Going Green:
Impact of China's Domestic Green Policy Shift on its Overseas Renewable Energy Finance Projects

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Abstract

China has been expanding its investment in renewable energy sources from not just its domestic sphere, but internationally as well. Why are Chinese overseas development projects transitioning to greener energy even without pressure from domestic constituents or international governance? We argue that it is a positive spillover of China's stricter environmental regulation on green economy and renewable energy initiatives in the early 2010s. Firms gain the technical expertise and know-how required to meet the new green standards within their home market, accumulating a comparative advantage in the global energy market and exporting cutting-edge technology overseas. We track energy types in construction and energy-related Chinese overseas development projects between 2000 and 2021, and find that they reflect a higher concentration of renewable energy projects after the implementation of domestic green policy shifts in 2012, long before its international pledge to green energy transition. In addition, when recipient countries have more ambitious green energy targets and transformation plans reflected in their Nationally Determined Contributions under the Paris Agreement, China supplies more green energy projects such as hydro, solar, and wind power. To explain why China appears as a genuine leading player in spearheading renewable technologies and fostering the global green economy market, we argue that its prior green domestic policy shift carries more weight than international commitments or pressure.

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1 Rebooting Foreign Aid and Renewable Energy

Climate change is undoubtedly one of the most pressing issues in global cooperation. It is also a problem that needs global leadership, and China seems to be taking on this role. Not only has China committed to a domestic green energy transition, it has publicly pledged to provide greener energy aid through financial support and technology transfer to Global South countries, thereby promoting a green energy transition on a global scale.

This commitment to greener energy aid may be somewhat surprising. When considering climate policies, many countries focus primarily on pledging to their own domestic green energy transitions rather than actively assisting other countries' energy transitions. This reflects the collective action problem in climate change mitigation (Kennard and Schnakenberg 2023; Nordhaus 2015) and raises the question of why states would invest resources to help other countries in their energy transitions. In fact, historically, when countries upgrade their positions in the global supply chain, they are often incentivized to or accused of offshoring pollution-intensive industries to less developed countries (Clapp and Dauvergne 2011). Similarly, China has frequently been criticized for its insufficient responsibility regarding the environmental impacts and risks of its overseas development projects, particularly those tied to fossil fuel investments in earlier years (N. Zhang et al. 2017; L. Zhou et al. 2018). These patterns would suggest that China should focus on its domestic energy transition, rather than help with a global energy transition.

Yet, China's leadership on climate change has benefited China. China has used the issue of climate change to elevate its international standing and establish itself as a global leader in the renewable energy industry. By accelerating progress toward the United Nations Sustainable Development Goals and contributing significantly to the Paris Agreement (an international treaty to mitigate climate change), China has strengthened its position as a key player in global environmental governance. Providing greener energy aid thus adds to

its domestic achievements; by adopting the role of a more responsible and environmentally friendly donor improves public perceptions of China's overseas engagements in recipient countries (Nedopil and Yue 2024). Regardless, there are many questions around whether China is providing greener energy aid and why it might do so.

We investigate whether Beijing is meeting its commitments on the international stage — commitments that include the adoption of the Green Belt and Road Initiative (BRI) starting in 2017, the cessation of funding for coal power plants, and assistance to help countries in the Global South achieve their lower carbon emissions targets. More importantly, we examine what motivates China to adhere to these commitments, especially when they may not yield immediate advantages to its domestic development or environmental conditions. As we will demonstrate, such changes in "greening BRI" have also occurred before the push for more active and globally accepted mandates in the Paris Agreement adopted in 2015. We find it puzzling: what drives China's proactive shift to financing greener energy projects overseas even before formal international commitments were made?

China's actions toward greener energy aid is difficult to explain through the standard mechanisms for climate policy shifts: domestic constituencies and foreign pressure. Domestic constituencies can pressure their governments for climate policy changes. For example, air pollution in cities like Beijing was 90 times higher than the World Health Organization's recommended daily level. This led to the launch of anti-pollution campaigns and the enforcement of complex policy changes aimed at meeting ambitious domestic environmental laws and pollutant emission limits. Now Beijing regularly shows "blue skies" and only recorded 10 days of heavy air pollution in 2020, a nearly 80% drop from 2015 levels (Yeung, Gan, and George 2021). However, at first glance, domestic constituencies does not seem to explain China's greener energy aid. Unlike domestic environmental reforms, the Chinese government has no direct accountability to the foreign constituencies of the host countries.

Foreign pressure may be another reason for China to pursue greener energy aid. Con-

cerns about climate change have generated new norms against fossil fuels, with campaigns generating international pressures against countries' financing plans for coal-burning power plant construction overseas (Davidson et al. 2023). But, in reality, international mechanisms lack robust enforcement measures to pressure China into greening its foreign investments or overseas aid projects. Scholars have documented a number of international programs, such as the UN Peace and Development Trust Fund and the UN Environment Program, which have played modest roles in greening the BRI through promoting Sustainable Development Goals (SDGs), greener standards, and guidelines and regulations (Gong and Lewis 2023). In addition, due to its developing country status, China contributes on a *voluntarily* basis to climate finance in the UN's New Collective Quantified Goal on Climate Finance (NCQG), which supports developing countries. These international engagements function more as incentive and exchange mechanisms than as forms of pressure.

In this paper, we argue that China's decision to make such international commitments follows significant domestic structural changes in renewable energy. On its domestic side, policy shifts toward decarbonization and greener energy as early as 2012 in its domestic market have incentivized firms to embrace technological upgrades within China. Consequently, these firms have gained experience and knowledge in the renewable energy sectors, positioning them to export clean energy. On the international side, recipient countries seek partners to facilitate upgrades in their renewable energy systems, aiming for greener economies. China is responsive to these policies and thus seeks to provide greener aid to those countries.

We aim to empirically assess the changes in China's overseas development projects in renewable energy. Can we detect if Chinese overseas energy projects greener? If so, are there patterns to how China is providing greener energy aid?

Our project makes three contributions to the literature. This paper is an exercise to answer the classic question in international cooperation more broadly: "Is good news about compliance good news about cooperation?" (Downs, Rocke, and Barsoom 1996).

To answer why there seems to be no compliance problem for China in climate change, meaning that China fulfills or arguably goes beyond its rather ambitious commitments in renewable energy within and beyond its border, we offer a simple answer: China self-selects into the international commitment and is ready to comply when domestic changes have already undergone to minimize the enforcement problem. In other words, it does not need extra enforcement to make China change its course in greening BRI. In fact, we argue that it is part of a positive downstream effect of the economic structural upgrades to renewable energy in China back in 2012.

This paper is also the first study, as far as we know, that connects China's domestic energy transition to explain the greening shift of its overseas energy development projects prior to the Green Belt and Road Initiative. These two phenomena have been studied separately. Centering around China's domestic energy transition, scholars focus on how firms in the energy sector absorb the impacts of a series of strict financial reforms to facilitate the government's climate-oriented goals in the early 2010s (Wen, Lee, and F. Zhou 2021; S. Li et al. 2022; Ma et al. 2024; B. Zhang and Wang 2021). A separate scholarship and policy team is interested in the Belt and Road Initiative's recent turn toward more environmentally friendly projects and the execution of those projects (L. Zhou et al. 2018; Springer, Lu, and Chi 2022; Larsen, Voituriez, and Nedopil 2023; Hongqiao Liu et al. 2023). This study provides a new perspective on bringing the two scholarships into dialogue to examine a much broader, unintended impact of China's previous reforms in reaching climate-related goals on the subsequent greening of BRI.

Lastly, this project is also the first attempt to systematically evaluate how recipient countries from Chinese overseas development projects envision their renewable energy transition in their economy, and how China as a donor responds to those demands. Previous studies have examined the pull factors from selective host countries, emphasizing that host countries with better political environments, higher local demands, and higher energy and

resource potentials tend to attract Chinese development finance and direct investment (Z. Li et al. 2022; Haiyue Liu et al. 2020). Building on these insights, we use an alternative measure to capture local incentives in green energy transition. We use countries' stated goals in the Nationally Determined Contributions (NDCs), years of commitment to the Paris Agreement and energy-related policies to create a composite indicator to measure their aspirations for renewable energy. We are sensitive to the needs of developing countries, recognizing that some developing countries are more eager to seek out finance and expertise from external sources, in this case, China, to facilitate the upgrade of their own energy system. To bring more nuance to the story of how China proceeds with the greening energy projects overseas, the demand side is critical, and yet, we have not seen a systematic investigation of the recipient countries' energy policies in the foreign aid literature.

The rest of the paper proceeds as follows. Section 2 illustrates how China repositions itself in climate mitigation negotiations, moving from a backseat participant to a global leader. Section 3 examines two factors driving China's overseas green energy projects prior to its international commitments: domestic push factors arising from China's green industrial policy introduced in 2012, and international pull factors shaped by various countries' aspirations for clean energy transitions. Then the subsequent empirical sections explain our research design, data, methods, and results.

2 Redefining Roles in Global Climate Governance

In international climate politics, questions of fairness and equity in addressing climate change have dominated international climate negotiations for a long time. The perception of what is a just way to deal with climate change means something different between the Global North and the Global South countries. To the Global North, and especially the European countries, climate change is a scientific challenge and what we need is more scientific information to

address this common problem. To the Global South, represented by the G77, climate change is a political challenge as a result of developed countries' overseas resources for decades, and challenges of "poverty, development, equity and access to technological and financial resources" (von Lucke et al. 2023, p. 76). Global North and Global South countries agree that climate change mitigation is necessary but disagree on how to define the problem and who should bear the cost of mitigation and how much. The classification of whether a country falls into developed, developing or emerging country is a highly relevant question in climate mitigation negotiation because of the different responsibilities and roles associated with these categories (von Lucke et al. 2023). This section demonstrates how China repositions itself in climate mitigation negotiations.

2.1 Green BRI and Beyond

2023 marked over a decade since China's announcement of the Belt and Road Initiative (BRI), a platform for bringing development projects to over 140 countries that have officially been part of the BRI network. Due to its rapid expansion of infrastructure projects and financing during the initial phase of BRI, these recent adjustments were seen as a strategic re-alignment or a fresh start aimed at fostering a more sustainable trajectory for the initiative (Center 2023; Parks et al. 2023). In April 2019, at the Second Belt and Road Forum for International Cooperation, Xi announced that the next phase of the BRI ("BRI 2.0") would be "open, green and clean" (Ministry of Foreign Affairs of the People's Republic of China, 2019, cited in Parks et al. 2023). Two years later, in 2021, Xi Jinping announced at the UN General Assembly that China would no longer finance new coal-fired power projects, but instead ramp up renewable energy support to developing countries overseas. Given China's importance in financing global power plants, this policy shift to exit coal financing was a surprising announcement to analysts and experts in this field (Davidson et al. 2023). Subsequent analysts paid close attention to the current pipeline of China's overseas power

plants and the international pledge to shift to a green BRI, and began to wonder: Is China making a serious pledge to the global community to promote clean energy, or is it just virtue signaling?

In many ways, China seems serious about its pledge to the global community. In the climate change era, it is known for "under-promising but over-delivering" (Hongqiao Liu 2021) — when making policies, China is often more conservative on the targets, but in actual implementation, China often overshoots them. Its commitments, alongside with the Green Belt and Road Initiative, are demonstrated in many ways. China has aligned its carbon emissions goals with the UN climate change mission and significantly increased its proportion of non-fossil fuels. The International Energy Agency (IEA) predicts that China's greenhouse gas emissions are set to peak in 2024 and then enter structural decline, as it is undergoing a clean energy transition with initiatives, investment and technologies in hand (Evans and Viisainen 2023). While China previously prioritized large infrastructure projects, it has now shifted its focus to smaller, greener renewable energy initiatives. It has stopped financing new coal power plant projects overseas and canceled many coal financing plans after the first half of 2021, preceding its official announcement of a coal financing phaseout (Davidson et al. 2023). The Asian Infrastructure and Investment Bank (AIIB), launched by Beijing in 2016, has not financed any coal-related projects ever since (Davidson et al. 2023). Instead, China has become a leading exporter of renewable energy technologies such as wind and solar power.

These shifts are somewhat surprising. For most of the world, progress around climate action under the Paris Agreement has been very slow and inadequate, as reflected and discussed during the COP28 UN Climate Change Conference in Dubai, a convening of over 150 heads of states and governments, non-state actors, NGOs and international organizations in 2023 (Nations 2024).[1] China could have easily latched on the identity of developing

[1]The core reason for the slow progress rests on the global framework of addressing climate change based

countries and taken a step back and pursued slower progress as many other countries have. Historically, China was hesitant to take on a substantive role in climate governance. However, that did not seem to be China's path anymore. The next subsection provides a brief overview of how China has positioned itself as a global leader in green energy.

2.2 Road to Paris Agreement

The Paris Agreement represents a historic moment to convene all states in a shared commitment to undertake ambitious measures to mitigate climate change and adapt to its impacts. The Agreement also established mechanisms to bolster support for developing countries in achieving this common objective (UNFCC 2024). A total of 196 countries adopted the Paris Agreement, marking a global commitment to addressing climate change, despite building on a voluntary commitment and discursive pressure.

The Paris Agreement formalized global desires for more green energy. Following the signing of the Agreement, countries pledged to reduce carbon dioxide (CO_2) and other greenhouse gas emissions through cooperative efforts and adaptation measures. Each country needed to communicate and outline the specific actions they planned to take to lower emissions in their Nationally Determined Contributions (NDCs), as well as detail the financial and technical support needed to implement these commitments. The robustness and ambition of these commitments vary across countries. Some states set more ambitious targets than others, while some depend heavily on external financial, technical and capacity-building support, and others prefer a more independent and bottom-up approach. The NDCs made explicit the need for more green energy across numerous countries.

The Paris Agreement negotiation also gave China an opportunity to demonstrate global leadership in climate change. Right before the Paris Climate Conference, representative Zhai Juan commented in *People's Daily*, a state-run newspaper, that China's role as "not only

on a pluralist state-based order (Hurrell 2007)

fulfilling its international obligations and responsibilities but also playing a leading role in global governance. This reflects the aspirations, commitment, and actions that are expected of China as it reaches a certain level of development" (Zhai 2015). In the months leading up to the 2015 U.N. climate change summit in Paris, China made a significant commitment by submitting its Intended Nationally Determined Contributions (INDCs). This pledge included a goal to reduce its carbon intensity by 60 to 65 percent of 2005 levels by 2030 and to peak emissions by the same year. Reaching this target would require China to achieve a greater annual reduction in carbon intensity than most developed countries. This ambitious commitment not only facilitated the Paris Climate Agreement negotiation but also set a high standard, placing pressure on other emerging economies, such as India, to make similar commitments (Krahl 2018; Finamore et al. 2024). Its NDC commitment serves as a critical model for what other countries can aspire to achieve. It underscored the Chinese government's serious approach to addressing the global challenge of climate change (Finamore et al. 2024). The Paris Agreement would not have been achievable without China's active participation (Krahl 2018).

China's proactive international leadership would not have been possible without changes in identity construction in global climate governance. China's official narratives framed itself as a leadership role ("yinlingzhe") in promoting international climate cooperation. Back in the 1990s and early 2000s, China preferred to remain in the back seat and stay in a low profile, aligning itself with the developing world under the collective voice of the G77, a broad coalition of developing countries in the United Nations. During this period, G77 often accused developed countries of using climate change as a pretext to hinder the developmental needs of less developed countries. While many countries such as some Latin American and African countries still called for a new legally binding commitment, China, India and several other countries opposed the idea of developing countries taking up legal commitments (ENB 2009). This narrative replicates the traditional North-South divide in the vexing climate

politics. Yet, slowly, China decided to make climate change a cornerstone of its foreign policy, as it aligned well with China's objective of "balancing domestic needs with international aspirations"(He 2010, p. 6). Furthermore, due to its economic and social progress, China had separated itself from the poorer G77 countries and changed other countries' perceptions of its responsibilities. Many members, including Argentina and Mexico, began to urge China and other major emitters to bear more responsibilities.

During the Copenhagen Climate Conference in 2009, China started to take a central role in climate negotiations for the first time (Krahl 2018). As more negotiations on climate change policies occurred, China had already begun implementing domestic climate mitigation measures and policy reforms to reduce greenhouse gas emissions and decrease reliance on fossil fuels. This proactive stance prepared China and influenced its approach to international cooperation and negotiations. At this juncture, China started to invest in and develop expertise in next generation low carbon energy technologies and solutions, such as renewable energy technology and conservation, supported by industrial restructuring policies at home (Lewis 2013).

3 Revisiting Push and Pull Factors

3.1 Domestic Financial Change: Green Credit Policy 2012

From the Copenhagen Summit in 2009 to the Paris Climate conference in 2015, climate responsibility has been reconstructed from a heavy burden to China to its own initiative as a responsible great power. In President Xi's words, climate change and carbon neutralization are "not something others ask us to do; it is what we choose to do ourselves" (cited in Xie 2015). To understand why China makes exceptional commitments to greening its overseas development projects, we examine its domestic energy policies.

China's shift to renewable energy started as early as 2012. The Chinese government's

climate-related goals are implemented through a policy infrastructure that includes regulations, guidance documents and financial support (Sandalow 2024). The policy structure is to improve energy efficiency, adjust industrial structures, optimize energy structures, develop clean energy, and strengthen ecological construction. In 2012, the China Banking Regulatory Commission (CBRC) issued the Green Credit Guidelines (GCG 2012), aiming to encourage banking institutions to develop green credit and adopt stronger environmental and social risk management. Green credit in China consists of a series of policies, institutions, and practices to promote pollution reduction and energy efficiency improvement through its credit intervention. Specifically, green credit policies influence the environmental behavior of enterprises through loan products, loan maturity, loan interest rates, and credit quotas. The Green Credit Guidelines (GCG 2012) play a guiding role in the allocation of bank credit in "two high and one surplus" industries — industries with heavy pollutant emissions and blind expansion of production scale (Wen, Lee, and F. Zhou 2021). On the one hand, it provides green industries with substantial financial support, such as energy conservation and environmental protection. On the other hand, the policy adopts punishment measures, such as suspending and delaying loans to pollutant industries risking in violation of laws and regulations on environmental protection.

As a binding industrial policy, the GCG 2012 has significantly cut down financial support to firms that fail to meet the environmental standards and reduce credit allocation efficiency of energy-intensive industries. In practice, banks have difficulty identifying the specific environmental features of enterprises and monitoring the practicality of access of firms to loans. Hence, commercial banks explicitly require their branches to reduce or suspend *all* loans that fall into the categories of "two high and one surplus" or energy-intensive industries (Wen, Lee, and F. Zhou 2021). At the same time, the GCG2012 facilitates the green investments of firms with undisclosed environmental information, and the green investment-induced effects are more pronounced among firms with soft financial constraints, limited

access to government subsidies, state-owned firms, and larger sizes (Ma et al. 2024).

This change in financial incentives reflects the Chinese government's goal to substantially reform its energy sector. Responding to the financing shocks, high-pollutant firms had to exit the market or upgrade to invest in energy efficiency. As a result, the economy has restructured internally to become more environmentally friendly, following the critical year of 2012 after the initiation of the Green Credit policy. We argue that these top-down green regulation policy shifts contributed to the development of expertise and increased firms' incentives to export green energy to other countries. As Chinese firms became greener, they looked for opportunities abroad as well. This trend coincided with an international appetite for more green energy, as the Paris Agreement solidified demands for green energy globally.

3.2 International Pull Factor: Desires for Green Energy

The December 2015 Paris Agreement has brought large and small countries into a mitigation system featuring a "pledge and review" system of nationally determined contributions (NDCs) (Hale 2016). While the Paris pledges will need to be substantially increased to achieve the long-term goal of carbon neutrality, states are expected to update their plans every five years, progressively increasing their level of action to meet the climate target. NDCs, which are submitted to the United Nations Framework Convention on Climate Change (UNFCCC), outline steps and policies that a country plans to undertake to reduce emissions at the national level, as well as other actions around adaptation. We argue that the Paris Agreement is a focal point for countries to articulate their aspirations of climate change mitigation; after Paris, the subject-to-review NDCs demonstate a country's aspirations and their policies and actions agenda. In other words, NDCs can be assessed as expressions of political commitments (Mills-Novoa and Liverman 2019).

Advancing state policies and non-state actions required to decarbonize the energy system is also reflected in the details of the NDCs. Generally speaking, countries have two

ways to organize their NDCs. One option is to communicate intended outcomes such as greenhouse gases (GHGs) outcomes — meaning emission reductions as absolute number, percentage compared to a base year or reduction of emission intensity. The other option is to use non-GHG outcomes as targets for energy efficiency or the share of renewable. Each country decides how much detail (i.e. financial support for policies, specific policies, etc.) it wants to provide in order to achieve its outcomes.

The information provided in the NDCs reflects different levels of ambitions countries have for their emission goals. Countries can specify detailed descriptions of different levels of renewable targets, current share of renewable capacity, projected energy consumption development and the type of financing to meet the goals. NDCs can also be vague, and simply mention that the country is planning to strengthen renewable energy, without specifying targets and implementation strategies. To provide additional context about how NDCs are used to reflect countries' policy ambition, the International Energy Agency (IEA) publishes the *World Energy Outlook* annually. This resource is the most authoritative global source of energy analysis and projections to identify trends in energy demand and supply. To forecast what needs to be done to reach climate goals, IEA projects and analyzes scenarios[2] using information from NDCs about behavioral measures and strategies such as pledges and policy landscapes in different sectors to assess and forecast changes (IEA 2024).

NDCs show the commitment countries have and their aspirations for their green energy transtion after the Paris Agreement. Some countries update NDCs every five years, which reflects progress for those countries. Through commitments and policy landscapes laid out within the NDCs, we can tease out different pathways and strategies of different countries. For example, a notable number of developing countries need to double their renewable installed capacity, but more than half of this is conditional on international support in the

[2]Stated Policies Scenario (STEPS), which is based on current policy settings and market conditions; Announced Pledges Scenario (APS), which incorporates regional and national energy and climate targets, assuming they are met in full and on time.

form of financing, technical assistance, technology transfer or capacity building (IEA 2023). China is the primary global powerhouse to provide renewables to the developing countries.

Driven by both a domestic shift in policy, increased international demands for green energy, and bolstered by its international standing as a leader in green energy, we argue that China would be in a prime position to respond to demands for more green energy from countries with strong NDCs.

4 Research Design

We argue that domestic and international pressures contribute to China's increasing green aid. Domestically, policy shifts toward decarbonizing and greener energy as early as 2012 incentivized Chinese firms to embrace technological upgrades. Thus, with more expertise and technological know-how in the renewable energy sector, Chinese firms have incentives to export green energy. On the international side, recipient countries, following international accords like the Paris Agreement, seek partners to provide or upgrade their renewable energy systems, and thus there is greater demand for greener aid.

Tracing China's domestic policy shift toward green energy and the international demand for more green energy leads us to two hypotheses:

H_1: China's aid projects are more green after 2012 compared to before 2012.

H_2: Countries with more demand for green energy will receive greener projects from China.

We identify China's Green Credit Policy in 2012 as a key year to study whether green domestic policy shifts in China impacted its foreign aid. We expect that China would give more aid to renewable energy projects after 2012 than before 2012. We use the logic of a difference-in-differences (Card and Krueger 2000) design to help us study these questions. We are interested in the "effect" of 2012 as a moment when the type of energy aid China

is giving should increase. To ensure that this increase is about greener aid, and not just a general increase in energy projects, we make comparisons at the project-type level, where we compare renewable energy projects to non-renewable energy projects. If the Green Credit Policy is a key moment in China's energy aid, we should see more green renewable energy projects compared to fossil fuel projects after 2012.

We use subgroup analysis to study how responsive China is to the energy demands of its recipient countries. If China is responsive, then countries with higher demands for renewable energy should see an increase in green aid compared to those with lower demands for renewable energy. By categorizing recipient countries as having higher or lower demands for renewable energy, we can determine if if the types of energy aid these countries receive are systematically different.

5 Data and Methods

5.1 Measurement

We use multiple sources of data to model China's overseas development energy initiatives in the context of international drive to renewable energy. The first dataset we draw on is AidData Global Chinese Development Finance Dataset (Version 3.0) that covers Chinese-funded development projects from 2000 to 2021 (Custer et al. 2023). This dataset provides fine-grained details about what the projects are about, where the projects are implemented, who executes them, and the purposes and implications of the projects. Since the complete dataset encompasses all Chinese overseas development projects and we are only interested in energy-related projects, we use a subset of projects that are classified by the AidData team from the following three sectors: "Energy," "General Environment Protection," and "Industry, Mining, Construction." The number of observations is 2603 projects.

To categorize the type of project and the energy used in each project, we manually

coded the 2603 projects with the following process: We first develop an initial set of project and energy categories, after which, two coders (the authors) started with a random sample of 50 projects to conduct a first round of coding. We then convened to discuss any discrepancies during our trial coding and revised our codebook and variable construction, focusing on the "Title" and "Description" variables from the AidData dataset. We iterated with pilot coding process with two other research assistants to develop a final codebook. Using the finalized codebook, the four of us (two authors and two research assistants) performed manual labeling for all 2603 projects in our data set.[3]

We generate six *project types* from AidData's Chinese overseas finances project descriptions: (1) Construction[4], (2) Electrical grid[5], (3) Mining[6], (4) Power generation[7], (5) Supply/refinery/processing[8] and (6) Others[9]. We further identify specific types of energy mentioned in the projects. The options for *related energy* are coal, gas, geothermal, hydropower, nuclear, oil (including petroleum, diesel), solar, wind, tidal, biomass and hydrogen/fuel cell. We note that half of the projects (n = 1341) did not have specific energy sources associated with them.

[3]We chose to conduct manual coding, instead of using a large language model primarily because of the complexity and nuances in the project description. Compared to automated algorithms, coders are better at understanding context, subtlety, and nuance in language. By reviewing and validating the results in weekly meetings, we applied our judgment and domain expertise to resolve ambiguities and make informed coding decisions. Coders can also gain domain knowledge to increase the precision of coding over time. Hence, overall, we are more confident about the accuracy and reliability of the categories we and our coders generate.

[4]Projects in Construction consist of general construction projects (such as building, factory, etc), but construction projects related to power generation are not included here.

[5]Projects in Electrical grid consist of building out an electric grid, such as transmission lines, substations, and distribution networks.

[6]Projects in Mining focuses on mining metals, coal, gold and other minerals.

[7]Projects in Power generation focuses on constructing power plants

[8]Projects in Supply/refinery/processing focuses on supplying, refining, or processing any resources (such as chemicals or fuel), including pipeline, offshore oil extraction

[9]All other projects, like donations, primarily loans, sharing equipment, training, etc. fall into this category. We have a separate label "green" to denote any projects in Others mentioning renewable energy initiatives or social responsibility, such as "clean energy," "renewable," "environmental and social due diligence," "social responsible," "green".

5.2 Dependent Variables: Project and Energy Type

To construct our main dependent variables, we categorize the projects into two groups based on the related energy: *non-renewable (fossil fuel) energy* (e.g., coal, gas, and oil) and *renewable (green) energy*[10] (geothermal, hydropower, solar, wind, and biomass). We create two variables from these categorizations: *proportion of fossil fuel projects* and *proportion of green projects*, which we calculate out of all energy-related projects by country-year.

Figure 1 shows the count of all projects, green projects, and fossil fuel projects funded by China between 2000-2021. It does appear that there are more renewable energy projects in general starting from 2012, especially in comparison to non-renewable energy projects. While the number of green energy projects surpassed fossil fuel projects around 2012, there were fluctuations in line with the broader trends in the Belt and Road Initiative, and fossil fuel projects surpassed green energy projects again after 2018. 2018 also marked a year when BRI projects became more restrictive, which can be observed in the data.

We have 136 countries in this study. To illustrate the types of projects countries received, we highlight the patterns of renewable and non-renewable energy projects in the figures below. As seen in Figure 2, among countries with the most projects, non-renewable energy projects seem to dominate these projects. Only Laos and Pakistan have more renewable energy projects, while Brazil, Indonesia, Russia, and Vietnam have more non-renewable energy projects.

If we only look at the countries with the most renewable projects, which are depicted in Figure 3, we notice that most of these projects are in Pakistan, Laos, and Myanmar. Except for Vietnam, the other countries in this group have fewer energy projects in general, and renewable projects seem much more prevalent than non-renewable projects.

[10]There are no projects coded as tidal or hydrogen/fuel cell so we drop these two categories in our analysis

Figure 1: Energy-related Projects between 2000-2021.

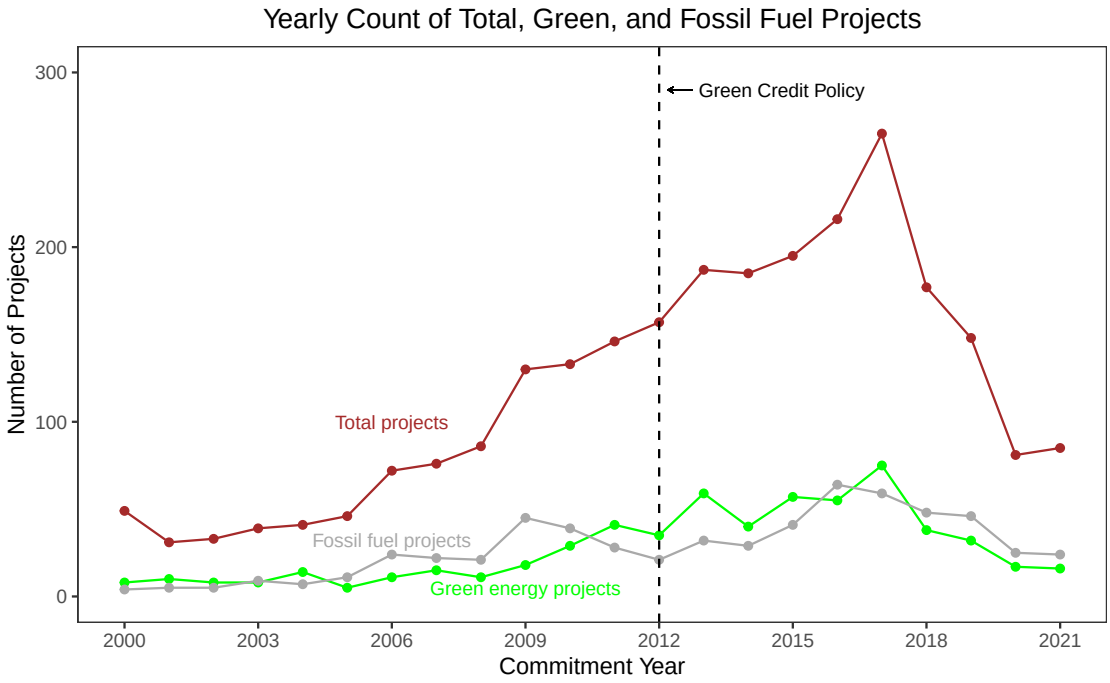


Figure 2: Cumulative count of renewable and non-renewable projects among countries with the most aid projects between 2000-2021.

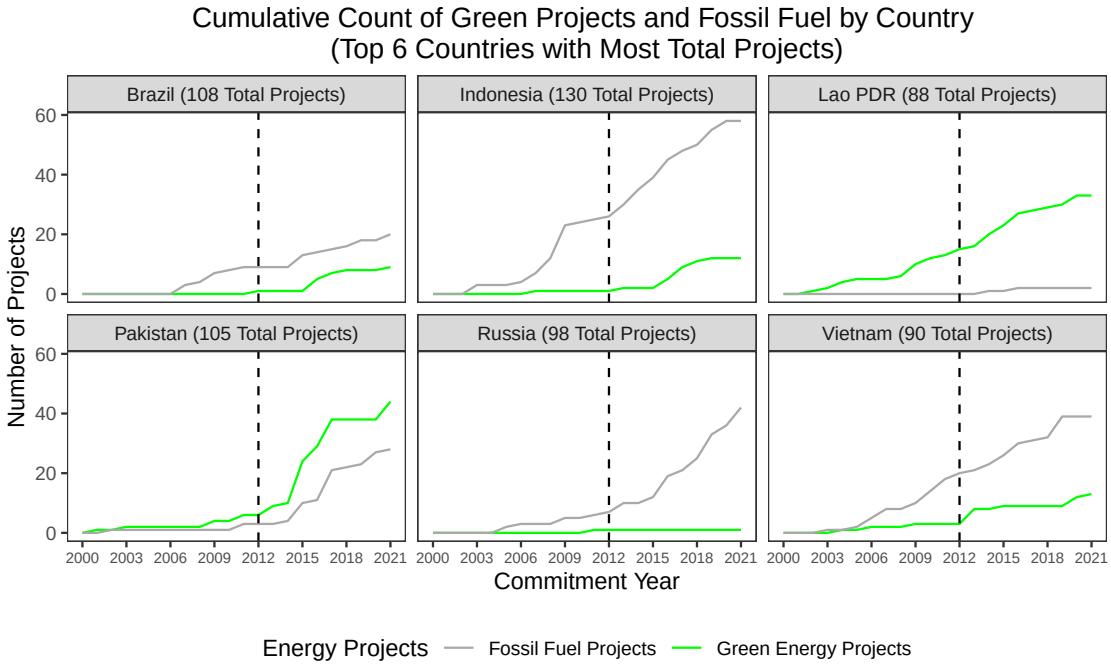
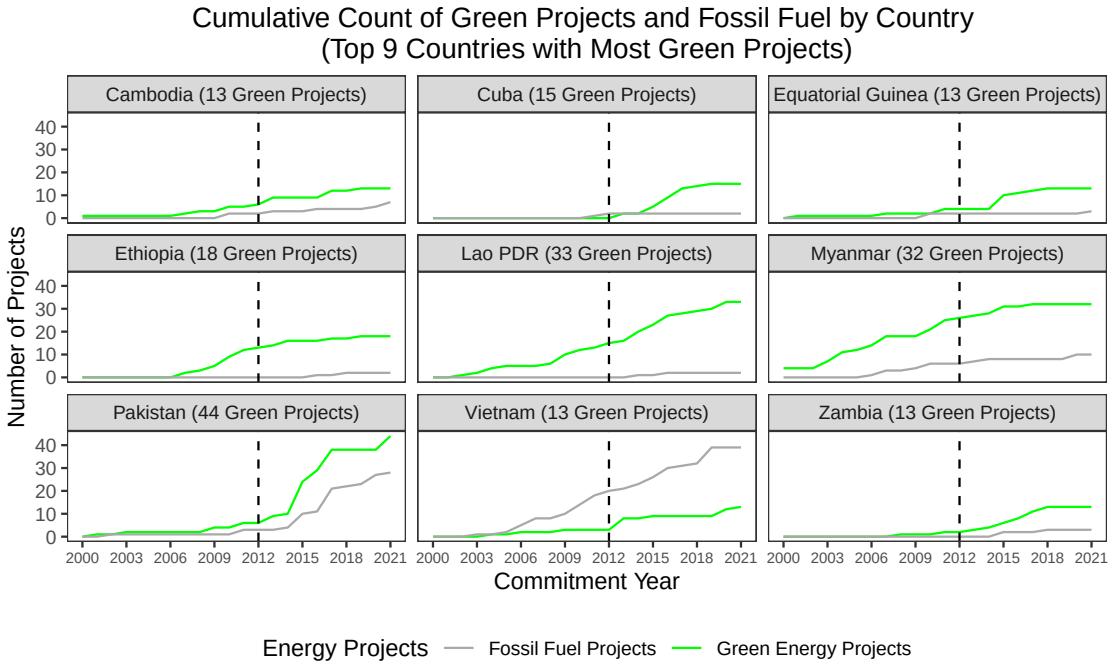


Figure 3: Cumulative count of renewable and non-renewable projects among countries with the most renewable projects between 2000-2021.



5.3 Independent variable: Green Credit Policy in 2012

For our first hypothesis, our main independent variable is the year of Chinese central government implementing green credit policy under the Green Credit Guidelines in 2012 (*GCG2012*). As discussed in the previous section, this financial instrument required commercial banks to restrict lending to energy-intensive firms and provided loans to environmentally friendly firms. This green credit policy marks an important transition for domestic enterprise and industry upgrades towards green, low-carbon and sustainable development in the domestic market.

5.4 Other variables

For our second hypothesis, we are interested in how responsive China is to recipient countries' policy initiatives in renewable energy transition. Thus, we create a composite variable of

the energy reduction targets and policies toward renewable energy for each recipient country according to their Nationally Determined Contribution (NDCs). Under the Paris Agreement, 179 countries have so far submitted and/or updated their NDCs to show their commitment to tackling climate change and strengthening their efforts over time (Nations 2024).

We construct the NDC composite variable using the following procedure:

1. Count of the number of commitment policies per country.

2. Create evaluation score where counts are binned into categories 0, 1-2, 3-4, 5-6, 7-8, 8+, and convert each category such that $0 \rightarrow 0$, 1-2 $\rightarrow$ 1, 3-4 $\rightarrow$ 2, and so on.

3. Percentage for unconditional mitigation target. If this is not recorded, then we the reported emission reduction compared to baseline or base year. If this is recorded, then we use the intensity target. If this is not recorded, we then use the condition mitigation target with a penalty.

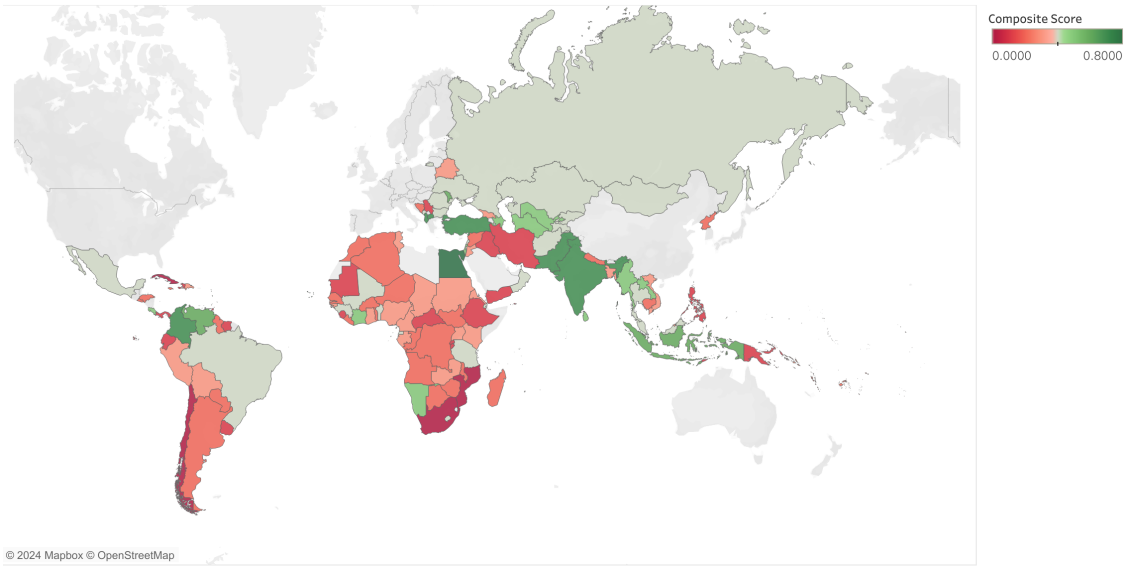
4. Create an evaluation score where percentages are binned into categories 0, (0, .15), [.15, .3), [.3, .45), [.45, .6), [.6, 1), and convert each category such that $0 \rightarrow 0$, (0, 0.15) $\rightarrow$ 1, [.15, .3) $\rightarrow$ 2, and so on.

5. Combine binned count of commitment policies and mitigation percentage using an additive index. Commitment policies account for 50% of the index and mitigation percentage accounts for 50% of the index.

6. Standardize composite score to 1

The goal of the NDC composite score is not to exactly measure how much a country has reduced, but rather to obtain a sense of how much they care about and *aspire* to have more renewable energy. For example, countries that want more renewable energy and want to reduce emissions tend to have more commitment policies while countries that have made

Figure 4: NDC composite score (aspirations for renewable energy) of recipients of Chinese aid



good progress toward renewable energy tend to have fewer commitment policies. Figure 4 shows the NDC composite score for recipient countries.

Finally, we control for CO_2 emissions for each country. This variable comes from the European Commission's Emissions Database for Global Atmospheric Research (EDGAR).

For our analysis, we use panel data and have a complete panel for 136 countries from 2000-2021. The main dependent variables, *proportion of green projects* and *proportion of fossil fuel projects* vary by country-year as does the control variable, CO_2 emissions. The main independent variable is a binary indicator, where 1 is on and after 2012 and 0 is before 2012. The NDC composite score is a country-level score that does not vary by year.

5.5 Estimation

We conduct three sets of analyses in this study. First, we assess descriptively if there is generally an increase in green energy projects. For this analysis, we use OLS following equation 1, where Y is the count of green projects per year and $Year$ is an indicator for each

year such that 2000 is 0 and 2021 is 21. If Chinese aid is becoming more green, we expect that there should be more green projects every year.

$$Y = \beta_0 + \beta_1 Year + \epsilon \tag{1}$$

Second, we assess whether countries are receiving more renewable projects after 2012 compared to before 2012. We use a panel dataset with *proportion of green projects* by country-year as the dependent variable. For this analysis, we use OLS with fixed effects for country. As specified in Equation 2,$Y_{i,t}$ is the proportion of green projects received by country i in year t, $T_{i,t}$ is a binary indicator for whether the year is on or before 2012 or after 2012, and $cov_{i,t}$ is CO_2 emissions. We use robust standard errors clustered by country. We also conduct the same analysis with the *proportion of fossil fuel projects* as the dependent variable as a comparison for the trends we see in renewable energy.

$$Y_{i,t} = \beta_0 + \beta_1 T_{i,t} + cov_{i,t}\epsilon_{i,t} \tag{2}$$

It may be the case that all types of projects generally increased 2012. Thus, we compare renewable projects with fossil fuel projects before and after 2012, using a difference-in-differences set up. This analysis gives us further evidence that renewable projects increased after 2012. Again, we use OLS with fixed effects for country. Equation 3,$Y_{i,t}$ is the proportion of projects received by country i in year t, $T_{i,t}$ is a binary indicator for whether the year is on or before 2012 or after 2012, $Z_{i,t}$ is a binary indicator for project type (whether the proportion of projects is renewable or non-renewable), and $cov_{i,t}$ is CO_2 emissions. We use robust standard errors clustered by country and we also conduct the same analysis.

$$Y_{i,t} = \beta_0 + \beta_1 T_{i,t} + \beta_2 Z_{i,t} + \beta_3 (T_{i,t} \times Z_{i,t}) + cov_{i,t} + \epsilon_{i,t} \tag{3}$$

Finally, we assess whether there is any influence of a country's own energy policy

on China's green aid, especially after the Paris Agreement. Again we use OLS with fixed effects for country, and robust standard errors clustered by country. We conduct the same analysis as Equation 3, but divide our sample by low and high NDC composite scores, where 0 is considered a lower score that is less that mean of the composite score (0.3), and 1 is considered a higher score that is equal to or greater than the mean of the composite score.

6 Results

Did Chinese foreign aid projects become more green as a result of its Green Credit Policy in 2012? Results from our analysis suggest that it did. We show our preliminary evidence in three steps.

First, it appears that China is supporting more green projects generally. Table 1 shows us that on average, China seems to have 2 additional renewable projects every year. Thus, we see that, with or without the Green Credit Policy, China's green projects have been increasing every year.

Table 1: Average yearly increase of China's green projects

	Green Energy
Year	1.92**
	(0.55)
Intercept (Year = 2000)	7.24
	(6.72)
R^2	0.38
Num. obs.	22

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Next, we test our hypothesis that China's Green Credit Policy had an impact on green projects funded by China. Table 2 suggests that on average across every country, the proportion of renewable projects that were green after 2012 was higher than the proportion of renewable projects before 2012. This result supports our hypothesis that China's Green

Credit Policy ultimately affected the foreign aid that China gave.

Table 2: Comparison of proportion of green projects after 2012 and before 2012.

	Green Energy
Post-2012	0.07***
	(0.01)
CO_2 emissions	0.00
	(0.00)
Country-level fixed effects	Yes

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

To find further evidence of China's greening aid, we make comparisons between renewable and non-renewable energy projects. We first study whether renewable energy projects increased more than non-renewable energy projects. Here, we compare the *proportion of green projects* with the *proportion of fossil fuel projects* before and after 2012, using a difference-in-differences-style set up. The first model in Table 3 shows overall results from this comparisons. We see that the proportion of non-renewable energy projects increased after 2012 by ($\beta = 0.04$). But, supporting our hypothesis, we also see that the interaction shows that the proportion of green projects increased even more than fossil fuel projects (though this result is significant at the 0.1 level).

Lastly, we assess how China responds to recipient requests when considering its aid projects and ask if renewable vs. non-renewable projects differ based on the recipient country's energy policy. We make the same comparisons for renewable and non-renewable energy and conduct subgroup analyses, separating the countries as those who have higher-aspirations for greening their energy policy (high NDC) and lower-aspirations fro greening their energy policy (low NDC). The second and third models in Table 3 show these results. Interestingly, in lower-aspiration countries, there is a small increase in renewable projects after 2012 compared to non-renewable projects, but this increase is not statistically significant at 0.05 or 0.1 levels. However, in higher-aspiration countries, there does appear to be more renewable

Table 3: Relationship between the Green Credit Policy and proportion of green projects compared to fossil fuel projects

	Project	Project (Low NDC)	Project (High NDC)
Post-2012	0.04^{**}	$0.03^{\dagger}$	0.04^{*}
	(0.01)	(0.02)	(0.02)
Green Projects	0.01	0.02	-0.01
	(0.01)	(0.02)	(0.02)
CO_2 emissions	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
Post-2012 $\times$ Green Projects	$0.03^{\dagger}$	0.02	$0.04^{\dagger}$
	(0.02)	(0.03)	(0.02)
Country-level fixed effects	Yes	Yes	Yes
N	5720	2464	3212

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; $^{\dagger}p < 0.1$

projects after 2012 compared to non-renewable projects, and this increase is statistically significant at the 0.1 level.

It is interesting to note that in all cases, China's aid for non-renewable energy projects still continues to increase as well, after 2012. China appears to continue to care about energy security, and funds energy projects whether they are renewable or non-renewable. Therefore, we do not see fossil fuels and green energy projects as complete substitutes. According to the energy report analysis by Boston University, the median year of commission of Chinese-funded fossil-fuel overseas plants is 2016, meaning that more than half of these plants are six years or less into their lifetime (Springer, Lu, and Chi 2022).

7 Remarks

In this project, we examine whether China fulfills its commitment made on the international stage, and we find a positive answer: Chinese overseas development projects lean towards renewable energy after 2012, long before they made the public statement about greener BRI. We find it even more puzzling why China has made more ambitious commitments

to renewable energy and climate change actions than many developed countries, especially considering that most of these commitments are inwardly focused. China has also pledged numerous commitments to decrease greenhouse gas emissions and diminish its dependence on fossil fuel energy sources within its domestic sphere. China does not seem to free-ride; rather, commits even further to supply public goods to developing countries.

What drives China to transit towards greener overseas development projects, particularly when there is no pressure from domestic constituencies? We argue that it is a downstream effect of the Green Credit Policy in 2012 where China has provided financial incentives to promote the green transformation of the economy. As a result, industries have undergone transitions to energy efficiency, and have gained expertise in renewable energy technologies, both domestically and internationally. The domestic shift to green energy starting in 2012 prepared China to take a lead in renewable energy sectors and climate change more generally. China also began to take a more proactive and leading role in the international climate change regime, as well as implementing its shit to Green Belt and Road Initiative. Our preliminary evidence supports this argument.

We also argue that China takes into account how much the recipient countries desire green energy. While China as a major financier can supply and fund various types of green projects in solar or wind energy, for example, not every developing country ready to transition to renewable energy. We use countries' Nationally Determined Contributions in the United Nations to infer their inspirations for green energy. Again, we find heterogeneous effects of China funding renewable projects in countries with lower- versus higher- aspirations of green energy. In higher-aspiration countries, there has been an increase in Chinese-funded renewable energy projects after 2012 compared to non-renewable energy projects. This suggests that China's overseas financing in renewable energy aligns with the aspirations of aid-receiving countries, reflecting a mutual interest in transitioning towards greener energy sources. Understanding these dynamics is crucial for effectively navigating the evolving

landscape of international energy development and sustainability efforts in the future.

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