "the market is undeveloped and investors may benefit from a first-mover advantage." A speaker from UN ESCAP highlighted different Southeast Asian countries' SDG7 (energy access for all) roadmaps and emphasized the need for investment. After a large solar cell manufacturer gave a presentation on their extensive operations and supply chain (17 factories with 15,000 employees worldwide), attendees asked several questions about how the company chooses locations for overseas manufacturing facilities. The commercial motivations for both organizers and attendees of the Forum were clearly on display.

Discussion and conclusion

China's green energy cooperation includes many types of initiatives, from training programs to development projects to dialogues and capacity building forums like those described in this paper. The cases of green grid interconnection and energy transition in mountainous areas share several characteristics that are common in China's energy cooperation. They both have a strong focus on technology and technical expertise, framing China's technocratic experience as an example to learn from. They both promote Chinese energy technology and infrastructure as essential to energy transition, even if (like UHVDC transmission, or small hydropower) the technologies have not always been viewed as "green" by the international community. And both offer potential platforms for further cooperation, with GEIDCO offering its research and services to national energy ministries and Chinese Chongqing Forum attendees seeking to offer capacity building and training programs. Indeed, the desire to engage in cooperation is a clear response to the Chinese government's push to "green" the BRI and promote China's positive environmental successes to the world.

Yet there were clear differences between the programs, too. For GEIDCO, the aim of its three forums was to promote the concept of energy interconnection and showcase its broad support from high-level ministers and officials from multilateral organizations. By hosting the events, GEIDCO is able to frame its work as essential to global energy transition, and China as a clear innovator and leader of the transition.

GEIDCO also used the events to showcase its research on interconnection pathways and the potential for wind and solar "hubs" in specific regions, further underlining its technical prowess. Of course, GEIDCO along with China's grid companies and energy SOEs continue to seek out investment and commercial opportunities in Global South markets, and cooperation provides one avenue for doing so – but, as a prominent organization, GEIDCO also seeks to strengthen China's green energy reputation in general.

The Chongqing Renewable Energy Society, meanwhile, is composed of much smaller (mostly) private companies that operate in a highly competitive domestic energy sector. As the Forum showed, these companies clearly aim to develop new markets and commercial relationships in the region. The program theme of "sustainable development in green mountains" was rarely mentioned by both Chinese and non-Chinese attendees; rather, the focus was on promoting technology as green, effective, and cheap. Framing the event as capacity-building based on China's energy transition provided small firms a way to associate their products with a broader narrative of China's technical expertise and planning.

Of course, these two examples are not fully representative of China's emerging "green energy cooperation," or of its cooperation activities in general. But they do suggest that this cooperation, while involving many different actors with different motivations, does coalesce in a way that promotes China's renewable energy achievements and technologies. This preliminary review suggests that this narrative, and the technologies associated with the narrative, are becoming attractive to Global South countries seeking to expand and strengthen their energy systems. It may be tempting for outside observers to decry these efforts as "greenwashing," especially given China's recent history of investing in fossil fuel infrastructure through the BRI. Yet while some of this green cooperation in the energy sector is certainly performative, it is not necessarily hollow – many of those involved are deeply concerned about accelerating energy transition and fully invested in capacity building. Green energy cooperation thus provides an opportunity for constructive engagement with China that works towards accelerating energy transition while ensuring that benefits are widely shared.

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