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Building a Net-Zero World: How U.S. Finance Can Strengthen Clean Energy Manufacturing Abroad

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Introduction

The world needs to rapidly expand and diversify clean energy supply chains to achieve net-zero carbon dioxide emissions by 2050 and mitigate dangerous climate impacts. While some sectors, such as solar photovoltaic manufacturing, are on track to hit their 2030 targets, there are major shortfalls in the production of many other clean energy products.

Take, for instance, electrolyzers, which use electricity to split water into oxygen and hydrogen, the latter of which is a vital energy carrier for a low-carbon economy. If all announced electrolyzer projects came to fruition, global production would reach about 60 percent of the level needed by 2030 to achieve the International Energy Agency's Net Zero Emissions by 2050 Scenario. But for wind turbines and heat pumps, current and announced production would reach only 30 percent and 40 percent, respectively, of the levels needed by 2030. And if only formally committed projects are considered—those already under construction or where the final investment decision has been made—the shortfalls are larger, even for rapidly growing areas like battery manufacturing. It can take years to get a battery or heat-pump plant up and running, and 2030 is only seven years away.

The United States has a particular interest in promoting clean energy manufacturing (and mineral processing) in partner countries around the world. Washington's overriding interest is to promote domestic manufacturing, and it is doing so: since the signing of the CHIPS and Science Act and Inflation Reduction Act (IRA) in August 2022, companies have announced clean energy and semiconductor manufacturing investments worth over $200 billion. There is a battery boom underway in the United States, and that is cause for celebration.

But even to achieve its own domestic goals, the United States will need other countries to increase their clean energy production capacity. Washington cannot do it alone. Friendshoring must include the active construction of clean energy supply chains abroad. As U.S. National Security Advisor Jake Sullivan argued in an April 2023 speech, humans need so much clean tech investment that there is room for all countries to pursue their own robust industrial policies. European countries and Australia, Canada, Japan, and South Korea, among others, have the capacity and fiscal space to join in. However, developing countries, many of which are struggling to stay on top of their debts, cannot provide subsidies and tax credits like those in the IRA. They will need financial support.

If Washington is to make good on its promises of bringing more clean energy manufacturing to the United States and friendly countries—while ensuring that rich-countries' industrial policies leave space in clean energy supply chains for countries from the Global South—it should use foreign policy tools, especially the deployment of public U.S. development finance, to help achieve its domestic industrial objectives. We call this "foreign green industrial policy." And it is a necessary component of the G7's Partnership for Global Infrastructure and Investment and the White House's International Climate Finance Plan from 2021, which aimed to make climate action a key piece of U.S. overseas finance. Such efforts, we argue, must be based on a strategic approach to building net-zero supply chains and creating manufacturing value-added abroad.

This paper analyzes U.S. development finance and assesses U.S. foreign green industrial policy. It looks at disbursements by key U.S. institutions that practice foreign green industrial policy and then divides this financing into projects that drive clean energy deployment or build net-zero supply chains. Our goal in this paper is to assess existing and potential contributions to building out clean energy supply chains overseas.

Strategic Context

The Developing World and the Political Economy of the Energy Transition

Early deals to build clean energy supply chains in the Global South have focused on critical minerals extraction: for example, the European Union is working on a deal to provide electric buses to Latin American nations in exchange for better access to lithium deposits for European firms. The history of colonial "development" casts a shadow over these deals. Under colonial rule, the peoples and lands of the Global South served as sources of raw materials and commodities that fueled the growth of the colonial powers. (An example is a colonial power buying cotton from a colony and reselling it as textiles.) To prevent reproducing this dynamic, rich economies have to actively support the creation of processing and manufacturing value-added in emerging and developing economies today.

Developing countries are not eager to merely become exporters of raw minerals like lithium or cobalt, nor to rush into a future where nearly all clean energy goods are produced in China, Europe, or the United States. As Zambia's President Hakainde Hichilema put it at a 2023 finance summit in Paris, adding value to clean energy supply chains in developing and emerging economies will benefit both the Global North and the Global South.

Indonesia's strategy has great appeal in this context: it is leveraging its world-leading nickel reserves into processing and manufacturing power. A key component of this effort is its ban on the export of raw nickel ore to drive investment in nickel processing in Indonesia. A number of countries are now following suit. Namibia and Zimbabwe have banned exports of raw lithium; Chile is aiming to take equity stakes in its lithium mines; and the head of the Democratic Republic of the Congo's state-owned mining company Gécamines has called for export quotas on the country's cobalt. This is evidence that, from the perspective of an individual country, measures to keep jobs and higher-value mineral processing at home are worth the risk of reducing the global supply of clean energy inputs in the short run.

Therefore, investing in clean energy manufacturing supply chains in developing countries will make the politics of global decarbonization easier. As political scientists have argued, building green industry creates the political coalitions necessary to support ambitious climate policy. In the United States, the political economy of the domestic energy transition requires that U.S. clean energy manufacturing and jobs be spread around the country—so the IRA directs most of its manufacturing subsidies to Republican-led states with an affinity for fossil fuels. Similarly, it is important for the political economy of the global energy transition that materials processing and battery production take place all around the world. For countries that currently rely on revenues from fossil fuels, it is hard enough to take steps that may shift revenue from the domestic actors extracting and refining oil to those extracting and refining lithium, let alone from domestic oil firms to foreign battery firms.

Competition with China

Another key motivation for the United States to promote clean energy manufacturing abroad is China's dominance of clean energy supply chains. China's share of solar panel manufacturing exceeds 80 percent, and in 2022 the country hosted 75 percent of all lithium-ion battery cell manufacturing capacity. For reasons of resilience, the United States and its partners need alternatives to using Chinese goods to build their low-emission economies. Beijing is proving willing to weaponize its leading position in rare earths, solar panels, and graphite—in part in response to Washington's moves to restrict exports of advanced semiconductors to China. On the U.S. side, the IRA excludes from subsidies any batteries produced with minerals from a "foreign entity of concern," such as a company with ties to the Chinese government. Not to be neglected is the ethical imperative to support alternatives to polysilicon produced in China by the forced labor of Uyghurs and other Muslim minorities.

In terms of total global infrastructure financing, China is in a league of its own, having invested over $1 trillion since it announced the Belt and Road Initiative in 2013. The impact of Beijing's global infrastructure financing on the global climate is, however, decidedly mixed. Significant Chinese investments in purported global industrial policy have been made in the global clean energy productive base, either to acquire critical minerals for its clean energy manufacturing or to circumvent U.S. sanctions on the export of finished clean energy goods. China also continues to invest heavily in foreign fossil fuel extraction to meet the energy needs of its economy and industry. Although Chinese President Xi Jinping pledged to halt the financing of foreign coal plants in 2021, and China has cut significant coal projects from its pipeline, it still has many on its books.

While Chinese foreign investment is frequently characterized by strategic directives from the Chinese Community Party for state-owned enterprises or private Chinese companies to pursue specific policy goals, this should not be taken to mean that Belt and Road global infrastructure financing is laser-focused and cohesive. The financing is better described as supporting a multitude of projects under the banner of Belt and Road, influenced by multiple domestic and foreign objectives that are increasingly in competition. The government has taken note of the current lack of direction in its lending—as many loans are nonperforming and need restructuring—and is increasingly championing more targeted, "small and beautiful" projects for financing. What this means is that a targeted U.S. approach to overseas finance could compete without matching Chinese finance dollar-for-yuan.

U.S. Clean Energy Investment

The Three Key U.S. Institutions Making Foreign Industrial Policy

The good news is that the United States already has a set of institutions and tools to build clean energy supply chains and drive the transition abroad. The main U.S. institutions that have begun to practice foreign industrial policy are the U.S. International Development Finance Corporation (DFC), the Millennium Challenge Corporation (MCC), and the Export-Import Bank of the United States (EXIM). Clean energy is a relatively new focus for these institutions. (The Department of Defense also desires to use military funds to finance facilities in Australia and the United Kingdom that process critical minerals, though it is awaiting congressional approval for those plans.)

DFC is focused on financing private sector investments that help meet development objectives, including energy access, healthcare, digital access, and climate change adaptation and mitigation. DFC financing includes loans, loan guarantees, direct equity investments, and political risk insurance. An example of DFC support for clean energy manufacturing is a $500 million loan to the firm First Solar to build and operate a new solar panel manufacturing facility in Tamil Nadu, India. But it has typically focused not on manufacturing but on

the deployment of clean energy abroad: in 2022 it made a $25 million direct investment in a solar power plant in the Dedza district of Malawi operated by Golomoti Solar and a $50 million investment in a green note purchase by Virtuo Finance for on-lending to six solar plants in Benban, Egypt.

MCC aims to finance goods and services that are identified as key constraints to economic growth. MCC operates through the provision of grants to target countries, though with the expectation that partner countries also contribute funding as well. One of the largest clean-energy-related MCC investments is the Benin Power Compact, for which MCC has granted $391 million with the aim of tripling Benin's power grid capacity.

EXIM focuses on supporting U.S. manufacturing and helping to finance deals for U.S. products (and occasionally services) abroad. It is meant to support U.S. exports, either when the private sector is unwilling or unable to do so or when U.S. exports must compete against foreign exports backed by other countries' export credit agencies. EXIM uses four main strategies: it makes direct loans to foreign buyers of U.S. exports, guarantees lenders against foreign buyers of U.S. exports defaulting on their loans, guarantees short-term loans to U.S. exporters, and provides insurance to protect U.S. exporters or lenders against export-related risks.

In 2022, EXIM's self-awarded Renewable Energy Deal of the Year was a $52.4 million loan guarantee to build a 53-megawatt solar power project in Olanchito, Honduras. The project involves J.P. Morgan providing financing to the Honduran bank Banco Atlántida for the procurement of U.S.-made solar panels from First Solar.

Not Enough U.S. Development Finance Investment in Clean Energy

This paper aims to answer two questions about U.S. finance.

1. What proportion of all existing finance is going to fund clean energy?

2. What proportion of clean energy finance is spent on deployment (such as installing solar panels), rather than building clean energy supply chains (such as mining and biomass production, processing, and manufacturing value-added)?

For 2018–2022, we coded each project in the three institutions along these two dimensions (see appendix A for the full methodology).

According to our analysis (see table 1), DFC financing for clean energy amounted to $2.21 billion of the $24.48 billion in total disbursements from 2018 to 2022. Thus, clean energy financing constituted 9.1 percent of DFC financing in this period, which compares unfavorably to financing for other energy (mostly fossil fuels), which totaled $3.55 billion in this period, or 14.5 percent of DFC financing.

MCC provided $159 million of financing for clean energy in this period. That represents 6.7 percent of the total financing of $2.36 billion. Fossil fuel financing amounted to $486 million, or 20.6 percent of total financing.

EXIM provided $241.3 million of financing for clean energy in this period, or 1.22 percent of total financing of $19.72 billion. Other energy investments amounted to $901.7 million, or 4.57 percent of the total.

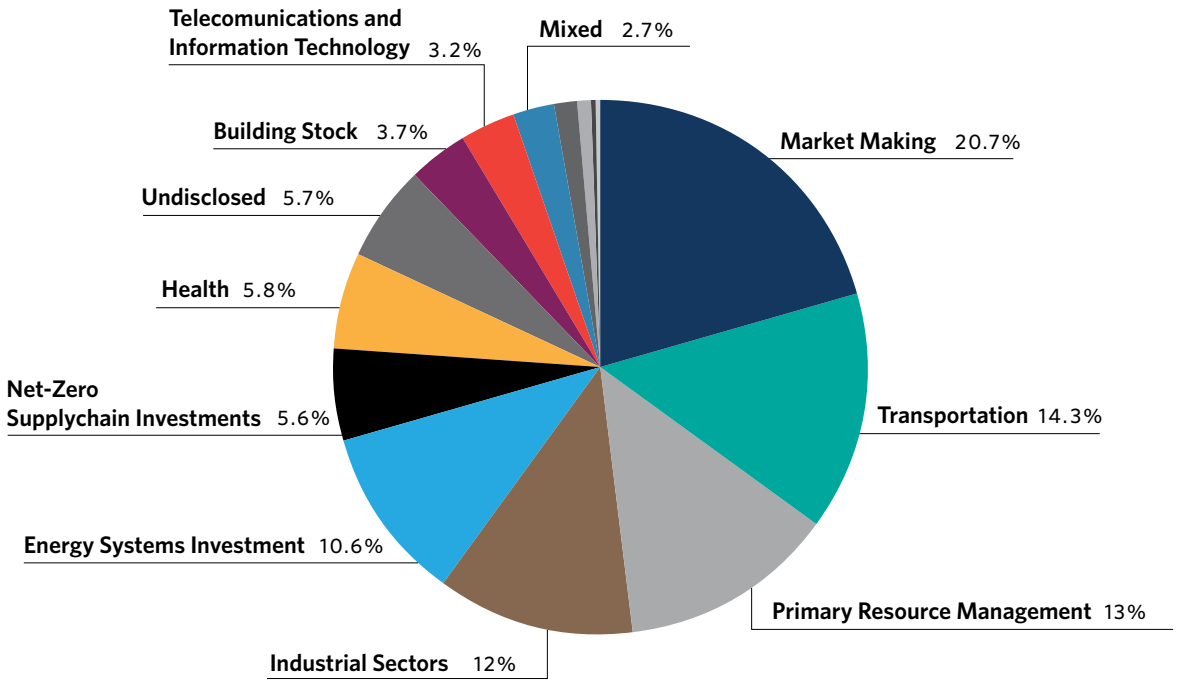
Table 1. Program Financing Breakdown by Sector, 2018–2022

Sector	DFC ($ millions)	% of program funds	EXIM ($ millions)	% of program funds	MCC ($ millions)	% of program funds	Total ($ millions)	% of total funds from all three programs
Market making	9,481	39%	24	0%	137	6%	9,642	21%
Transportation	706	3%	4,966	25%	1,001	42%	6,672	14%
Primary resource management	2,640	11%	3,246	16%	144	6%	6,030	13%
Industrial sectors	0	0%	5,596	28%	0	0%	5,596	12%
Energy systems investment	3,555	15%	901.7	4.57%	486	20.50%	4,943	11%
Net-zero supply chain investments	2,219	9%	241.3	1.22%	159.3	6.73%	2,619	6%
Health	2,168	9%	469	2%	75	3%	2,713	6%
Undisclosed	317	1%	2,349	12%	0	0%	2,666	6%
Building stock	885	4%	839	4%	0	0%	1,724	4%
Telecommunications and information technology	684	3%	804	4%	0	0%	1,489	3%
Mixed	1,234	5%	0	0%	0	0%	1,234	3%
Water	176	1%	58	0%	308	13%	542	1%
Education	330	1%	0	0%	40	2%	370	1%
Waste management	86	0%	141	1%	0	0%	227	0%
Good governance	1	0%	12	0%	16	1%	29	0%
Total	24,482	100%	19,727	100%	2,367	100%	46,575.2	100%

Source: See appendix A.

Note: Some sectoral funding was low enough so as to not make up 1 percent of a program's funding or total funding by all three programs. All percentage figures were rounded up to the nearest 1 percent.

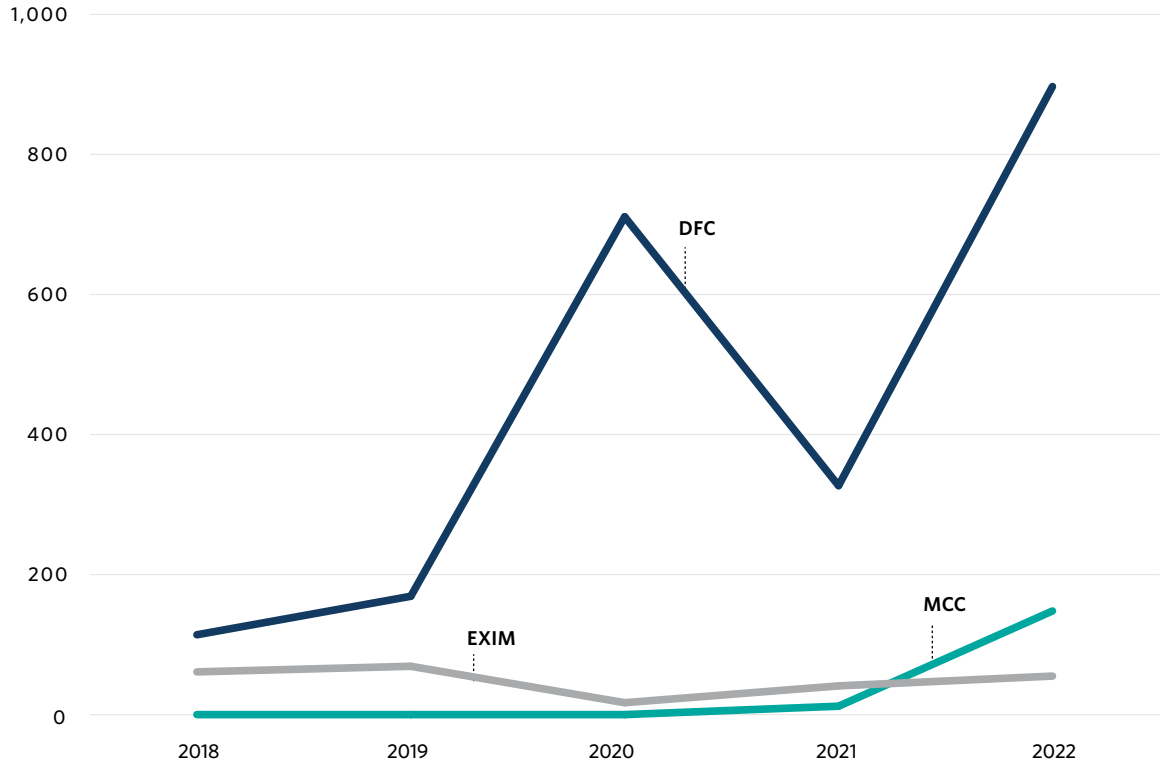
Figure 1. Program Financing by Sector for DFC, EXIM, and MCC, 2018–2022



Source: See appendix.

In view of U.S. President Joe Biden's 2021 executive order that directed his cabinet to work with EXIM and DFC to "promote ending international financing of carbon-intensive fossil fuel-based energy," it reflects poorly on U.S. climate policy that these institutions continue to support fossil fuel projects (see figure 1), such as the nearly $100 million in financing EXIM provided in May 2023 for upgrades to an Indonesian oil refinery. However, our objective here is not to lambast U.S. government institutions for deploying some public funds to finance fossil fuel energy projects. Indeed, the White House's 2021 climate finance plan may be starting to take effect: clean energy investments ticked up in 2022.

Figure 2. Total Clean Energy Investments ($ Millions)



Source: See appendix.

However, while DFC clean energy financing is up in real dollars, growth as a percentage of total investment is effectively quite low: it stood at 4.9 percent of total investment in 2018 and increased to only 9.66 percent in 2022. So, the real increase reflects a growth in the organization's funding more than a prioritization of clean energy investments. It is also worth noting that many of these transactions take multiple years to develop, so there is a lag in projects' abilities to reflect current U.S. policy priorities. And there are relatively few projects, so one large project can make a significant difference in overall financing.

Is U.S. Clean Energy Investment Building Global Supply Chains?

For the purposes of our analysis, the key issue is whether this clean energy investment is actually building global supply chains. What percentage of clean energy investment is in feedstock production, processing, and manufacturing?

We looked for investments across supply chains for renewables, fuels, and batteries. We coded the upstream production of biomass or mineral feedstock, the midstream chemical processing, and the downstream technology manufacturing as investments in clean energy supply chains (see table 2).

Table 2. Ratio of Investments in Clean Energy Supply Chains to Deployment of Technologies, 2018–2022

Program	Deployment ($ millions)	Proportion of clean energy finance	Building supply chains ($ millions)	Proportion of clean energy finance	Total ($ millions)
DFC	1,664	75%	555	25%	2,219
EXIM	233	97%	8	3%	241
MCC	159	100%	0	0%	159
Total	2,056	78%	563	22%	2,619

Source: See appendix A.

Table 2 shows that only 22 percent of the clean energy financing from these institutions supports manufacturing as opposed to deployment.

Investments in clean energy deployment are important, especially in countries suffering from energy poverty. They help economies decarbonize in the short run, and they can also promote clean energy manufacturing to the extent that they increase demand for clean energy products. However, investments in clean energy processing and manufacturing provide a different set of benefits, directly and effectively increasing the global supply of goods, such as solar panels, heat pumps, and refined nickel, and raising the political and technological capacity of all countries to achieve deep decarbonization in the long run.

Therefore, it is unfortunate that such a small share of U.S. foreign industrial policy supports the mines, processing facilities, and factories at the core of clean energy supply chains.

A model project for investment in clean energy supply chains is DFC's $30 million equity investment, approved in September 2022, in the critical minerals firm TechMet Limited. That investment is supporting the development of a critical mineral mining facility in Piauí, Brazil, which will produce nickel and cobalt suitable for lithium-ion batteries. Funding from DFC—which is now TechMet's second-largest shareholder—has also facilitated a strategic partnership between TechMet and Lifezone Metals, a metals firm that has announced a framework agreement with the Tanzanian government to open a new facility to process nickel and other critical minerals mined in Tanzania and is targeting delivery of battery-grade nickel to the global market as soon as 2026.

DFC is also building overseas manufacturing capacity by supporting First Solar's integrated solar module facility in Tamil Nadu, India. DFC is providing debt financing worth $500 million. This will create 3.3 gigawatts of manufacturing capacity and support jobs and supply chain development in both India and the United States.

It is worth pointing out that these two kinds of investments provide a unique mix of benefits and capabilities. Equity is more expensive than debt. So equity investments, as DFC rules require, should only be used when they are enabling a project to happen and thereby unlocking value for the host country.

Implications and Analysis

Each of these programs could do far more to bolster clean energy supply chains overseas. They could make strategic investments that catalyze and direct private capital to support global decarbonization while providing economic benefits to partners abroad.

To effectively play this role, the group of organizations we examine need three things:

- **a strategy to build supply chains** indexed to demand that is generated by the United States and its friendshoring partners and that is unlikely to be met by their domestic production;

- **more financing capacity** to fulfill a strategic role, especially for MCC and DFC, which as the most capable of these vehicles will need more capacity in the medium term; and

- **more ability to fund projects** in upper-middle-income and high-income countries. With more financing and freedom, DFC could build overseas supply chains in an active way.

Additionally, DFC specifically should make a fourth change, to its equity scoring. Instead of writing off all equity investments as grants (and thus as losses) on DFC balance sheets, as is current practice, it should recognize that equity investments could return a profit as well as achieving other goals.

EXIM

EXIM's mandate and lending instruments are focused on bolstering U.S. domestic production. Nonetheless, the new China and Transformational Exports Program (CTEP) creates a powerful tool to build overseas manufacturing and processing capacity. Historically, EXIM had focused on creating U.S. jobs by supporting the purchases of U.S. goods and services by foreign buyers. Under the Biden administration, EXIM has been empowered to take a holistic supply chain approach that allows it to make the overseas investments necessary to support U.S. manufacturing at home.

CTEP identifies ten areas, including renewable energy, where strategic competition with China necessitates expanded support for U.S. exporters. Under CTEP, EXIM could fund an overseas mine that feeds into a U.S. processing or manufacturing facility, so long as it can show that the overseas investment is creating U.S. jobs (as well as meeting some other conditions). Furthermore, previous EXIM projects had to contain 85 percent U.S. content (meaning that 85 percent of the value of the export products that received EXIM support had to be made in the United States). But now the bank has more flexibility and can go down to 51 percent U.S. content—even lower under certain conditions—which will help EXIM compete with export credit agencies with even lower national content thresholds. This capacity complements EXIM's new Make More in America initiative, which can directly finance U.S. manufacturing facilities that are export oriented.

In short, EXIM can build overseas manufacturing capacity in clean energy supply chains in two central ways. First, it can support U.S. technology providers in establishing manufacturing centers in other countries. For example, the United States could help an innovative battery processing firm set up capacity overseas.

Second, it can help to fill out the overseas supply chain for U.S. manufacturers. This could mean funding a mine or a polysilicon processing facility abroad. A lot hinges on, first, how broadly or narrowly EXIM case officers interpret and implement these provisions and, second, how the EXIM board chooses to use its approval authority. A broader interpretation of EXIM's mission would allow the bank to contribute to the development of manufacturing and processing value-added in emerging economies while helping American firms scale.

MCC

MCC and other aid organizations have a real potential to support the industrial policy objectives of countries in the Global South by providing funding for basic goods that are the prerequisite for development, including the clean energy that could power factories or metal refineries. So far, however, none of its investments have sought to expand the clean energy manufacturing base.

Since MCC's mission is "to reduce global poverty through economic growth," it is understandable that the organization is focused on deploying clean energy in developing countries suffering from local pollution and energy poverty. But the organization's climate strategy includes the goal to "engage with partner country governments on their climate priorities," which in many cases would include helping developing countries domestically produce some of the clean energy products they will need in a net-zero world. With MCC's commitment in 2021 to devote more than half of its program funding to climate-related investments over the following five years, there should be opportunities to support clean energy manufacturing projects in developing countries.

DFC

DFC was created by the 2018 BUILD Act by combing two existing development finance tools. In the act, Congress gave DFC the authority to make equity investments and increased its loan authority to $60 billion. (In FY2022, however, the size of its total portfolio was just $35.7 billion.) The act mandated DFC to finance projects primarily in low-income countries and lower-middle-income countries, while nonetheless leaving the door open to investment that "furthers the national economic or foreign policy interest of the United States." It currently requires a waiver to make investments in upper-middle-income and high-income countries, but such waivers are not prohibitively difficult to acquire.

While DFC's clean energy investments have been focused on a mixture of deployment and manufacturing base investments, it is not constrained by a requirement to focus on building U.S. capacity, as EXIM is. Thanks to its versatility, DFC is well-positioned to lead U.S. foreign green industrial policy and finance the high value-added components of clean energy supply chains abroad.

DFC, however, needs more capacity to make equity investments. Due to a prevailing federal budget rule, DFC must treat its rare equity investments as a total loss. This is paradoxical, as equity investments have the potential to generate far greater returns than concessional loans. However, at the moment, those returns go to the Treasury Department and not DFC. Congress should address this problem in line with language proposed in the Enhancing American Competitiveness Act. That language also proposed to increase the maximum possible size of DFC's portfolio from $60 billion to $100 billion. However, these components of the bill did not make it into the CHIPS and Science Act that became law in August 2022.

Giving DFC more flexibility to make investments in upper-middle-income and high-income countries would also benefit U.S. objectives. Many of the mines and processing plants that are required to deliver on the IRA and bolster clean energy supply chains are likely to be located in these countries. However, this increased flexibility should be indexed to a clear strategy, so as not to water down DFC into a pure foreign policy bank.

Conclusion

The United States needs to build out overseas supply chains in order to deliver on the IRA and incorporate developing and emerging economies into the energy transition. To do that, significantly more overseas finance should be devoted to production, processing, and manufacturing value-added.

DFC must ramp up its activity if the United States is to compete with China's overseas finance and address global production base gaps preventing attainment of net-zero targets. Even though most of the finance for the energy transition will inevitably have to come from the private sector, public funds will play an important role in catalyzing and steering private investment.

To meet the gap in clean energy manufacturing capacity, diversify clean energy supply chains, and avoid overreliance on any one country, DFC and EXIM should be not only scaled up but also given more strategic directive on how to deploy investment. The United States needs an investment strategy to build overseas supply chains in a focused and coordinated fashion.

The first step in creating such a strategy would be to quantify expected demand for clean energy goods in the United States and allied countries. The next step would be to map out supply chains and identify bottlenecks. Our May 2023 article highlighted a number of target countries where U.S. engagement and financing could promote the processing of minerals and manufacturing of related clean energy products, including Brazil (which has large reserves of graphite), Indonesia (nickel and tin), Peru (silver), and Türkiye (graphite and chromium), though more work needs to be done in this area.

Investment directives should focus on both building out clean energy supply chain segments that are under targets and balancing manufacturing capacity where China dominates supply chains. The future direction of investment (outlined in table 3 in appendix A) involves more focus on production, processing, and manufacturing in areas such as solar panels, hydrogen, and grid infrastructure, in addition to the current focus on the battery and renewables supply chains.

Countries with emergent capacity and development needs can be identified as priority areas for investment. Writing such a strategy for foreign green industrial policy would send a clear signal to private capital that this is where investment is going, and it would signal to developing and emerging economies that they should be establishing industrial strategies in these priority areas.

The good news is that the United States has the opportunity to be more strategic and nimble in its investments than China, which is already trailing over $1 trillion in committed infrastructure loans, some of them nonperforming, and is now determining whether it should prioritize relations with or repayment from borrowers in the Global South. While the United States will need to provide more capital to institutions like DFC in order to practice effective foreign green industrial policy, the goal should not be to compete with China dollar for dollar. Rather, the United States should deploy smaller, more strategic state funding to address underinvestment or vulnerabilities in clean energy supply chains, quickly. In short, it should get some more firepower, use it wisely, and use it now.

Appendix A: Methodology

Data

Data included all development projects funded by MCC, all development-relevant deals funded by DFC, and all U.S. export deals backed by EXIM from 2018–2022.

In the case of EXIM, only funds that have been dispersed were counted, not the total funding per deal that has been approved/rejected or the undispersed exposure amount.

For MCC, funding was counted for the year of a project's signing, not averaged over the length of the project.

For DFC, only funds that were directly committed by DFC were counted, not those that were crowded in by other funding partners for a project. All program financing, including grants, loans, loan guarantees, equity investments, or insurance, was counted in the total amount of sectoral public financing.

Table 3. What Types of Supply Chain Investments Are Being Funded?

Subsector	DFC ($ (millions	of % program funds	EXIM ($ (millions	of % program funds	MCC ($ (millions	of % program funds	Total ($ (millions	of total % funds
Deployment								
Biofuel deployment	0	0%	0	0%	0	0%	0	0%
Biomass deployment	9	0%	0	0%	0	0%	9	0%
Batteries deployment	0	0%	4	2%	148	93%	152	6%
Critical minerals export	0	0%	29	12%	0	0%	29	1%
Energy efficiency deployment	280	13%	0	0%	0	0%	280	11%
Electric vehicle deployment	0	0%	3	1%	0	0%	3	0%
Grid infrastructure capacity building	0	0%	0	0%	12	7%	12	0%
Grid infrastructure deployment	0	0%	151	63%	0	0%	151	6%
Multiple (renewable energy, grid transmission, misc.)	100	5%	0	0%	0	0%	100	4%
Renewables (mixed sources)	103	5%	0	0%	0	0%	103	4%
Solar deployment	994	46%	43	18%	0	0%	1,037	40%
Wind deployment	160	7%	2	1%	0	0%	163	6%
Manufacturing								
Biomass manufacturing	10	0%	0	0%	0	0%	10	0%
Biofuel manufacturing	0	0%	0	0%	0	0%	0	0%
Batteries manufacturing	0	0%	0	0%	0	0%	0	0%
Critical minerals extraction and processing	55	3%	8	3%	0	0%	63	2%
Energy efficiency manufacturing	0	0%	0	0%	0	0%	0	0%
Electric vehicle manufacturing	0	0%	0	0%	0	0%	0	0%
Grid infrastructure manufacturing	0	0%	0	0%	0	0%	0	0%
Hydrogen production	1	0%	0	0%	0	0%	1	0%
Solar manufacturing	500	23%	0	0%	0	0%	500	19%
Wind manufacturing	0	0%	0	0%	0	0%	0	0%
Total	2,219		241		159		2,619	

Note: Some sectoral funding was low enough so as to not make up 1 percent of a program's funding or total funding by all three programs. All percentage figures were rounded up to the nearest 1 percent.

Coding Methodology

DFC- and MCC-financed projects were assessed individually to ascertain their sectoral focus according to the criteria below. In each case, public data provided details as to the intended outcomes of projects financed.

EXIM-financed deals were screened based on their North American Industry Classification System (NAICS) code, the standard used by federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. Where further granularity was required to determine sectoral fit, such as in eighteen NAICS codes of potential significance to net-zero supply chains, the business activities of the producing firm were reviewed. EXIM's database includes the export-producing firm's name and its corresponding NAICS code.

We coded the data according to the following coding scheme (see table 4).

Table 4. Sector Coding Criteria for the Data in Figure 1

Sector	Sector criteria	Sector	Sector criteria
Health	Maternal care, vaccinations, cold storage, any other health-related service or good	**Waste management**	Anything involved in the linear removal of waste, recycling outside of critical minerals, or clean energy supply chains
Transportation	Roads, procurement of public transport vehicles, rail infrastructure, port construction	**Net-zero supply chain investments**	Mining/processing of critical minerals; manufacturing, deployment, or recycling of clean energy system materials, components, or final products
Education	General education, higher education, entrepreneurship skills	**Telecommunications and information technology**	Electronics for which computation or information storage is the primary focus, software, any infrastructure used for the transmission of information
Market making	Financial market making (enabling capital investment), connecting local producers to markets (outside of primary resource production), supporting tourism	**Mixed**	Any program financed for which multiple objectives are the goal and it is not possible to discern how much funding went to any one goal (such as a program for which goals include women's empowerment and healthcare infrastructure)

Sector	Sector criteria	Sector	Sector criteria
Good governance	Criminal justice, civil society strengthening, rule of law, transparency, accountability, tax reform, regulatory streamlining	**Industrial sectors**	Any NAICS coded EXIM deal that either does not have a clear focus in one of the above categories (such as 322211 Corrugated and Solid Fiber Box Manufacturing) or is such a basic commodity that it could be used in multiple sectors (such as 331222 Steel Wire Drawing)
Energy systems investments	Any fossil fuel system	**Undisclosed**	An EXIM deal where it was not possible to distinguish a sectoral focus, either because the NAICS code was for general business services or NAICS code information was missing. Some DFC deals also had their relevant details redacted due to security concerns
Water	Wastewater treatment, desalinization, groundwater management, water infrastructure (nonirrigation)	**Building stock**	Investment in building stock or component materials for which end-use in building stock was clearly shown
Primary Resource Management	Agriculture, agrifood processing, conservation, forestry, (non–critical mineral or energy-product) mining, fisheries		

About the Authors

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