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China's Outward Investments and Global Sustainability

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Abstract

China's outward investments are likely to have a substantial impact on global sustainability. Through capital, technology, and standards, China's investments, including through the Belt and Road Initiative (BRI), have the potential to act as catalysts for sustainable, climate-conscious development—or to accelerate resource depletion, pollution, biodiversity loss, and carbon-intensive resource depletion. This policy paper draws from several pieces of research analyzing the political economy of China's outward investments and consequent environmental impacts. Findings from these analyses cast doubt on the narrative that domestic overcapacity is the major driver of outward Chinese investment in coal-fired power; show that political favoritism in recipient countries exacerbates the environmental impacts, including deforestation, of China's investments; and point to early evidence of a growing anti-China bias in energy infrastructure development among recipient country citizens. Together, these findings highlight the need for more nuance in policymaker models of BRI investments and their environmental impacts, with particular attention to the interaction between recipient country politics and China's unique, state-capitalist political economy. These findings suggest that U.S. government agencies can best support sustainable, climate-conscious development by working to enhance institutional standards, bureaucratic capacity, and stakeholder engagement in recipient countries, so that they are able to channel investment financing toward needed development while reducing elite capture and mitigating environmental and climate impacts.

Implications and Key Takeaways

- Policymakers need to move beyond extreme typologies of the BRI and Beijing's control.
- Greater attention needs to be paid to the interaction between host country politics and how China's state capitalism channels capital.
- A public opinion backlash against China's overseas investments and against coal-fired power suggest increasing awareness of environmental issues and increasing skepticism around Chinese investment.

- We may be at a global inflection point for greening energy infrastructure generally and China's capital specifically, but potential pitfalls remain.

- U.S. government agencies—especially USAID, the EPA, the Department of Energy, and the State Department—should work creatively with host country governments to enhance standards and build capacity for maximizing the sustainability of BRI investments.

Introduction

In September 2021, Beijing made waves with its announcement at the UN General Assembly that it would halt the building of new coal-fired power projects overseas.[2] What this actually means is still relatively unclear. Some postulate that this public commitment by China's top leader signals a critical shift in the Chinese government's policies toward climate change and sustainable development. Others argue that the devil is in the details of implementation—what projects would be included and when this policy would take effect—and that it also sidesteps China's domestic reliance on coal.

Debates around China's impacts on global sustainability often focus on the unique nature of China's business-government relations, which are often referred to as "State Capitalism."[3] China's state capitalism entails a complex system of party-state control over the economy; this also leads many policymakers and observers to assume that China's state capitalist system gives Beijing complete control of overseas activities and investments, including under China's Belt and Road Initiative (BRI). For the global environment, such a view suggests that greening China's overseas impact is simply a matter of cajoling Xi Jinping, China's top leader, into adopting environmentally friendly policies. An alternative viewpoint highlights the plurality of actors and interests in China's political economy, noting that environmental policy and foreign policy do not fit into neat narratives of state control,[4] even as China's system remains far more state-driven than the U.S. and other Western economies.

The implications of this debate for policy responses to the BRI are significant, and this paper outlines several pieces of related research that moves beyond traditional generalizations and dichotomies to unpack specific actors and mechanisms, in both destination and host countries, that determine whether and how China's overseas economic footprint impacts the environment.

I proceed by first outlining the crucial stakes at play: why China's central role in global trade, investment, and technology flows, as well as its large domestic market, hold the key to curbing carbon and taking a sustainable development path. I next outline the domestic drivers of China's overseas investments, including the common argument that overcapacity pushes Chinese companies to invest abroad. I show that there is an absence of evidence in support of such a contention. But destination country politics may also condition the BRI's environmental impacts. I present evidence of

how political favoritism in the allocation of projects exacerbates deforestation around Chinese investment sites. Finally, I consider the larger context of public opinion in destination countries, examining the specific case of energy infrastructure. I present preliminary evidence showing a major public backlash against coal-fired power and against China as a project developer; though part of a larger anti-foreign bias in project development, the generally more negative attitudes towards China seem to suggest some of the lasting public opinion consequences of a poor reputation for environmental stewardship.

Global Sustainable Development: China's Role

China's significance in global environmental issues is hard to overstate. It is not only the world's largest carbon emitter, but also a carbon multiplier because of its active involvement in the financing and construction of overseas investment and infrastructure projects. These projects often have major environmental impacts on recipient countries, and in the case of energy infrastructure also lock in future emission trajectories in many developing countries. Foreign investment commonly serves an engine of growth but also an avenue for environmental and social dislocation. As a source of capital and technological know-how, and given China's extensive financial resources and companies' experience in capital-intensive construction at scale, China's overseas investments will have an outsize role on the trajectory of sustainable development in countries across the world.

In this context, the Belt and Road Initiative (BRI) has received much attention not just for its potential geopolitical impacts but also its environmental consequences. Initially proposed in 2013, the BRI seeks to establish both a land-based "Silk Road Economic Belt" and a "Maritime Silk Road," prioritizing economic development and international partnership[5] while promoting energy cooperation.[6] Although Chinese overseas economic activities are not limited to the BRI, the ambitious initiative has provided further political impetus for the acceleration of China's investments abroad. In fact, it has largely become synonymous with "Chinese overseas investment", even subsuming many projects conceived and implemented before the BRI came into effect. China's overseas in- vestments had already been rapidly increasing since its "going out policy" announced in 2000, which encouraged Chinese companies

to invest and operate abroad. Here, I largely use both terms interchangeably, including drawing on evidence from investment projects that sometimes precede the formal announcement of the BRI.

A growing body of research has cataloged when and whether China's overseas finance has serious environmental impacts.[7] Decisions made around siting and planning new infrastructure will have long-term impacts on development trajectories and environmental conservation at a global scale. China's overseas financing of energy infrastructure will significantly influence the future power generation sources for countries throughout the world. Chinese-financed power plants will affect local environmental quality and water sustainability, and will have major impacts on the global emissions trajectory. Chinese-financed projects more generally have the potential to influence biodiversity, air, and water in large areas adjoining projects; highlighting the potential impacts of the BRI on global sustainability, broadly construed.

Overcapacity, Overblown?

One sector of investment which has received particular investment is energy generation infrastructure. China has often been criticized for continuing to develop coal-fired power plants over- seas. Due to their long life span, coal-fired power plants have significant impacts on both climate change,[8] and local environmental conditions, especially air and water.[9]

Against this backdrop, scholars and policymakers have actively debated the drivers of China's overseas energy investments. One group actively sees Chinese firms as motivated by domestic overcapacity and market constraints, opting to build dirty, technologically less advanced fossil fuel (especially coal-fired) power plants as a way to maintain revenue and employment.[10] Another group views the Chinese firms as part of the larger global energy financing landscape, with demand from recipient countries for new power plants driving the construction and financing of new plants, and the most successful and technologically-advanced Chinese firms driving the investment.[11]

From a policymaking perspective, understanding when and why Chinese firms invest over- seas can help destination countries understand and respond to prospective investments, while also providing valuable information for other bilateral and multilateral development lenders about the nature and drivers of China's energy financing.

Despite these high stakes, existing attempts to unpack the drivers of China's overseas investments have generally looked at a small number of cases, have relied on public statements by the Chinese government on the overall goals of the project, and have paid too little attention to firm- level variation in overseas financing activities. While case-study approaches shed valuable light on the processes of firms' investments and their impacts, they also point in different directions. Chinese government statements, though potentially informative, should be taken with a healthy grain of salt, and at best may not reflect the commercial reality. Firm-level approaches, although able to surmount these obstacles, have been stymied by limited data, measurement issues, and a lack of clear inferential strategy.

China's State Capitalism and Environmental Reforms

The nature of China's domestic political economy has shaped—and constrained—efforts at energy reform. This is despite increasing public awareness and demand for environmental protection. While an authoritarian regime, the Chinese Communist Party remains sensitive to public opinion as an important source of regime legitimacy and internal stability. The fact that public satisfaction with the central government is affected by environmental issues—such as air pollution—has made addressing environmental concerns even more imperative for Beijing.[12]

At the same time, the necessity for maintaining economic growth—another very important source of performance legitimacy for the CCP—often comes into tension with environmental goals. During a January 2022 visit to Shanxi, China's largest coal-producing province, President Xi Jinping made a speech saying that the 'dual carbon' goals of peaking emissions by 2030 and achieving carbon neutrality by 2060 "is not what others ask us to do, but [something] we do on our own initiative"; that this process could not wait nor could it be "rushed"; and that China was "rich in coal, poor in oil and low in gas."[13] Concerns over political stability, economic development, and satisfying the vested coal interests of state-owned enterprises have continued to constrain China's domestic and global environmental policies.

Institutional inflexibility at dealing with sometimes competing priorities often leads to seesawing governance cycles as well as interjurisdictional tensions

between local and central governments.[14] This has often led to seemingly paradoxical policies. For instance, China's massive expansion of renewables capacity seems contradictory to its continued domestic reliance on coal-fired power as well as its support (until very recently) for building coal-fired energy infrastructure overseas. But renewables manufacturing and generation has also helped spur local economic growth, frequently to the extent that curtailment (the excess generation and hence loss of renewable energy) is a serious problem; where policies often fall short is facilitating a full-on energy transition such as encouraging grid reform and delivery of non-coal-based electricity generation.

Overcapacity and Challenges of Power Sector Reform

The power sector is no exception. Despite problems of overcapacity, stalled reform of China's power sector presents a particular dilemma for the CCP. On one hand, power generation constitutes a sector in which reform is particularly difficult. It was never particularly marketized, and direct and indirect subsidies for coal production have only increased since the crisis. Coal generation is also geographically concentrated, making it difficult to reform, and coal reserves and coal generation are particularly important in some of the historically less developed areas that are the regional targets of central development priorities. The energy sector is also dominated by SOEs, making it difficult to enforce environmental regulations.[15] Because of their corporate structure, SOEs have been key contributors to overcapacity: "Since SOEs typically do not pay dividends (except to the state and much of those are returned to the SOEs), they use the dividends to expand capacity and keep employment levels up."[16] At the same time, the stalled implementation and progress in reform of many key markets has also reduced the potential disciplining roles of price signals.[17]

Since the 2008 financial crisis, the empowerment of statist coalitions and the regime's overriding concerns of mitigating political risks have sheltered SOEs from structural reforms. Projected economic reforms in China are taking place without the kinds of layoffs that characterized earlier waves of SOE reforms in the 1990s.[18] Protecting the interests of SOE employees is seen as a major task.[19] As Zhang Yi, the head of China's state-controlled SASAC (State-owned Assets Supervision and Administration Commission), said in 2015,

"In the process of deepening reforms of state-owned enterprises, the leadership of the party can only be strengthened, not weakened."[20] In order to ensure the continued employment protection and the maintenance of stability, the CCP has shown little inclination for further market-oriented reforms.

Thus, for both domestic imperatives of survival and for international reasons, the CCP has sought to reform China's energy sector. However, the crisis-response legacy of statist policy-making has helped to limit the scope for market-based reforms. Since local governments acting in China's decentralized system tend to vary in their response to environmental and energy policy goals, depending on their initial endowments and development strategies,[21] many local governments' interests and incentives are poorly aligned with the larger goals of energy sector reform. Furthermore, centralized command-and-control in the form of environmental authoritarianism is not a panacea.[22] Indeed, such attempts at reform and central control inevitably tend to face institutional limitations in China's decentralized system.[23]

Overcapacity as a Driver of BRI Investments?

Against this backdrop, overseas energy investments through the Belt and Road Initiative have been explained by some as the CCP's response to 1.) address overcapacity issues; and 2.) manage conflicting imperatives of statist intervention and structural reform. According to this logic, a key driver of the BRI has been the need to relieve overcapacity across sectors. Overcapacity has been particularly acute in the power sector. At the same time, China has actively increased its market share in the construction of overseas coal-fired power plants. Estimates suggest that roughly 11-21 percent of total overseas coal finance, or USD35-72 billion, is from China.[24] Most of the overseas financing is in the form of engineering, procurement, and construction contracts, the know-how for which firms arguably find easier to transfer overseas than to make the switch to the domestic renewable energy industry.

By encouraging, or selectively supporting, investment overseas, the regime can use these state-subsidized investments to support less competitive industries domestically, as well as compensate SOEs and regions that have been left behind by the trajectory of reforms. While the BRI has largely evolved as an all-encompassing strategy subsuming many investment projects, it has sent

important political signals through lending decisions by state banks, which control much of the credit allocation.[25] The BRI also provides Beijing with additional opportunities to use laws and targeted regulations to constrain and shape SOE involvement in BRI-sanctioned overseas investments, especially through the widespread mobilization in recent years of key ministries like the NDRC, MOF, and Ministry of Commerce to shape BRI activity.[26]

While a common argument in academic and policy circles, the role of overcapacity and reform pressures in driving BRI investments has not been systematically tested. Below, I construct a new dataset to test this claim, but find a lack of evidence that this is the dominant reason behind China's allocation of overseas investments. I disaggregate the Chinese state to focus empirically on the role of firms within this state capitalist system. Firms, particularly powerful state-owned enterprises (SOEs), often have the political clout to influence government decisions, and are also the crucial actors in executing overseas investments. Analysis of firm-level investment drivers can add more nuance in explaining *when* and *why* Chinese firms sometimes invest in fossil fuel projects but invest in renewable energy at other times, as well as observed variation in generation technology levels.

Overcapacity Assessment: Data and Analysis

In order to create the dataset used in the analysis, I merged and extended several existing data sources on coal-fired generating capacity within and outside of China, data on other power generation installations globally, as well as measures of multidimensional risk for coal plants within China. The first step in dataset construction was to create the first firm-level inventory of coal-fired power plant assets for all Chinese firms. This allowed me to build a measure of the extent to which each firm in a given year faces risks from structural changes in China's domestic political economy. I drew on data from the Global Coal Plant Tracker, published by the NGO Global Energy Monitor.[27] Because of data availability and because China's overseas investments have only begun to pick up in earnest in recent years, I focused on the years 2000–2018.

I first disentangled joint ownership by partnership shares, and used these partnership shares to weight unit-level generating capacity. I then calculated each firm's total generating capacity (included weighted capacity) for a given

year, and for each province specifically. To calculate the annual capacity, I used data on the commissioning year (and in some cases, retirement years) as well as plant locations within a specific province. I then calculated the province-level share of generating capacity for each firm-province combination in each year.

Next, I constructed a measure of (over/under)-capacity specific to the power sector. I used aggregated data on electricity consumption and production at the provincial level, together with data on electricity imports and exports from every province, to assess the extent of excess generation in each province. The net (over/under)-generation is calculated for each province-year. For a large country like China, this imbalance is largely driven by a.) existing grid constraints, b.) changes in regional demand due to differing rates of economic growth; c.) variability due to the introduction and expansion of renewables generation capacity; and d.) varying levels of over-investment in generating capacity at the provincial level. While firms can anticipate and respond to many of these issues, because of the massive investments required to build generating infrastructure as well as the long time horizons of returns, these investments are classic sunk costs, and can face insufficient demand under conditions of overcapacity. Factors affecting overcapacity and supply demand imbalance include the location and intensity of new, energy-intensive economic activity, the capacity, technology and policies of China's grid,[28] and the distribution of renewable energy sources, such as hydropower, wind, and solar. Most of these factors are determined by factors largely exogenous to the location and capacity of existing generating capacity and are outside of even large generating companies' control.

Because of the different locations of firms' generating assets, each Chinese firm faces different levels of financial pressures on their domestic assets. I uses this variation as my major source of inferential leverage. Since the underlying variations in overcapacity are not random or quasi-randomly assigned, I do not claim that the analysis can make causal claims about domestic markets and firm investments. However, it does provide novel, suggestive evidence of the correlations between domestic conditions and overseas investments, and helps to answer questions about which kinds of Chinese firms invest overseas.

I then took the sum of the product of the province-year shares of generating assets for each firm and the province-year under/over-capacity measures. This has the advantage of automatically incorporating firms' size into the measure.

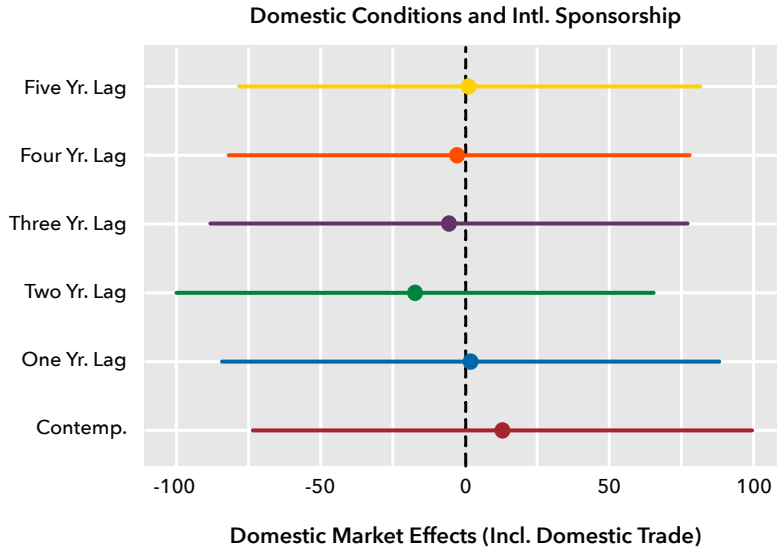
Since we would expect that larger firms have more overseas investments (or are more likely to invest overseas), this makes the measure a direct comparison of relative over/undercapacity.

Next, I matched these measures at the firm-level with data from the Global Coal Plant Tracker on coal-fired power plants outside of China. I then matched across firm names, connecting all over- seas projects sponsored (or partially sponsored) by Chinese firms to the respective firms' domestic measures of yearly excess/under demand.

To analyze the impact of domestic market constraints, I modeled the total firm-level megawatts sponsored overseas by year as a function of its domestic market constraints on a panel of firm-year investments. To calculate domestic market constraints, I scaled the generating capacity of each Chinese parent by provincial-level annual electricity generation balances. If Chinese firms facing market constraints or bearing the greater brunt of reform pressures at home were more likely to invest overseas, then we would expect that provinces with more positive balances (greater production relative to demand— and in some specifications, inclusive of trade) would be more likely to sponsor overseas plants. Conversely, if the most successful and well-placed firms were most likely to invest, we would expect to see effects in the opposite direction.

Because it would likely take several years for domestic reform pressures or market constraints to translate into overseas coal construction, I tested different temporal relationships between the explanatory variable (province-year domestic imbalance) and my outcome measure of total megawatts sponsored internationally. These ranged from contemporaneous to a five-year mapping. In calculating domestic market constraints, I also evaluated the effects both inclusive and exclusive of extra-provincial electricity trade. The unit of analysis is the universe of firm-year combinations for all Chinese firms with generating capacity in a given year (from 2000 to 2018). The models include fixed effects for parent firms and year. Coefficient plots below summarize the results from these models. The top panel of Figure 1 uses measures of domestic conditions including trade, while the bottom panel uses measures without trade. Each panel summarizes six models, ranging from zero to five-year lags. Across measurement strategies and lag lengths, point estimates are small and coefficients are imprecisely estimated. While this consistent failure to reject the null hypothesis cannot itself be disposi-

FIGURE 1: Effects of domestic electricity market constraints on international sponsorship of coal-fired power are substantively small and statistically indistinguishable from zero. Unit of observation is the firm-year and all models include firm and year fixed effects. Panel covers the period from 2000–2018.



tive of some relationship between domestic conditions and overseas investments, it suggests that simple theoretical models of overcapacity-induced overseas investment are likely to be insufficiently nuanced.

The analysis above presents a first cut at a firm-level approach to understanding the political economy of Chinese outward investment and its potential environmental impacts. A range of existing case study research, largely critical of Chinese investments, have rightly pointed to the potential environmental risks of China's financing of coal-fired power generation overseas. This paper's findings suggest the importance of broadening the scope of inquiry and policy prescriptions beyond a focus on China's overcapacity. In the next section, I discuss such an approach, focusing on the inter-

action between the politically-motivated allocation of overseas investment and environmental consequences.

Elite Politics and Destination Country Environmental Impacts

If overcapacity isn't pushing Chinese firms out, than what other variables matter? Increasingly, research is focusing on the complex interactions between China's overseas investments and domes-tic politics in recipient countries.[29] Turning to the role of elite politics in mediating environmental impacts, I collaborated with Dr. Hongbo Yang, of the Chinese Academy of Sciences, to analyze the deforestation impacts of China's overseas investments—particularly how dynamics of political favoritism might be exacerbating deforestation.

We operationalized both political connections and a measure of the environmental impacts of BRI investments, focusing on deforestation. This makes two major contributions. First, while it is often argued that Chinese investments are accelerating deforestation, the extent of the environmental impacts of China's overseas investments at a global scale have not yet been measured. We are the first to provide a global spatial assessment of forest loss as a result of China's overseas investments. Second, the paper provided the first empirical estimates of whether and when political favoritism in BRI project siting affects deforestation around BRI-funded projects.

Forest cover, which has impacts on both biodiversity and carbon emissions,[30] has long been considered an important measure of environmental impact.[31] This highlights the importance of understanding the impact of China's overseas investments on forest loss. Only Benyishay et al (2016)[32] have adopted a spatial approach to analyzing the deforestation impact of Chinese investments. Their analysis focused on identifying impacts in critical areas in Cambodia and Tanzania. Their findings show that the effects on deforestation are highly heterogeneous, depending on national political and local conservation context, highlighting the importance of understanding how variables that vary at regional and project-level—for example, the extent of political favoritism—may condition deforestation and other environmental impacts of the BRI.

The Environmental Costs of Political Favoritism

For capital-scarce developing countries, the BRI represents a much-needed source of finance. At the same time, the BRI is widely understood to serve political goals for both China and destination country leaders, which in turn affects project siting and the regulatory and oversight environment. A common refrain among observers states that BRI projects use political connections and corrupt business practices to sidestep efforts at regulation and conservation.[33] Accordingly, such politically-motivated projects, benefiting from the support of destination-country politicians, might be more likely to cause environmental harm.

Leaders in office often reap more immediate political gain and popular support from generating economic growth, boosting employment, and building infrastructure, as compared to pursuing environmentally sustainable choices. Amid opportunities to secure rents from China's (often corrupt) investments,[34] as well as efforts to secure development and investment in order to increase reelection and garner political capital, national leaders often work to influence the timing, location, scope, and other dimensions of China's overseas investments.[35]

The siting of investment projects (and their environmental implications) generally involve complex political interactions between communities in affected areas; politicians at the local, regional, and national levels; regulatory bodies and bureaucracies; firms; as well as domestic and sometimes international non-governmental organizations. National-level politics play a major role in shaping the environmental impacts of investment projects. A large body of literature has documented the potential for regulatory capture when powerful corporations and multinationals invest in developing countries.[36] This casts a shadow over political decisions on where to site projects and the degree of environmental compliance required from these corporations. The environmental externalities of such foreign direct investment, such as water and air pollution, are often concentrated in marginalized and poor constituencies, which have little political voice or financial clout to sway politicians' decision-making.

In the specific context of the BRI, host country leaders play important roles in the life-cycle of prospective projects.[37] In the bargaining and back-and-forth entailed in BRI project siting and planning, national leaders can

propose project locations and type, as well as influence proposed projects' final locations and project implementation details. These threefold layers of influence highlight the distinct and crucial levers political leaders play in project planning and siting.

Furthermore, the location and distribution of investment projects tend to be influenced by political motivations. Research has shown that across different regimes, national leaders' home regions tend to benefit disproportionately from investment and transfers.[38] In the specific context of China's aid, African leaders' homeland regions are more likely to receive financing inflows than other regions within the same country, controlling for a range of variables.[39] Leaders are more likely to direct economic benefits to their home regions in order to reward supporters and maintain popularity, or simply build projects for prestige reasons. National leaders often have established patronage networks or ethnocultural ties to their home regions, while politicians and firms from these regions are likely to have more established access routes to lobby the national leader and her inner circle. The effects of leaders' home regions is not deterministic—in many countries and for many leaders, the home-region bias may not exist in many cases, but on average existing research provides support for the contention that home regions are more likely to benefit when leaders from those areas are in office.

There is thus strong evidence that political favoritism plays an important role in the geographical allocation and siting of projects, and that investments in leaders' home regions tend to be driven more by political reasons. This then suggests that such politically-motivated investments may have even greater environmental costs relative to other investments in the same country.

There are two theoretical pathways through which political favoritism may exacerbate the environmental outcomes of BRI projects. These two pathways can be defined as subversions of de jure and de facto environmental protections, respectively. In the de jure case, the formalized, legal structures that are established to protect the environment—for example, regulations, law enforcement, or ministerial oversight—are circumvented by nationally-powerful politicians who prioritize the completion of projects for economic, prestige, or patronage-based reasons. In such cases, we would expect uneven implementation of de jure regulations within countries and over time, depending on whether regions are politically favored by politicians. In the second, de facto

case, local opposition from citizens, civil society, and in some cases, local politicians, constitutes the primary barriers to adverse environmental impacts. In such cases, de facto environmental protection from these stakeholders is more critical than regulatory and legal context, for example due to weak or underdeveloped rule of law. In this context, a powerful national leader uses her power to push past these sources of subnational opposition in order to have a project completed. Reflecting diverse local and regional stakeholders, this may be because the economic benefits and environmental costs accrue differentially. The de jure and the de facto cases are ideal types and neither mechanism excludes the other. It is entirely possible that powerful politicians can use their power to circumvent both legal/regulatory constraints and to steamroll local opposition.

Might projects that are politically favored and sited in favored regions actually be associated with *fewer* adverse environmental impacts? If national political leaders or their local allies are environmentally minded, focused on conservation, or draw economic benefits from environmental protection, then projects in favored regions might benefit from greater focus on environmental protection in project implementation. While such situations are probably relatively rare, our approach allows us to assess whether BRI projects in politically-favored regions are more or less likely to cause adverse environmental impacts.

Data Sources: Chinese Investments, Forest Loss, and Political Favoritism

We measured the environmental impacts of China's overseas investments using AidData's Geocoded Global Chinese Official Finance Dataset.[40] The dataset contains geocoded data on China's global overseas finance from 2000-2014, including 3,485 projects with total commitments in excess of $273 billion USD. A key advantage of the geocoded dataset is the existence of verified coordinate data for a large subset of projects (we discuss geographical precision in project location in our methodology section below.)

This data also included a wide spectrum of projects, spanning investments in linear infrastructure to loans to national governments. Because

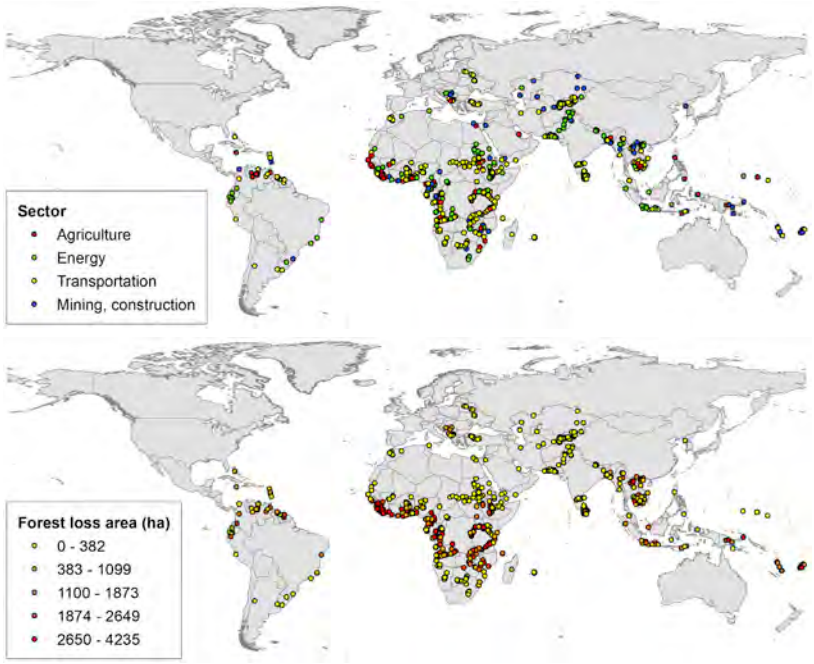
we are interested in the environmental impact of these investments, we restricted the focus of our analysis to those investment types that can be precisely allocated spatially. For instance, a loan to a national government ministry that is fungible and could be plausibly dispersed anywhere globally would not be included in our analysis, nor would capital allocated to training programs or other non-physical infrastructure programs.

In our analyses, we only includes projects which have been coded with high geospatial precision (codes 1 or 2), since we are focused on providing spatially explicit analyses of impacts on forest cover. Following the approach of Yang et al,[41] we restrict our analyses to four types of investments: 1.) transport and storage; 2.) energy generation and supply; 3.) agriculture, forestry, and fishing; and 4.) industry, mining, and construction. After these restrictions for geographic precision and sectoral relevance, we were left with 764 unique project locations. Figure 2 shows the location, sectoral composition, and total forest loss associated with each of these types of projects. The top map shows each project location and is separately colored for each of the four sectors. The bottom map shows the total forest loss (in ha) within a 15km buffer around each project location, with darker colors shading more severe forest losses.

We used forest loss to measure the environmental impacts of BRI projects. Analyzing the impact on forest cover confers theoretical and empirical advantages. From a theoretical perspective, while environmental impacts may take many forms, forest cover represents a particularly important measure of the tradeoffs between physical infrastructure and investments that can facilitate growth, on one hand, and the conservation of natural resources, on the other. Furthermore, forest loss represents a concern to the broadest array of physical, capital-intensive projects China may be involved in, while other important measures, such as air pollution, might only be plausibly associated with certain types of projects, such as power plants or manufacturing facilities.

Empirically, forest cover allows for much more precise spatial and temporal measurement than most other environmental measures. It does not rely on national administrative data, which might be adversely impacted by political considerations,[42] and which is particularly challenging to use for large, multinational studies. Additionally, advances in remote sensing over the past decade allow for satellite measurement of forest loss at high resolution across the entire globe, providing consistent and accurate measures of

FIGURE 2: Project locations. Top map shows project locations colored by each of the four broad sectors included in our analyses. Bottom map shows total project-location losses (in ha) within a 15km buffer around project location, with darker colors shading larger losses.



the forest cover change in the areas surrounding all of the Chinese overseas projects in our data.

We specifically adapted measures of forest cover change following the approach of Hansen (2013).[43] The updated version of the Global Forest Change Data[44] provides baseline forest cover measures (year 2000) and annual measures of forest cover/loss. Figure 3 helps to visualize these patterns of forest loss over time. Each row shows before (left column) and after (right column) for one project location from our data.

Our third main data source allows us to measure political favoritism, using national leaders' home regions as a proxy. To do so, we used the geolocated nature of our China administrative data to code whether Chinese-

FIGURE 3: Aerial images of forest cover before and after project implementation. Each row shows before (left column) and after (right column) images areas for three distinct projects from our data.

financed projects fall within the home regions of current political leaders. To measure the location of leaders' homelands, we draw on a new global database, the Political Leaders' Affiliation Database (PLAD),[45] of national political leaders' home regions for 177 countries spanning the period 1989–2018 Dreheretal2020. We use this data to code all subnational regions during our study period as either affiliated or unaffiliated. Only projects initiated in the leader's home region during the period in which that leader is in office are considered affiliated (politically favored) projects, and all others are considered unaffiliated (not politically favored). Using this straightforward approach and geomatched data on forest cover change, we analyzed the effect of Chinese investments, comparing projects in affiliated and unaffiliated regions to measure the effects of political favoritism.

Analyzing Political Favoritism and Deforestation Impacts

Because sites that receive Chinese-financed projects (any type of overseas investment) are very likely to be systematically different from other locations, we only compared sites that have already been the destination for Chinese projects with those that will be the destination for Chinese projects. This allows us to first provide the initial assessment of the effects of Chinese projects on forest cover—regardless of whether these projects are politically motivated.

The main goal of this first empirical assessment was to provide a baseline estimate of deforestation around all Chinese projects, so that we could estimate the differential deforestation be- tween politically connected and unconnected projects against an appropriate baseline. We make no claims about the relative size or significance of deforestation around Chinese projects generally, such as whether these sites would have been developed regardless of Chinese projects or whether other project developers would build projects leading to comparable rates of deforestation.

In our first approach, the treated population consists of an area around a flexible buffer in the years after a Chinese project has begun construction, and the control population consists of all areas around the same-sized flexible buffer in the years before the commencement of construction. Project locations with zero forest cover in the year 2000 are removed, since it is not possible for meaningful forest loss to occur in such situations. We adopted a

variable buffer, reporting de- forestation effects at sizes of 3, 6, 9, 12, and 15 km. In the second, primary stage of the analysis, we adopted a multi-period difference-in-differences approach to measuring the causal effects of political favoritism on deforestation.[46]

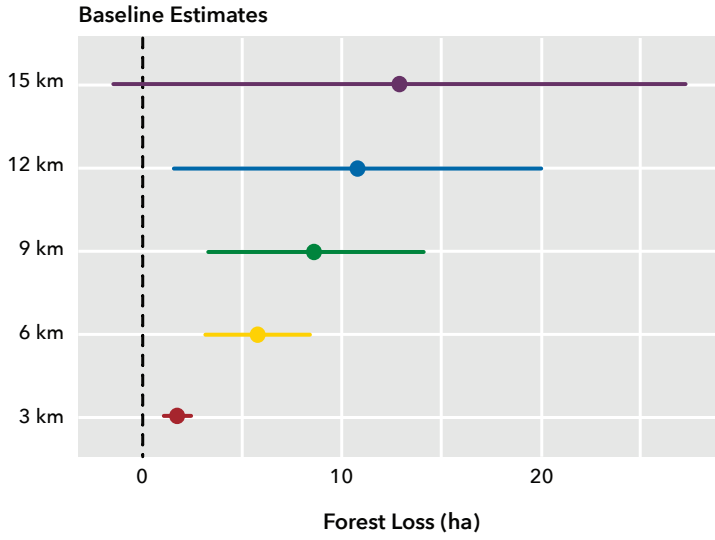
We first describe the effect of Chinese projects on deforestation to establish baseline rates for all projects, regardless of whether these projects are subject to political favoritism. The goal of this descriptive exercise is not to claim that Chinese-financed projects cause more deforestation than other overseas investors (our data do not allow us to make such claims) nor to make any normative statements about the developmental and ecological tradeoffs involved in these projects, and whether they are net positive or negative. Our data do not allow us to quantify these tradeoffs, and our goal is simply to quantify deforestation losses associated with Chinese development projects, providing a baseline for all future analyses focused on uncovering how different factors, such as political favoritism, that may exacerbate overseas investments' impacts on the environment.

Models summarized in Figure 4 provide estimates of the deforestation losses around Chinese development projects, estimated against the losses surrounding the same projects in the years immediately preceding construction. These models provide estimates across all available years before and after project construction. Taking the middle-sized buffer as an example, 9km buffer zones around Chinese projects see, on average, increases in the rate of forest loss of 8.6 hectares a year, which is approximately 16 percent larger than the yearly forest-loss rate in the 9km buffer around these projects in the years before the construction of Chinese projects.

Next, in the primary analysis, we examined the deforestation effects of political favoritism. Our difference-in-difference approach allowed us to compare Chinese projects that are politically connected to those that are not, focusing on the difference in the before and after deforestation rates between politically connected projects and unconnected projects.

As seen in Figure 5 with the exception of the smallest buffer zone of 3km, political favoritism substantially accelerates the deforestation rates of Chinese development projects when compared to unfavored Chinese projects. For example, for the 9KM buffer, politically favored Chinese projects see increases in deforestation of over 15.5 hectares each year, an acceleration of deforestation 181 percent greater than the baseline rate of post-project deforestation.

FIGURE 4: Estimates of the effect of Chinese development projects on deforestation losses. Models show point estimates and 95 percent confidence intervals for different geographic buffers around BRI projects. All models include year and project location fixed effects.



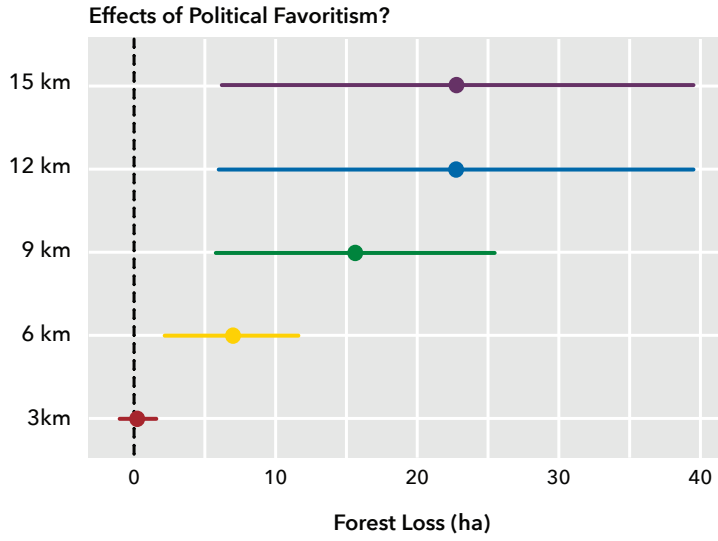
These effects are similarly large for 6, 12, and 15 KM buffer zones.

Political Favoritism and Deforestation: Temporal Dynamics

How long does it take for the gap in deforestation rates to appear between politically motivated projects and those that are not? To investigate the temporal dynamics of deforestation, we re- estimated the difference-in-differences specification summarized in Figure 5 above, but for each spatial buffer, we estimated the effects of political favoritism on deforestation from 1–10 years after project completion.

Figure 6 summarizes the results for each spatial buffer. While different for each buffer, the models show that deforestation impacts become larger (and

FIGURE 5: Difference-in-difference estimates of the effect of political favoritism on deforestation losses. Models show point estimates and 95 percent confidence intervals for different geographic buffers around BRI projects. All models include year and project location fixed effects.

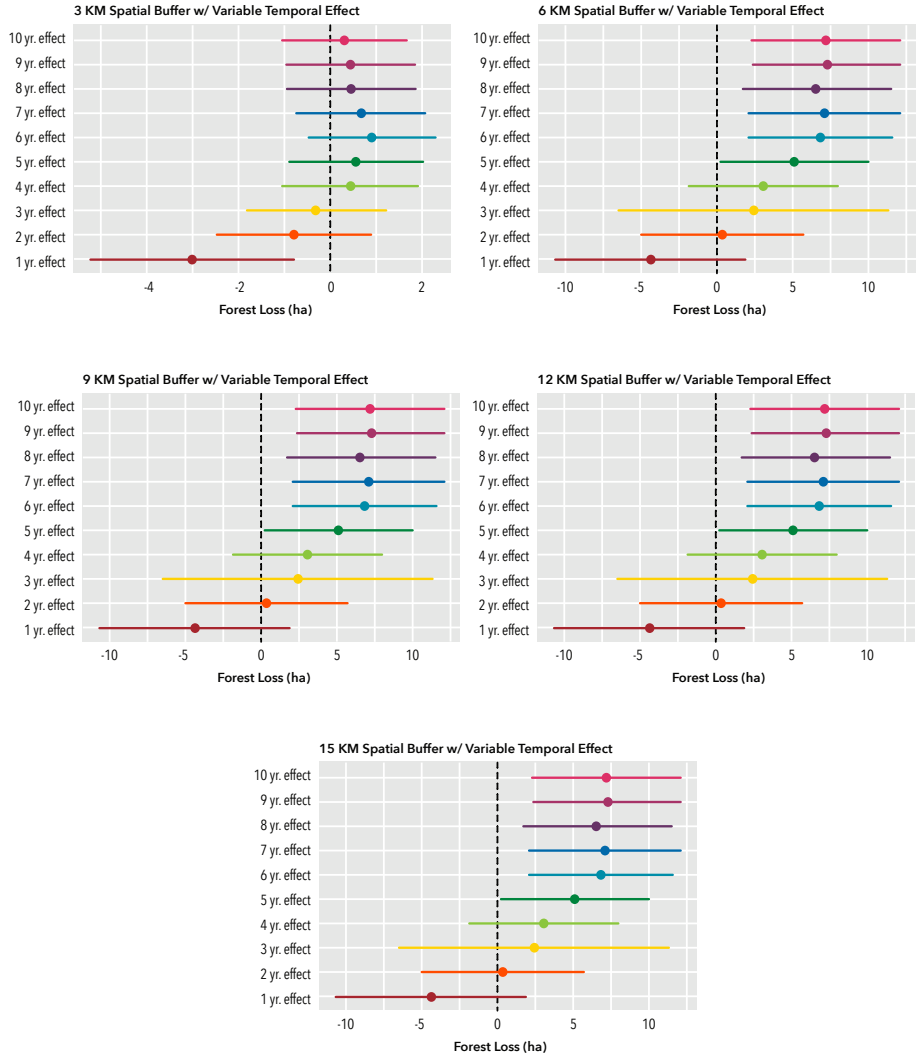


more precisely estimated) several years after projects begin. This accords with the fact that for most projects, construction will not be completed for several years following. These effects stabilize approximately 5 years after project effective dates for most buffer sizes.

While this approach sheds light on when deforestation exacerbated by political favoritism is most likely to occur during a project's lifespan, it does not distinguish between the direct effects of project construction and the indirect impacts of the project. As such, it is important to understand the treatment effect of political favoritism as a bundled effect. Distinguishing political favoritism's direct and indirect environmental effects calls for more project-specific case studies.

Our findings show that political favoritism in project allocation—which is both a demand and supply side factor—substantially accelerates deforestation.

FIGURE 6: Difference-in-difference analyses of the effect of project favoritism with variable temporal lags. From top right, estimates at 3, 6, 9, 12, and 15 km spatial buffers of post-project effect of favoritism in years 1–10 post-project.



This suggest the importance of continued efforts to foster transparency and regulatory oversight in BRI projects. From the perspective of future research, our findings point to the complementary potential of case study approaches and multi-site, spatially-explicit analyses. Continuing to probe and analyze the dynamics of the relationship between host country domestic politics and China's overseas finance will be crucial to better understanding and managing the BRI's global environmental impacts.

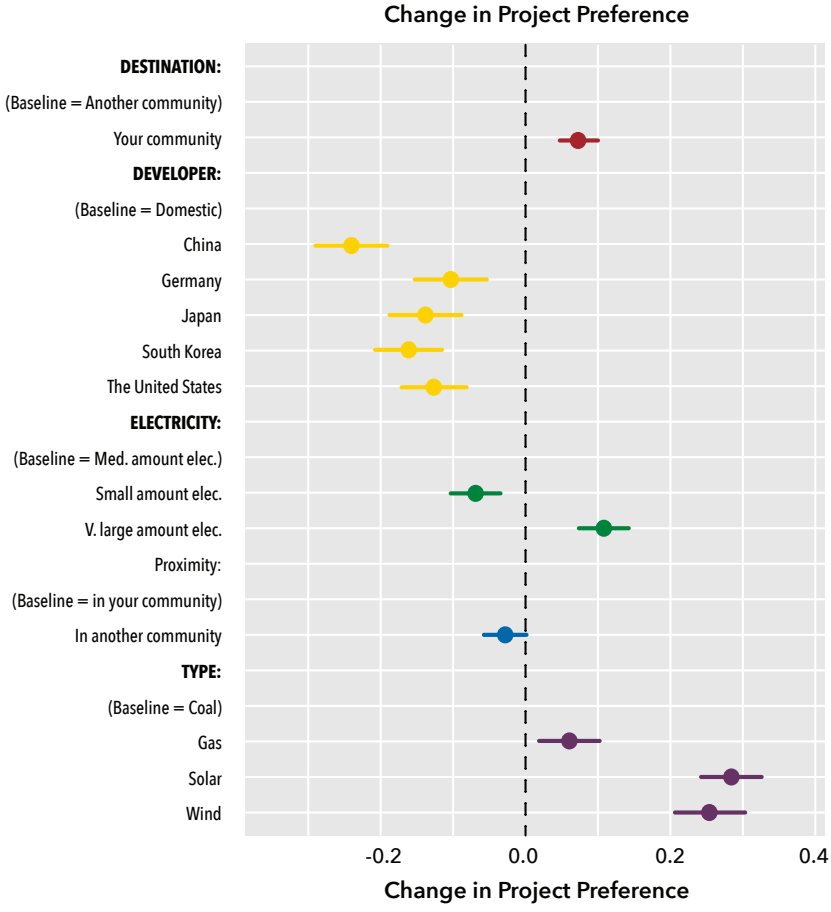
A Turning Tide?

Finally, I describe some preliminary findings on the public opinion dimension of overseas energy investments. In an ongoing project, together with Dr. Jennifer Hadden of the University of Maryland, we are using multi-country survey experiments to evaluate how the public thinks about energy infrastructure in the developing world—including how they think about China and China's role in building and financing this energy infrastructure. This work is part of a promising push to understand the public opinion foundations of China's reception around the world.[47]

While this multi-country survey is still in the field, two findings of particular importance stand- out from our pilot data, which are summarized in Figure 7. First, it is evident that across countries involved in the study—India, Turkey, and South Africa—there is a widespread preference for energy infrastructure projects powered by renewable fuels (solar and wind) and, to some extent, by fossil gas, together with a strong aversion to coal-fired power. This is consistent with increasing awareness of climate changes across the developing world, dissatisfaction with air pollution, and a generally increasing consciousness of environmental issues.

Second, respondents are much less likely to prefer energy infrastructure projects built by Chinese developers. This holds across project types and is a more important predictor of project preferences than a number of other variables including the amount of electricity and the number of jobs generated. This suggests that China increasingly faces public opinion headwinds. These headwinds could be problematic if they keep China from developing much needed infrastructure projects, but may also provide needed pressure to help increase accountability and high environ- mental standards in projects,

FIGURE 7: Project attributes effects on respondents' preferences. Plots show AMCEs from forced-choice conjoints of energy infrastructure projects.



maximizing their economic impact and turning them into a force for good, sustainable development.

Discussion and Policy Implications

The research findings presented here suggest a few important directions for analysis of and policy responses to the BRI. Black-and-white characterizations of the BRI are harmful because they force host country governments into a false dichotomy: protect the environment and the climate, or develop and grow. Such a dichotomy is inconsistent with the reality and the imperatives of sustainable development, and serves neither of the (inseparable) goals. The different empirical findings discussed above also point to some specific policy implications.

First, reasons of overcapacity do not seem to be the dominant driver of China's overseas investments in coal-fired power. This echoes research highlighting how Beijing is not a unitary actor in foreign policy.[48] For those engaged in environmental advocacy, a focus on blaming Beijing for pushing the construction of coal-fired power overseas may not be productive. There are more varied reasons why coal-fired projects get built, and broad claims about overcapacity miss the mark. Instead, a more nuanced policy advocacy and mobilization effort—from the U.S. government and the international environmental community writ large—should focus on understanding the specific country contexts of individual projects, including the companies and actors involved. Pin- pointing the potentially varied local drivers of coal-fired projects built by Chinese companies in recipient countries would better inform strategies to decrease local support for environmentally-harmful projects and improve the provision of realistic, sustainable, and carbon-conscious alternatives.

Second, what are the policy implications of deforestation being linked more to political patronage? First, it is clear that activists, CSOs, and other environmental advocacy actors must broaden their critique from China's BRI to recipient countries. The allocation and siting of infrastructure projects may be driven more often by the parochial interests of political elites in these recipient countries who are seeking to extract rents or benefit their cronies, rather than Beijing's explicit preferences. At the same time, such critiques must recognize

the reality of development imperatives and the need for recipient country governments to build and deliver high-quality infrastructure. Such political and developmental imperatives means that these organizations' critiques and advocacy must be couched not in language universally opposed to the BRI, but instead in language that recognizes the importance—and even the political necessity—of BRI projects, while also building on findings about political favoritism to push for increases in transparency, regulation, and enforcement to ensure that de jure regulation is strengthened and that the de facto realities of policy implementation hew to these standards. This can help to reduce problems of elite capture and political patronage that exacerbate environmentally-destructive activities. By investing in standards and capacity, the U.S. government and the international community can encourage environmentally-sustainable policymaking in BRI countries without forgoing the positive developmental effects of these infrastructure projects.

Third, our findings on the public opinion backlash to Chinese energy infrastructure projects, while preliminary, point to potentially serious implications for Beijing. Negative perceptions of the BRI are likely to hamstring Beijing's ability to use such initiative for geopolitical influence. In fact, many countries have become more concerned over the environmental impacts of Chinese-financed projects, and the corresponding political fallout for leaders who support such projects. This is likely reflective of the wider implications of negative public opinion for China. It also suggests that much of the angst pervading Washington about the success of the BRI in wooing destination countries may in fact be overblown.[49] Additionally, U.S. policymakers and environmental activists could work more closely with local civil society organizations and local governments in recipient countries to amplify grassroots-level sentiments and ensure that these voices are heard as part of the project planning and implementation processes in recipient countries.

Broadly, U.S. government agencies such as USAID, the State Department, the EPA, the Department of Energy, and other relevant bureaucracies should redouble efforts to build cooperative links to BRI recipient countries. These links should focus on building host country institutional infrastructure and bureaucratic capacity and to promote stakeholder engagement in BRI projects. Creative efforts by the United States to capitalize on internal strengths—technical capacity and regulatory policy—can help inform how local communities

as well as subnational and national governments work with Chinese firms—by rejecting unsustainable projects, pushing for more consideration of sustainability and climate change during project planning, and ensuring that environ- mental rules and procedures as well as strengthened enforcement are front-and-center in policies on the Belt and Road Initiative.

The views expressed are the author's alone, and do not represent the views of the U.S. Government or the Wilson Center.

Notes

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