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How Can African Countries Participate in U.S. Clean Energy Supply Chains?

Zainab Usman and Alexander Csanadi

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Summary

The United States Is Building Out New Clean Energy Industries

Building out new clean energy industries and securing the necessary supply chains to sustain them are major priorities for the United States. Recent landmark legislation—including the Inflation Reduction Act of 2022, the Infrastructure Investment and Jobs Act, and the Creating Helpful Incentives to Produce Semiconductors and Science Act of 2022 (CHIPS and Science Act)—has codified this priority into discrete objectives. The push for new clean energy ecosystems is driven by the desire to meet climate change goals as well as new geopolitical realities of great power competition, and both major legislation and ancillary policy documents reflect this duality.

Concurrently, the United States is revamping its relationship with Africa, as demonstrated most saliently by the recently unveiled strategy document focusing on the continent, as well as commitments made during the U.S.-Africa Leaders Summit in December 2022. These commitments aim to facilitate two-way trade and investment, and, crucially, seek to reorient the relationship between the United States and Africa away from the historical aid donor-recipient paradigm.

There are significant areas of synergy between these twin objectives of developing new clean energy supply chains and reorienting the U.S. economic and strategic relationship with Africa. Many African countries are endowed with the natural resources that the United States needs to produce clean energy technologies, and in certain cases they boast some of the largest reserves of these minerals in the world. This combination of key mineral endowments in African countries and U.S. objectives to reorient supply chains away from competitors like China can serve as the foundation for a new economic and strategic relationship.

Importantly, this new partnership can be markedly different from African countries' historic relationships with foreign powers, in which these powers merely regarded Africa as a source from which to extract unprocessed raw materials. Many African countries have long made it a priority to ensure value addition for their natural resources, and honoring this intent will be key to realizing the second major U.S. objective: revamping its relationship with the continent.

Three Opportunities for African Countries to Integrate Into U.S. Clean Energy Industries

Given this convergence of interests between the United States and African countries, the intent of this paper is to identify opportunities for Africa to join the emerging clean energy industrial supply chains as well as opportunities for the United States to leverage and partner with African countries in this effort. It outlines three such opportunities for African countries to integrate with U.S. clean energy industries: (1) transition minerals supplies and battery manufacturing; (2) research, development, and commercialization; and (3) data collection and analytics. The recent major pieces of legislation mentioned above offer a total of \$47.84 billion in appropriations across these three categories. Although these funds have not been authorized specifically for Africa, they are relevant to efforts to achieve this U.S.-Africa partnership, albeit contingent on other factors such as subsequent regulations and secondary policies.

First, with respect to **transition minerals supplies and battery manufacturing**, there are twenty mineral producing countries in Africa for which the sector accounts for at least 25 percent of exports. For many of these countries, mineral-based development has been a long-standing economic strategy. Indeed, mineral-based development strategies are commonly reflected across pan-African institutions as well. There is significant potential for American companies to source processed transition minerals from African producers in these countries to achieve U.S. strategic objectives of diversifying its sources of mineral supplies. Specifically, the thirty-five countries that already have duty-free access to the U.S. market through the African Growth and Opportunity Act (AGOA) could include suppliers of transition minerals that have undergone some processing and refining, provided that both the U.S. and African sides support certain policy enablers and regulations. These enablers have precedence, and can be achieved through regulations designed by the Departments of Treasury and Energy, as well as by using AGOA as the basis for negotiating a Critical Minerals Agreement, similar to that which exists for Japan.

Second, new opportunities may be found as African firms participate in **research, development, and commercialization** proposals for energy-related innovations within the United States. These include research and development (R&D) partnerships with entities in African countries that have strong hydrogen potential—including Morocco, Namibia, and South Africa, where the U.S. presence in this industry is nearly nonexistent compared to European engagement. Furthermore, leveraging the USAFRICOM State Partnership and Sister

City Partnership programs in U.S. states will facilitate research and knowledge exchanges between U.S. and African firms, as these states will be home to some of the twenty regional technology and innovation hubs authorized by the CHIPS and Science Act. By coordinating on research, development, and commercialization activities, the United States can further its strategic objectives, while African countries can spur future innovations enabled by their access to the latest technologies through coordinated transfer mechanisms.

Finally, synergies exist between the U.S. and African countries on strengthening **data collection and analytics** on the global supply of transition minerals and in demand-forecasting. One major area for collaboration is in the mapping of transition minerals in Africa through the Earth Mapping Resources Initiative of the U.S. Geological Survey (USGS). A second area of collaboration relates to the U.S. Energy Information Administration's collection and analysis of international energy data. Improved knowledge on the global allocation of key minerals as well as energy analytics serves the U.S. objective of designing policy to both secure its own supply chains and counter potentially coercive energy diplomacy on the part of competitors.

Recommendations to Advance U.S.-Africa Partnerships in Clean Energy Industries

Although the potential for collaboration is clear, both public and private actors in the United States and Africa will need to take further action to fully realize the benefits. **For the U.S. government**, a first priority is to leverage the upcoming AGOA reauthorization to rethink the program as a basis of a trade deal—such as Japan's Critical Minerals Agreement—for the United States to source transition minerals from African countries in order to achieve U.S. supply chain objectives and to develop value chains for African countries. Second, the United States should consider extending offers of membership to the Mineral Security Partnership to select African countries, along with complementary investment promotion strategies to ensure implementation. Finally, the United States should support the African Minerals Development Centre to help transform it into a world-class center of excellence for natural resource management. This last approach should seek to emulate the highly successful example of U.S. support for the Africa Centres for Disease Control and Prevention.

African governments and regional organizations should simultaneously invest in repositioning domestic R&D and data analytics institutions in order to take full advantage of future collaborations. Beyond the African Minerals Development Centre, institutions like the African Union Development Agency – the New Partnership for Africa's Development and African Natural Resources Management and Investment Centre will be key bodies for providing thought leadership and technical assistance to member states. In addition, African governments should empower their diplomatic corps in the United States to better engage with the U.S. policymaking process and relevant private sector actors, including at the subnational level.

Finally, nongovernmental actors from both sides of the Atlantic have an important role to play. Private sector actors in the United States should help make the business case to the U.S. government for policy and regulatory support for sourcing transition minerals from Africa. Philanthropic actors—beyond funding the uptake of final consumer products, such as electric vehicles—should invest in enabling upstream value-chain development in Africa for clean energy technologies. Lastly, scholars should seek to identify and bridge knowledge gaps on clean energy value-chain development in Africa by conducting more granular country-level and subregional analyses.

Introduction: U.S. Policies to Build Domestic Clean Energy Supply Chains

The United States is building out new clean energy industries. The 2022 National Security Strategy states that “global action begins at home, where we are making unprecedented generational investments in the clean energy transition through the IRA [Inflation Reduction Act], simultaneously creating millions of good paying jobs and strengthening American industries.”¹ Ever since the United States rejoined the Paris Accords in 2021, a raft of government legislation and policies have aimed to drive the expansion of clean energy industries domestically and to restructure their related supply chains. This clean energy push has been motivated by climate change objectives of reducing U.S. greenhouse gas emissions through investing in low-carbon technologies for electrification and transport, economic objectives to secure the windfalls of investments in future-facing industries, and national security imperatives of reorganizing industrial supply chains away from competitors like China in a changing geopolitical landscape. U.S. National Security Adviser Jake Sullivan has said that the United States is “leveraging the Inflation Reduction Act to build a clean-energy manufacturing ecosystem rooted in supply chains here in North America, and extending to Europe, Japan, and elsewhere.”²

Concurrently, the United States is revamping its economic and strategic relationship with different regions of the world, including Africa. In a strategy document unveiled in August 2022, the U.S. government envisions a “21st century U.S.-African partnership,” one that “reframes the region’s importance to U.S. national security interests.”³ A U.S.-Africa Leaders Summit in December 2022 advanced this vision of partnership through a commitment of \$55 billion in various initiatives, including in economic sectors that will facilitate trade,

investments, entrepreneurship, and jobs creation.⁴ Critical to this reorientation of the U.S. engagement with Africa is an interest in moving, according to Secretary of Commerce Gina Raimondo, “beyond just aid to investment . . . and partnership to unlock the potential of the private sector to the benefit of *all* of our countries.”⁵

These U.S. policy objectives could be an important foundation for expanded trade and investment relations with African countries. On a continent endowed with a variety of natural resources—including those minerals essential to the production of clean energy hardware such as batteries, solar panels, wind turbines, and others—important partnerships could be forged with the United States to this end. Several African countries have some of the world’s largest mineral deposits, and for their governments the effective management of their natural resources to generate revenue, provide universal electrification, improve the well-being of their citizens, and drive industrialization by increasing domestic processing and value-addition of these resources before exports, is an important priority. In a sense, the U.S. government’s dramatic policy shifts away from the prevailing orthodoxy of lowering prices for consumers and toward “reshoring” the supply chains for domestic production of clean energy hardware somewhat counterintuitively converges with the long-standing policy priorities and economic goals of African countries and other parts of the global south. The U.S. objective of pivoting away from China and other competitors also leaves a gap in the supply chain for clean energies; a gap that African countries may fill.

This convergence of interests—embodied most saliently in the U.S. demand for minerals needed for energy transition and African countries’ supplies of these minerals—could form the foundation of a twenty-first-century U.S.-Africa partnership centered around two-way trade and investment relations, as well as research and data collaborations in clean energy industries. This paper identifies three opportunities for Africa to join the emerging clean energy industrial supply chains, as well as opportunities for the United States to leverage and partner with African countries and thereby help realize this partnership: (1) transition minerals supplies and battery material processing, (2) research, development, and commercialization, and (3) data collection and analytics. To harness these opportunities, we offer tailored recommendations for follow-up actions to be taken by specific sets of actors, including the U.S. government, African policymakers, and nongovernmental actors.

Method and Definitions

We address the following questions:

1. What are the specific areas in clean energy industries being enabled by recent U.S. federal policies in which African countries could participate to achieve both U.S. and African economic and foreign policy objectives?
2. What amount of public finance authorized by these U.S. federal policies to achieve economic and foreign policy objectives in clean energy industries could be relevant to advancing this U.S.-Africa partnership?

3. What steps should U.S. and African public sector and nongovernmental entities take to harness these opportunities to advance this U.S.-Africa partnership in clean energy industries?

To address these questions, we examine recent U.S. federal legislation enacted and policies announced since January 2021, when the Biden administration took office and the country rejoined the Paris Accords. Although much attention has been paid to the IRA, other recently enacted pieces of federal legislation are of significance to clean energy technologies and their industrial supply chains. We therefore also focus on two other pieces of legislation: the Infrastructure Investment and Jobs Act (Bipartisan Infrastructure and Jobs Act of 2021) and the Creating Helpful Incentives to Produce Semiconductors and Science Act of 2022 (CHIPS and Science Act). As a secondary step, we also cover adjacent legislation, where relevant, including the African Growth and Opportunity Act (AGOA). Finally, we selectively draw on relevant executive-level policies including executive orders, agency white papers, departmental regulations, and other policy announcements.

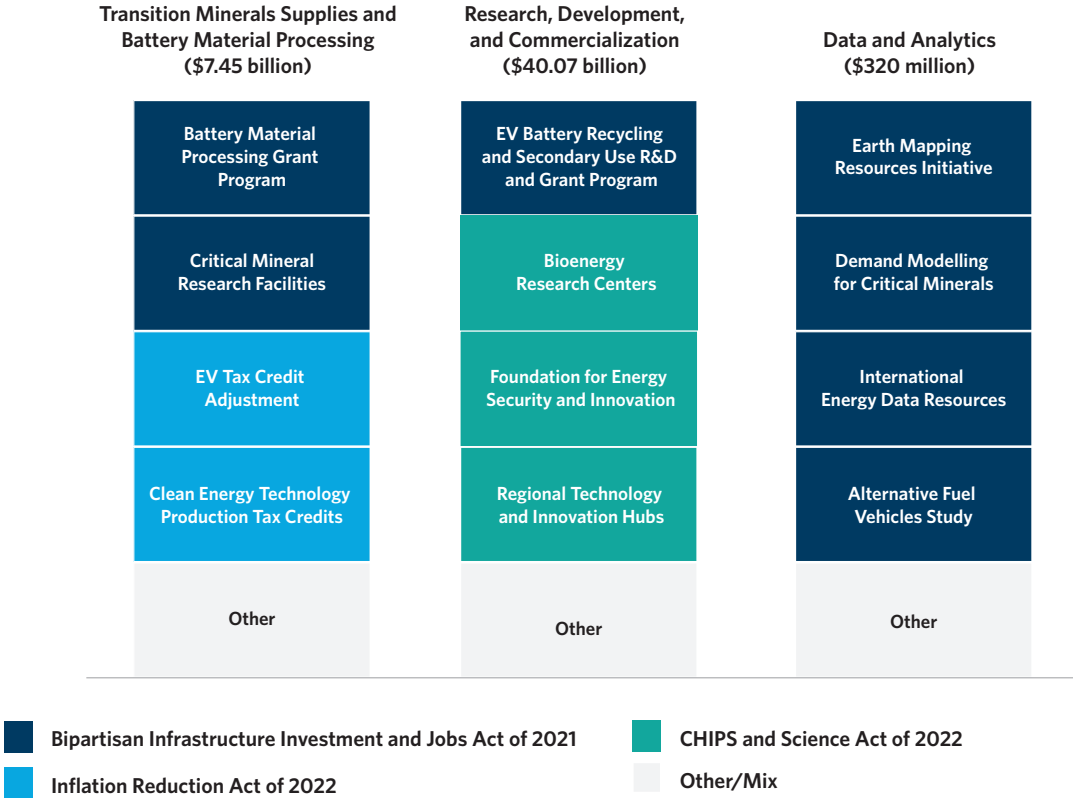
Before proceeding, it is worth clarifying the meaning of terms employed in this analysis. *Clean energy industries* refer to the innovations, production, and commercial activities associated with emissions reduction technologies in energy generation, such as renewable energy like solar, wind, and nuclear energy, but also some aspects of transportation such as electric vehicle batteries. In this paper, we therefore use *clean energy* interchangeably with terms like *low carbon* or *low emissions technologies*. *Minerals* refer to naturally occurring organic substances found in the earth (such as coal, crude oil, precious metals, industrial rocks, and gemstones), which once extracted are nonrenewable. *Transition minerals* are therefore a subset of these resources (such as copper, cobalt, graphite, lithium, nickel, and the platinum group of metals) that are used as input to manufacture of low-carbon hardware. In this paper, we use *transition minerals* instead of the more popular *critical minerals* because the latter has a narrower, time-bound and nation-specific definition.⁶ Copper, for instance, is a transition mineral, but at the moment the United States does not regard it as a critical mineral, although its criticality could change at a later date. A *supply chain* is a network of firms, inputs, and raw materials involved in the production and delivery of a product or service. A *value chain* describes the full range of consecutive activities in the process of bringing a product or service from its conception to its end use; that is, the sourcing of raw materials, research and design, production, marketing, distribution, and support to the final consumer.⁷

The paper covers Africa as a continent. *Africa* refers to the fifty-five countries on the continent as defined by the African Union (AU), although the AGOA covers only forty-nine countries in “sub-Saharan Africa.” Although we provide specific country examples where relevant, the task of engaging in country-specific analyses and recommendations goes beyond the scope of this paper and is best tackled in follow-on research. Our analysis of U.S. legislation is limited to the federal government; it does not include state-level policies. The next section identifies three opportunities for African countries to join U.S. clean energy industries. The paper’s final section concludes with recommendations for U.S. government officials, African policymakers, and nongovernmental actors on steps to take to harness these opportunities in building a U.S.-Africa partnership in clean energy industries.

Opportunities for Africa to Join U.S. Clean Energy Supply Chains

In the three pieces of U.S. legislation enacted since 2021 that address energy and climate change, there are three possible arenas in which African countries might integrate with U.S. clean energy industries: (1) transition minerals supplies and battery manufacturing, (2) research, development, and commercialization, and (3) data collection and analytics. (See Table in Annex 1 for the detailed provisions.) Across these three dimensions, the legislative provisions authorize \$47.84 billion that could be relevant to advancing this U.S.-Africa partnership in clean energy industries. Although these funds have not been authorized specifically for Africa, they are relevant to efforts to achieve this U.S.-Africa partnership contingent on other factors, including subsequent regulations and secondary policies. About a dozen U.S. federal agencies are involved in the implementation of these provisions (see Figure 1).

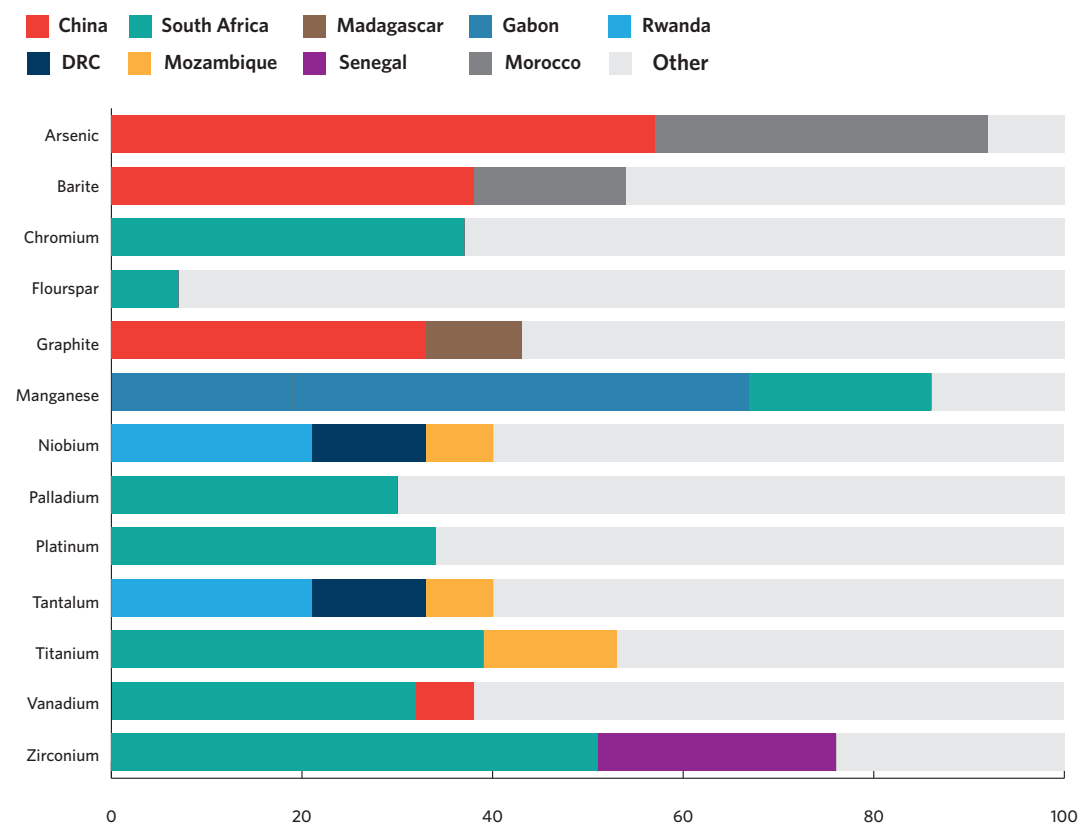
Figure 1. Highlights of Programs and Initiatives Within U.S. Clean Energy Legislations That May Be Relevant to African Countries



Transition Minerals Supplies and Battery Manufacturing

U.S. Objective: The United States seeks to secure supplies of strategic minerals and increase the domestic production of batteries and low emissions technology hardware. According to Sullivan, “the United States produces only 4 percent of the lithium, 13 percent of the cobalt, 0 percent of the nickel, and 0 percent of the graphite required to meet current demand for electric vehicles.”⁸ Additionally, the United States is between 50 and 100 percent reliant on imports from China for more than ten of the fifty minerals currently identified as critical by the U.S. government (see Figure 2). Thus, the United States has an overriding national security objective to reduce its dependence on countries it has identified as adversaries (such as China and Russia) and on other economic competitors by sourcing minerals, developing value chains, and expanding the production of batteries within the domestic economy. (At present, the United States currently controls less than 10 percent of global battery production capacity.⁹) Current legislation explicitly requires this sourcing (or sometimes recycling) to come from countries with which the United States has a free trade agreement (FTA), such as those in the U.S.-Mexico-Canada Agreement (USMCA).¹⁰

Figure 2: Major Suppliers of Select Critical Minerals to the United States



Source: United States Geological Survey, 2022 List of Critical Minerals, <https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals>.

Relevant Budget to advancing the U.S.-Africa Partnership: At least \$7.45 billion.

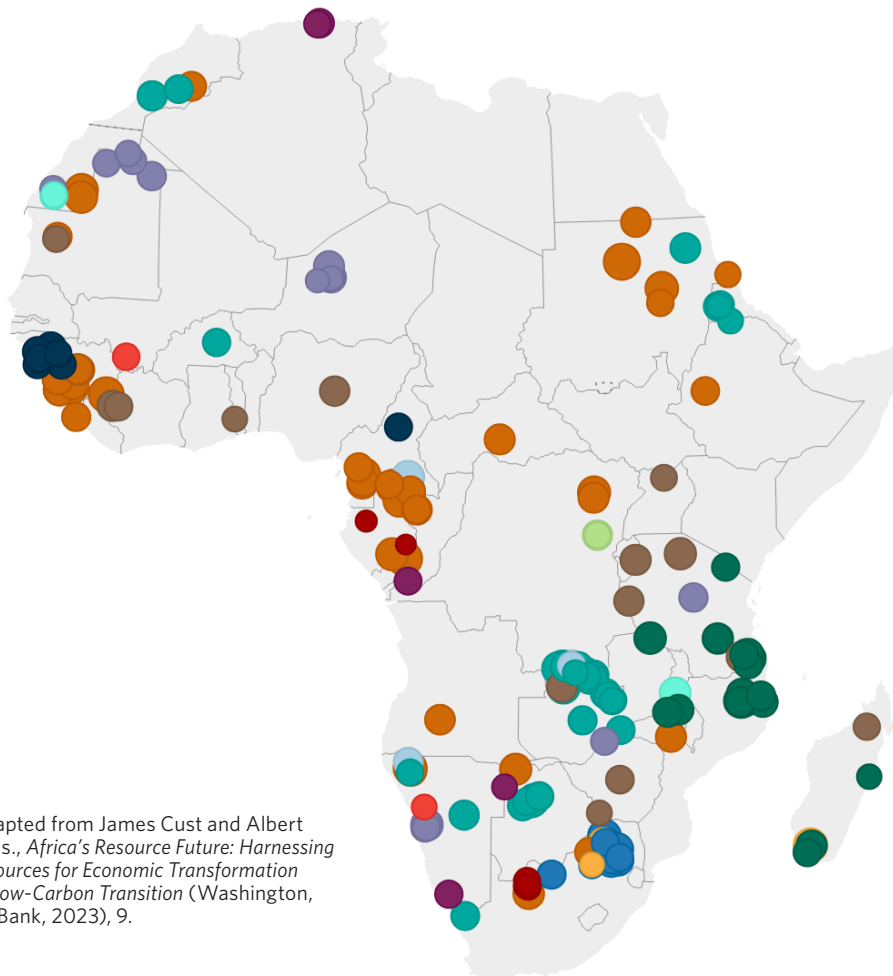
Implementing Agencies: the Office of Manufacturing and Energy Supply Chains (Department of Energy); the USGS (Department of the Interior); the Internal Revenue Service; the Critical Minerals Subcommittee (National Science and Technology Council); the National Science Foundation.

Opportunities: Africa has twenty mineral-producing countries—including those endowed with transition minerals—in which the minerals sector accounts for more than 25 percent of exports. These countries include Ghana, Guinea, and Mali in West Africa; the Central African Republic and the Democratic Republic of Congo (DRC) in Central Africa; Tanzania in East Africa; and Namibia, South Africa, and Zambia in Southern Africa (see Figure 3).¹¹ Many of these countries have pursued mineral-based development as an economic strategy since at least the 1960s. These strategies also can be found in continent-wide vision documents, such as the African Commodities Strategy of the AU’s Agenda 2063, which aims to enable African countries “to add value, extract higher rents from their commodities, integrate into the Global Value Chains, and promote vertical and horizontal diversification anchored in value addition and local content development.”¹² The centerpiece of the AU’s commodities strategy is the Africa Mining Vision (AMV), which aims to optimize the “exploitation of mineral resources to underpin broad-based sustainable growth and socio-economic development.”¹³ Country-level strategies aim to leverage these mineral resources by adding value domestically through downstream processing before exporting minerals to global markets. Ghana, DRC, Namibia, Nigeria, Tanzania, and Zimbabwe, among others, all have such country-level strategies.

For these African mineral producing countries, there are several important entry points into the U.S. clean energy ecosystem across the value chains for transition minerals and battery manufacturing.

Firstly, the IRA’s generous tax incentives to spur domestic production and uptake of clean energy technologies specify where the component minerals must be sourced, with broader implications for the African continent. These tax credits include consumer subsidies for electric vehicle (EV) purchases and incentives for firms to encourage the domestic production of renewable energy hardware; per the legislation, “those relating to wind or solar energy, inverters, certain battery components and ‘applicable’ critical minerals.” Elaborate domestic content requirements attached to these credits relate to the sourcing of mineral components for the production of EV batteries and renewable energy hardware. With EV batteries in particular, these domestic content requirements are on an ascending scale, reaching 100 percent by the end of this decade.¹⁴ More importantly, the content requirements stipulate that the minerals must have been sourced from *or processed* in the United States or an FTA country. Despite the protectionist overtones, by incentivizing both the domestic demand for EVs and production of renewable energy hardware, these tax credits also strengthen demand for downstream supply chains with portions in which mineral-rich African countries can play a role.

Figure 3: Select Transition Mineral and Metal Deposits Discovered in Africa, 1990–2019



Source: Adapted from James Cust and Albert Zeufack, eds., *Africa's Resource Future: Harnessing Natural Resources for Economic Transformation During the Low-Carbon Transition* (Washington, DC: World Bank, 2023), 9.

Second, a new Battery Material Processing Grant Program aims to ensure a viable supply of battery materials in North America, enhance U.S. battery manufacturing capacity, and reduce reliance on foreign competitors for critical minerals and technologies. With a budget of \$3 billion for fiscal years (FYs) 2022–2026, this program will provide grants of \$50 million to \$100 million to eligible entities to carry out demonstration projects, upgrade current facilities, or construct new battery material processing centers within the United States.¹⁵ Although the source act (the Bipartisan Infrastructure and Jobs Act of 2021) directs “priority” but not exclusive consideration to entities located and operating in the United States, owned by a U.S. firm, and using supplies that do not originate from a “foreign entity of concern,” these restrictions do not preclude the sourcing of raw or semi-processed transition minerals from African countries that are not on U.S. sanctions lists. The act also authorizes another \$3 billion for a similar grant program for battery materials recycling for FYs 2022–2026 with similar provisions.

A third set of provisions supports “advanced energy manufacturing and recycling,” covering various types of low-carbon technologies. These technologies include renewable energy generation and storage, emissions reduction technologies (including carbon capture and storage), EVs, charging stations, and grid system components. This grant program has a budget of \$750 million for FYs 2022–2026, authorized by the Bipartisan Infrastructure Act. It targets medium-sized firms employing less than 500 workers on-site, but also gives preference to “minority-owned” enterprises within the United States, which would include African American but also African-diaspora firms.

Finally, the Bipartisan Infrastructure Act authorizes \$307 million for the creation of two mineral research facilities: the USGS Energy and Minerals Facility, in conjunction with the Colorado School of Mines (\$167 million); and the Rare Earth Elements Demonstration Facility, with the mandate to demonstrate commercial feasibility of integrated rare earth element extraction, separation, and refining (\$140 million). This work on transition minerals is another area of synergy with African resource rich countries.

Across these four areas authorized by federal legislation, particularly the IRA, American companies could source transition minerals from African producers. Specifically, the thirty-five countries that already have duty-free access for more than 6,000 product lines to the U.S. market provided by AGOA (see Box 1) could participate in these North American supply chains. In other words, AGOA could be the starting point to consider further negotiation of FTA-like reciprocal privileges specified in the IRA to qualifying African mineral producers, contingent on action by the U.S. Treasury and the U.S. Trade Representative (USTR) to design the necessary rules and regulations. The sourcing requirements outlined in the legislation disqualify credits if any of the components come from “foreign entities of concern,” but AGOA-eligible countries are already screened on the basis of various eligibility requirements. The trade in minerals and metals, an underutilized aspect of AGOA, has significant growth potential, as the bulk of U.S.-Africa trade volumes under the program is composed of energy fuels and apparel.

Box 1: The African Growth and Opportunity Act

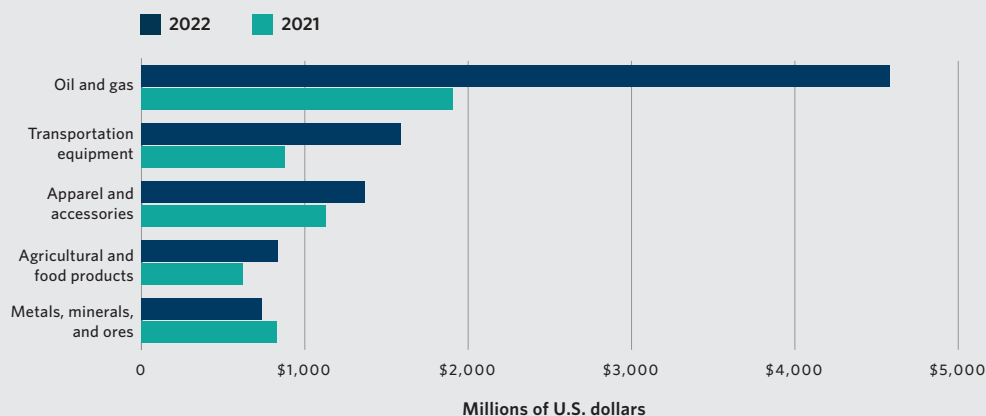
The African Growth and Opportunity Act (AGOA) is a unilateral trade preference program from the United States to African countries. It provides duty-free access to the U.S. market for exports from eligible economies of forty-nine countries in “sub-Saharan Africa.” Through AGOA, the U.S. Congress seeks to increase U.S. trade and investment with the region, promote sustainable economic growth through trade, and encourage the rule of law and market-oriented reforms. The legislation was established by Congress as part of the Trade and Development Act of 2000 and has been amended several times. In 2015, AGOA was reauthorized for ten years, to September 2025.

There are currently thirty-five AGOA-eligible countries. To be eligible to receive AGOA benefits, a country must meet five main criteria: economic (have a market orientation), political (rule of law, political pluralism, and anticorruption), commitment to poverty reduction, labor and human rights,

and terrorism and security. It is also possible to graduate out of AGOA benefits if a country achieves a high-income status. President Joe Biden terminated AGOA preference benefits for Burkina Faso, effective January 1, 2023, after determining that it had failed to meet the rule of law eligibility criteria. Biden also terminated preference benefits for Ethiopia, Guinea, and Mali for failing to meet eligibility requirements regarding human rights, political pluralism, and workers' rights. Ten other countries remain ineligible for the program's benefits, including high-income countries such as Mauritius and Seychelles.

AGOA provides duty-free access to the U.S. market for over 1,800 products, in addition to more than 5,000 products eligible for duty-free access under the Generalized System of Preferences (GSP). Contrary to common assumptions, textiles are not the program's main export category (see Figure 4). Energy products, especially mineral fuels, account for the vast majority of AGOA exports, at 44 percent or \$4.5 billion in 2022, with Nigeria being the top supplier. The top nonenergy export categories include motor vehicles (\$1.5 billion); textile and apparel (\$1.3 billion); agricultural products (\$835 million); and a combination of metals, nonmetallic mineral products, and mineral ores (\$739 million).¹⁶ Nearly 90 percent of U.S. nonenergy imports under AGOA in 2022 came from five countries: South Africa, Kenya, Madagascar, Lesotho, and Ghana.¹⁷

Figure 4. Top Export Sectors Under AGOA and GSP



Source: Authors' calculations using data from AGOA.info

The program has increased the volume of exports of certain African products, especially apparel. Yet AGOA imports have accounted for less than 1 percent of total U.S. imports by value since the program's inception.¹⁸ The number of eligible countries has been declining. Ongoing governance, human rights, and conflict challenges in a growing number of African countries make it difficult to meet eligibility criteria, thereby curtailing participation in the program. Additionally, countries that transition to high-income status become ineligible. Considering AGOA's future after its current expiry year of 2025, there are important questions around how best to optimize the program for both U.S. and African interests. Such improvements may entail a pivot to previously underutilized sectors and products, such as the continent's abundant transition minerals. A clear strategy to promote U.S. investments in Africa will better harness the program's ability to revive declining U.S.-Africa trade volumes that lag Africa's rapidly expanding trade relations with competitors like China.

A policy objective to expand U.S.-Africa trade in transition minerals could be the basis of a new economic partnership, one that supports U.S. government objectives of securing mineral supplies and African objectives of attracting investments to process their mineral resources before export. This convergence of interests should drive the revamp of U.S. public and private engagement in the resources sectors of African countries, which historically have occurred only in fits and starts since the 1940s, underpinned by geopolitical factors (see Box 2). Indeed, on the sidelines of the U.S.-Africa Leaders Summit in December 2022, the United States signed a memorandum of understanding (MoU) with the DRC and Zambia to strengthen the supply chain for EV batteries (see Box 2).¹⁹ Beyond this specific MoU, a broader U.S.-Africa partnership in trading in transition minerals will require strong proactive efforts to ensure its realization. AGOA is set to expire in 2025, and the uncertainty around its future will discourage investors from making the long-term commitments necessary to set up operations along the value chain of the mining industry in African countries.

Box 2: From the Manhattan Project to critical minerals: The history of U.S. engagement in Africa's resources industries

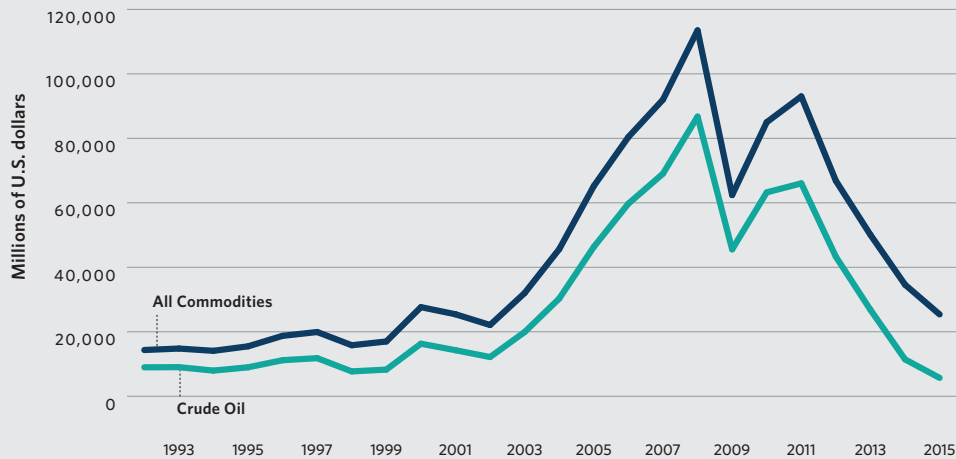
On December 13, 2022, the United States signed a MoU with the DRC and Zambia to strengthen the supply chain for EV batteries.²⁰ The DRC is the world's largest producer of cobalt, and Zambia is a major producer of copper; both are key minerals used in solar panels, EV batteries, and emissions reduction technologies.²¹ This MoU is the latest in a long history of U.S. engagement with African countries and their extractive industries, going back almost one hundred years. This historical economic relationship has had deep geopolitical underpinnings.

Uranium mining provides an illustrative case in point. The majority of the uranium used in the atomic bomb dropped on Hiroshima, Japan—nicknamed “Little Boy”—came from the Shinkolobwe mine in the Belgian Congo in 1942, today known as the DRC.²² The United States first became aware of the importance of Congolese uranium from a letter that scientists Albert Einstein and Leo Szilard sent to then president Franklin D. Roosevelt, urging the administration to consider “the problem of securing a supply of uranium ore for the United States.”²³ U.S. officials also sought to secure this uranium with the intention of denying access to Nazi Germany.²⁴ Furthermore, the Congo was an important source of not only uranium, but also cobalt, as demand skyrocketed between 1938 and 1943 to fuel the defense industrial base.²⁵ Following the end of the Second World War, control over access to uranium—and Congolese minerals more generally—remained a major concern for the United States as the Cold War with the Soviet Union intensified.

The private sector also features in this history of U.S. engagement with the resources industries of the DRC and across Africa. During the late twentieth and early twenty-first century, U.S. and other international oil companies expanded their investments across the continent.²⁶ For example, Chevron and ExxonMobil have had operations spanning at least twenty-two African countries. By the early 2000s the vast majority of U.S. imports from African countries were oil-related (see Figure 5). In fact, between

1992 and 2015, crude oil constituted two-thirds of all U.S. commodity imports from the continent. However, following the advent of hydrologic fracturing (fracking) and the subsequent shale revolution, U.S. oil imports from African countries fell precipitously.²⁷ Nigeria, Africa’s largest oil producer, was particularly affected by the loss of the U.S. market for oil exports.

Figure 5. U.S. Crude Oil Imports Relative to Total Imports from Africa



Source: Authors’ calculations from U.S. Census Bureau Data, <https://usatrade.census.gov/data/Perspective60/Dim/dimension.asp>

Concurrent to the shale revolution period, U.S. mining companies operating in the DRC began divesting their assets—often to Chinese companies. A notable case is China Molybdenum’s 2016 acquisition of U.S.-based Freeport-McMoRan’s stake in the Tenke Fungurume Mine—home to the largest copper and cobalt deposits in the world.²⁸ The Tenke Fungurume situation was part of a larger trend of decreasing U.S.-based mining activities in the DRC following the collapse of the Soviet Union.²⁹ This divestment of mining assets, alongside the expansion of U.S. oil and gas production from the shale revolution, resulted in a retrenchment of American presence in extractive industries across Africa.

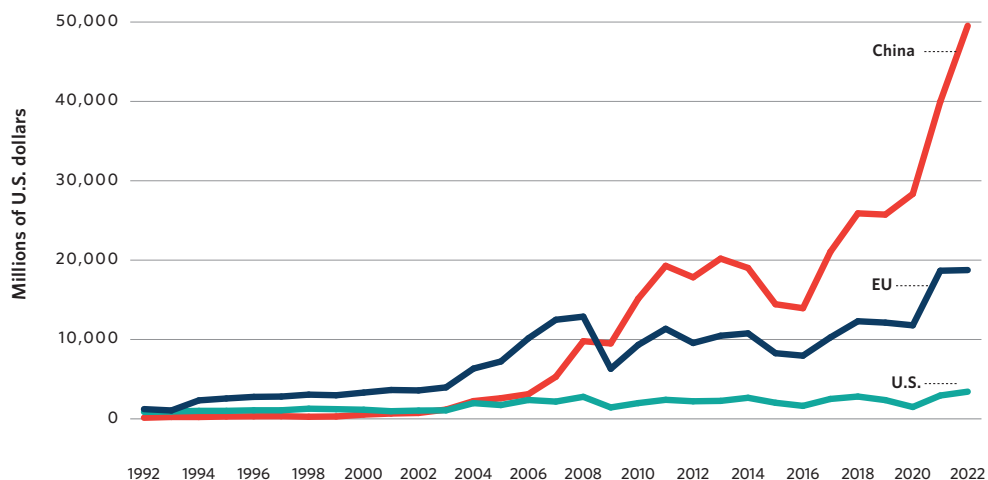
Within today’s geopolitical landscape, the United States could look once again to African countries to supply the natural resources needed to support its strategic objectives. The dynamics of great-power competition with China are certainly relevant. Cognizant of this history, African countries and publics emphasize the urgency of domestic value addition, in terms of mineral processing and manufacturing of clean energy hardware, to allow them to join global value chains and benefit more from these natural resources. The DRC-U.S.-Zambia MoU is just one example of this imperative.

Challenges

Overall, the climate-related legislation that contains strong local content requirements to secure domestic U.S. clean energy supply chains create the possibility of two distinct scenarios involving African countries.

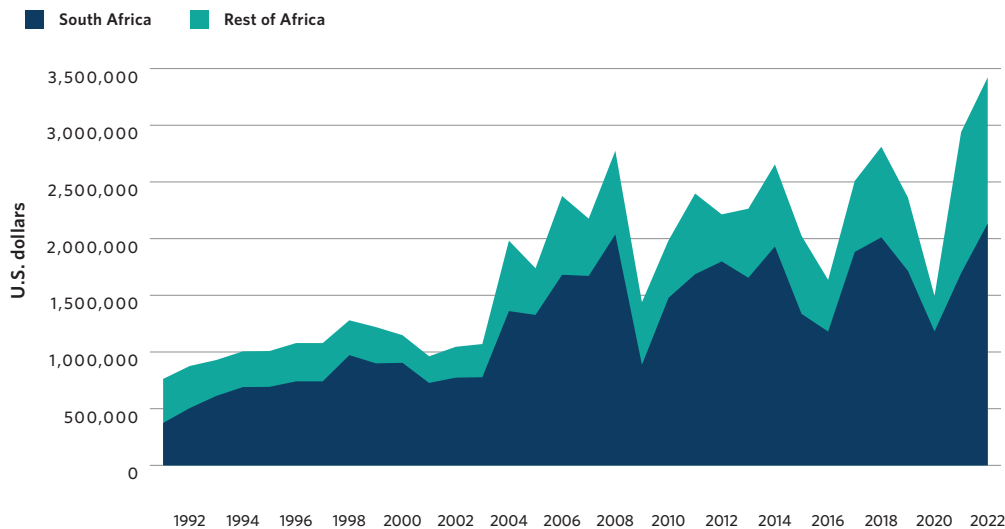
One scenario is that African countries whose mineral value chains are not integrated with the United States from the outset may never be able to join this North American ecosystem. Indeed, with the exception of Morocco, no African country has an FTA with the United States. For years, the U.S.-Africa mineral trade has been much lower than European Union (EU)-Africa and even China-Africa trade in these commodities (see Figure 6). And of this limited U.S.-Africa trade, South Africa accounts for the vast majority (71 percent) of the mineral exports to the United States (see Figure 7). Therefore, local content provisions that require firms to source from North American (or other FTA countries) may lock U.S. EV and renewable energy companies out of African markets, and thereby cede ground to Chinese EV and renewable energy companies that are currently expanding their presence on the continent. One example of these Chinese investments in mineral processing and battery manufacturing is a \$300 million lithium processing plant, opened in Zimbabwe in June 2023 by Prospect Lithium Zimbabwe, an arm of Chinese company Zhejiang Huayou Cobalt. Morocco also has at least two gigafactory projects associated with a \$280 million investment from Chinese firm Tinci Company, and a planned \$6.3 billion project led by China-based battery maker Gotion High Tech.³⁰

Figure 6: Mineral and Metals Imports from Africa to the European Union, United States, and China, 1992-2022



Source: Authors' calculations from the World Bank's World Integrated Trade Solution database. [Figure is based on a summation of product codes using HS 1988/92 nomenclature. The following codes were used: 26, 72, 73, 74, 75, 76, 78, 79, 80, 81 and 83.]

Figure 7: South Africa Accounts for the Dominant Share of U.S. Mineral and Metals Imports from Africa, 1992-2022



Source: Authors' calculations from the World Bank's World Integrated Trade Solution database. [Figure is based on a summation of product codes using HS 1988/92 nomenclature. The following codes were used: 26, 72, 73, 74, 75, 76, 78, 79, 80, 81 and 83.]

There is a second scenario, however. African countries with AGOA privileges that grant duty-free market access to the United States may qualify for some exemptions on such restrictions. These carveouts have precedence and can be achieved through regulations that can be designed by the Departments of Treasury and Energy, and by using AGOA as the basis for negotiating a Critical Minerals Agreement (CMA), as was done for Japan.³¹ All of these will require concerted effort and sustained interest not just from Congress, but from future presidential administrations. We outline specific recommendations for how this second scenario can be realized in the final section of the paper.

Research, Development, and Commercialization

U.S. Objective: The United States seeks to increase its economic competitiveness, and achieve energy security and national security objectives, by supporting scientific advancement in the technologies that will drive the low-carbon transition through investments in research, development, and commercialization of energy-related innovations.

Relevant Budget to Advancing U.S.-Africa Partnership: At least \$40.07 billion.

Implementing Agencies: The Department of Energy broadly, and specific divisions including the Office of Manufacturing Energy Supply Chains, the Hydrogen and Fuel

Cell Technologies Office, the Office of Energy Efficiency and Renewable Energy, and the Bioenergy Technologies Office; the Department of Commerce; and the National Science Foundation.

Opportunities: There are entry points for African firms, with the support of policy actors in both African countries and the United States, to help advance a U.S.-Africa partnership in research, development, and commercialization of energy-related innovations. The AU’s Africa Mining Vision recognizes the importance of investing in R&D by governments and the private sector to unlock the continent’s potential in joining global energy and industrial value chains and advancing priorities around domestic value addition.³² The Kigali Communique, endorsed by high-level representatives of ten African countries, calls for the catalyzation of “a step-change in technology transfer mechanisms to ensure that the entire continent has access to the latest energy innovations, on fair terms.”³³ Beyond minerals, another area with a large demand for R&D partnerships is civilian nuclear energy. A third of the almost thirty countries currently considering nuclear power are in Africa, according to the International Atomic Energy Agency.³⁴ Egypt, Ghana, Kenya, Morocco, Niger, Nigeria, South Africa, Rwanda, and Uganda have all either begun construction or signed contracts with vendor countries for nuclear reactors for planned completion by 2030.³⁵ With a few exceptions—such as Ghana, which is negotiating an agreement with Japan and the United States—the vendor countries are mostly China and Russia.

In the provisions within the recently enacted U.S. laws that advance clean energy R&D objectives, we identify three relevant areas for African countries. The first set of relevant provisions targets transition minerals. In the CHIPS and Science Act, \$16.3 billion of \$80 billion authorized to the National Science Foundation for research to advance transition minerals mining strategies and technologies is associated with language around exploring “opportunities to support international research collaboration.” Relatedly, certain provisions support the recovery of transition minerals through electric vehicle battery recycling. Relevant directives in the Bipartisan Infrastructure Act aim to establish a program of research, development, and demonstration projects for EV battery recycling and secondary use applications (including scrapping for transition minerals). The program has an objective of establishing “alternative supply chains for critical materials that are found in electric drive vehicle batteries,” as well as demonstrating second-life applications of EV batteries as aggregated energy storage installations. Within the act’s authorization to the Department of Energy (DOE) for FY2022–2026, at least one stream of work allocates \$60 million to establish a series of grants focusing on innovations in battery recycling, including the recovery of critical minerals, which could be the basis of further collaborations with African countries.

A second set of provisions related to the commercialization of low-carbon energy technologies could be an entryway for African economies to join this U.S. clean energy ecosystem. The CHIPS and Science Act authorizes \$180 million for the creation of up to six bioenergy research centers to accelerate research on advanced biofuels and bioenergy and facilitate the translation of research results to industry. A directive in the Bipartisan Infrastructure Act calls for the DOE’s Hydrogen and Fuel Cell Technologies Office to establish a Clean

Hydrogen Research and Development Program in collaboration with the private sector to expand the commercial use of clean hydrogen. The activities in this program entail advancing the production of clean hydrogen from carbon capture utilization and sequestration systems, ethanol, biomass, and nuclear energy, among others. This program could be the basis of R&D partnerships between these centers and the relevant African countries that have strong hydrogen potential, including Morocco, Namibia, and South Africa, where the U.S. presence in this industry is nearly nonexistent compared to European engagement. Facilitating partnerships between U.S. and African firms on the commercialization of low-carbon energy sources—from biofuels to hydrogen—could complement U.S. Agency for International Development initiatives like Power Africa that aim to use various clean energy sources to expand electricity access in Africa (see Box 3).

Box 3: Power Africa

Power Africa is a U.S. government-led program aiming to increase energy access and eliminate energy poverty in sub-Saharan Africa. It was initiated with bipartisan support on June 30, 2013, by then president Barack Obama with the goal of doubling access to electric power in sub-Saharan Africa.³⁶ Further support for the initiative came with the passage of the Electrify Africa Act of 2015, which codified in legislation the framework for U.S. government engagement with the power sector in African countries.³⁷ Power Africa's principal objectives are to generate 30,000 megawatts (MW) of new clean power, and to establish 60 million new electricity connections.³⁸ The initiative's coordinating office is housed within the U.S. Agency for International Development, but Power Africa's operations take place through a partnership model.³⁹ This partnership involves eleven additional U.S. government agencies, major development partners, and over 170 private sector partners.⁴⁰ Since 2013, Power Africa has operated across forty countries, brought online 6,500 MW of electricity, and helped connect upward of 165 million people to electricity.⁴¹ In 2022, during the U.S.-Africa Leaders Summit, Power Africa launched two new initiatives: the U.S.-Africa Clean Tech Energy Network, which seeks to mobilize \$350 million over five years for technology investment, and the Health Electrification and Telecommunications Alliance, which seeks to digitally integrate 10,000 health facilities across the continent. Power Africa has achieved visible results, but moving forward the initiative will need to continue to adapt to rapidly shifting global conditions. The extent to which the initiative is able to adapt to the realities of rapid urbanization, accelerating impacts from climate change, and geopolitical competition will largely determine future success.⁴² Furthermore, beyond adding new electricity connections, the metric for success increasingly will be gauged in terms of the reliability of those connections.

Another provision establishes a DOE program of R&D and commercialization for low-emissions steel manufacturing as well as for carbon capture, smart manufacturing, and alternative materials. On this front, the CHIPS and Science Act authorizes \$14 billion for FYs 2023–2027 for a DOE initiative on basic energy science R&D to support new energy technologies, and \$475 million for another program on the R&D and commercialization from research to industry of microelectronics for energy innovation. The act also authorizes \$40 million for FYs 2023–2027 to establish a Foundation for Energy Security and Innovation, affiliated with the DOE, to engage with the private sector to raise funds that support the creation, development, and commercialization of innovative technologies to address tomorrow’s energy challenges. Finally, the legislative provisions supporting the commercialization of new types of nuclear energy could be relevant for African countries with an interest in building civilian nuclear energy programs. The CHIPS and Science Act authorizes roughly \$700 million in funding to support nuclear energy research through various programs and university support mechanisms, and \$800 million in support for advanced nuclear reactor (fission) research.

A third set of provisions that aim to support jobs creation and spur innovation in underserved regions of the United States could be relevant to African countries, especially those with a USAFRICOM State Partnership and municipal Sister City Partnership programs with U.S. states.⁴³ The CHIPS and Science Act directs the Department of Commerce to create twenty “regional technology and innovation hubs” in areas that are not currently tech centers for the purpose of job creation and expanding U.S. innovation capacity. The budget is \$10 billion for FYs 2023–2027. The act calls for at least three hubs in each of the six administrative regions of the Economic Development Administration, all of which are in the continental United States. The hubs are to be composed of consortia, including national labs and state governments as well as “industry or firms in relevant technology, innovation, or manufacturing sectors.” Therefore, African countries could find opportunities to leverage the State Partnership and Sister City Partnership programs with the relevant U.S. states where such hubs are located to facilitate research and knowledge exchanges between U.S. and African firms. The tendering process for these hubs is still ongoing, and their exact locations are not yet decided. This could be an area for relevant African stakeholders and U.S. partners to potentially incorporate as the business, trade, and economic development components of both the USAFRICOM State Partnership and the municipal Sister City Partnership program.

Challenges: These R&D provisions ultimately aim to achieve U.S. economic and national security objectives, but they do not contain explicit local content restrictions. Therefore, the various grant programs do not exclude collaboration with African research entities, whether these are research institutes, universities, nonprofits, or the private sector. (Countries of “concern” and those on the specially designated nationals list [see Annex 1 for definition of foreign entities of concern] will not benefit from these initiatives.) Even in the provisions that indirectly restrict participation to domestic entities, the stated preference for “minority-serving” entities should be a boon to African diaspora associated firms, entrepreneurs, and scientists who can establish knowledge exchange relations with their home countries on the continent. In the final section, we specify ways in which the President’s Advisory Council on African Diaspora Engagement in the United States could play an important coordinating role on this front.

Data Collection and Analytics

U.S. Objective: The United States seeks to strengthen data collection and the analytical basis for U.S. government decisionmaking with respect to the global supply of transition minerals as well as demand-forecasting.

Relevant Budget to advancing U.S.-Africa Partnership: At least \$320 million.

Implementing Agencies: the Energy Information Administration; the USGS; the Department of Commerce; and the Department of Transportation.

Opportunities: There are synergies between the United States and African countries on strengthening data collection and analytics on the global supply of transition minerals as well as demand-forecasting. The AMV, for instance, recognizes that “most of Africa still lacks systematic geological mapping which could bring to light a much greater resource base.” The African Minerals Development Centre (AMDC), the entity responsible for coordinating and overseeing the implementation of the AMV, is expected to support African governments in various areas, including geological and mining information systems.⁴⁴ Other pan-African entities involved in data, analytics, and knowledge generation around energy, natural resources, and climate change include the African Natural Resources Management and Investment Centre (ANRC) of the African Development Bank, the United Nations Economic Commission for Africa, and the United Nations University – Institute for Natural Resources in Africa.

In recently enacted U.S. legislation, we identify two main sets of provisions that could be relevant for collaboration with African countries with respect to data collection and analytics around transition minerals.

The first set of provisions pertains to mapping the quantity, quality, and location of transition minerals. The Bipartisan Infrastructure Act directs the USGS to establish an Earth Mapping Resources Initiative with the mandate to accelerate the organization’s mapping mission, and a specific focus on “critical minerals” (as defined in section 7002(a) of the Energy Act of 2020).⁴⁵ The act allocates \$320 million over FYs 2022–2026 for this initiative, and the results of the exercise will be publicly available. Since 2019, the USGS, in collaboration with the Australian and Canadian governments, has been managing the Critical Minerals Mapping Initiative meant to improve the knowledge of mineral reserves with the expressed purpose of diversifying certain mineral supply chains. The act also calls for the Energy Information Administration (EIA), in collaboration with the USGS, to forecast demand for transition minerals that could be designated as “critical” with the objective of aligning “analysis of demand with . . . analysis of where the minerals are produced, refined and subsequently processed.”

A second set of provisions have to do with the collection and analysis of energy data more broadly. The Bipartisan Infrastructure Act authorizes the expansion of the international

energy data resources of the EIA to understanding the “production and use of energy in various countries” and the “changing patterns of energy use internationally.” The EIA already generates large volumes of energy data that span a wide geographic scope across eighty-four countries (including a number of African countries) and dozens of thematic areas. These areas include energy forecasts, financial market analysis for major energy companies, greenhouse gas data and emissions monitoring, and energy infrastructure mapping. These EIA data are open source and easily accessible to policymakers and researchers, regardless of nationality.

With these potential synergies, an AMDC that (with USGS and EIA support) becomes more effective could serve as a hub for African countries to conduct geological surveys of mineral deposits and take on expanded data, research, and analytics coordination functions that benefit African countries and also provide the U.S. government with crucial data to inform its energy security policies.

Challenges: There are no stated restrictions in the legislation to collaborations with either pan-African research agencies or entities in individual African countries, so long as the partner organizations are not in the list of “foreign entities of concern.” Both the EIA and the USGS engage in international partnerships to “support U.S. foreign policy and science diplomacy and improve characterization and management of ecosystems and natural resources worldwide.” In fact, the USGS Office of International Programs “helps facilitate and coordinate USGS science with diverse partners, including other federal agencies, international institutions, and foreign governments.”⁴⁶

Recommendations to Advance a U.S.-Africa Partnership in Clean Energy Supply Chains

As the U.S. efforts to build clean energy industrial supply chains, with legislative and policy instruments, take shape, there are entry points for African countries to participate in this ecosystem. The three opportunities we have identified could be the basis for realizing the promise of a 21st century U.S.-Africa partnership by expanding two-way trade and investment relations and research and analytics collaborations in clean energy industries. These entry points enable the United States to present a positive vision of how it intends to provide a viable alternative to the growing Chinese engagement in African energy and natural resources sectors. However, several public and private actors will need to take further action to harness these opportunities. In this section, we offer recommendations on such follow-up actions to be taken by specific sets of actors, including the U.S. government, African policymakers, and various nongovernmental actors (see Table 1 summary).

Table 1: Summary of Recommendations to Advance a U.S.-Africa Partnership in Clean Energy Industries

Stakeholders	Recommendations	Implementing Bodies
U.S. Government	1. Leverage and rethink AGOA as the basis for a trade deal for the United States to source transition minerals from African countries to achieve U.S. supply chain security and development of value chains for African countries	<ul style="list-style-type: none"> ▪ U.S. House of Representatives Subcommittee on Africa ▪ U.S. Trade Representative ▪ National Security Council ▪ Department of Energy ▪ Department of Treasury
	2. Extend an offer of membership in the Mineral Security Partnership to select African countries, with a complementary investment promotion strategy for implementation	<ul style="list-style-type: none"> ▪ Bureau of Energy Resources (Department of State) ▪ Department of Commerce ▪ Prosper Africa (U.S. Agency for International Development) ▪ U.S. Trade and Development Agency ▪ U.S. African Development Foundation ▪ U.S. International Development Finance Corporation
	3. Fund and support the takeoff of the AMDC as a world-class center of excellence for natural resources management	<ul style="list-style-type: none"> ▪ U.S. Geological Survey ▪ Bureau of Energy Resources (Department of State) ▪ Energy Information Administration ▪ U.S. Agency for International Development
African Governments and Regional Organizations	4. Invest in repositioning African domestic (national, regional, and pan-African) energy R&D, data, and analytics institutions	<ul style="list-style-type: none"> ▪ African Minerals Development Centre ▪ African Union Development Agency – the New Partnership for Africa’s Development ▪ African Natural Resources Management and Investment Centre ▪ African Union
	5. Empower the African diplomatic corps in the United States to better engage American policy and the private sector to participate in clean energy supply chains	Individual African governments
Nongovernmental Actors	6. The U.S. private sector should make the business and strategic case to the U.S. government for policy and regulatory carveouts to enable the sourcing of processed transition minerals from Africa	<ul style="list-style-type: none"> ▪ Corporate Council on Africa ▪ U.S. Chamber of Commerce ▪ Presidential Advisory Council on Doing Business in Africa
	7. In addition to funding the uptake of final consumer products, corporate philanthropies should invest in enabling upstream value-chain development in Africa for these clean energy technologies	<ul style="list-style-type: none"> ▪ Global Energy Alliance for People and the Planet ▪ Climate Works ▪ Individual corporate philanthropies
	8. Scholars should identify and bridge knowledge gaps on clean energy value-chain development in Africa by conducting country-level and subregional analyses	<ul style="list-style-type: none"> ▪ Individual researchers ▪ Policy institutes, universities, think tanks

U.S. Government

The United States should seriously consider African countries as suppliers of processed transition minerals to feed into low-carbon technology hardware and as partners in new vistas of R&D, and the data and analytics underpinning low carbon economic pathways. As discussed in previous sections, since the U.S. engagement in Africa's minerals sector, with the exception of South Africa, has been much lower compared to that of Europe and increasingly China, there is a significant growth potential in the U.S.-Africa minerals trade through a three-pronged approach.

Leverage and rethink AGOA as the basis for a trade deal for the United States to source transition minerals from African countries.

The objective of expanding U.S.-Africa trade in transition minerals that are in short supply in the United States should provide a new imperative for reauthorizing AGOA. As discussions around the future of AGOA pick up, the potential of growing the U.S.-Africa trade in transition minerals should provide a new imperative for its reauthorization as the basis for negotiating a new economic partnership. To that effect, the process of reauthorizing AGOA needs powerful champions within the U.S. government. These champions could include the newly recast **U.S. House of Representatives Subcommittee on Africa**, the **U.S. Trade Representative**, and the **National Security Council** staff who recognize the importance of expanding trade with African countries in transition minerals and, more broadly, forging a new U.S.-Africa economic partnership in a more competitive geopolitical environment.

AGOA champions should convey clearly to the U.S. House Ways and Means Committee, the congressional entity with jurisdiction over AGOA, the new merits for reauthorizing the program. It will be crucial to employ data and analysis to convey AGOA's successes and shortcomings today, the opportunities ahead, and the instruments to use in realizing this objective of growing U.S.-Africa transition minerals trade. The AGOA champions should work with advocates outside the U.S. government, especially business groups such as the U.S. Chamber of Commerce, the Corporate Council on Africa, the Presidential Advisory Council on Doing Business in Africa, and the President's Advisory Council on African Diaspora Engagement in the United States. They should also ally with think tanks that have the expertise, know the landscape, understand the market dynamics, and use data and analytics on AGOA's strengths and weaknesses.

The task for the AGOA champions is on two fronts: within the framework of these clean energy legislations, especially the IRA, and in the text of the AGOA reauthorization bill. With respect to the clean energy legislations, advocacy is needed for regulations that facilitate the expansion of U.S.-Africa minerals trade. On this front, it would be essential for AGOA champions to work with the **U.S. Departments of Energy and Treasury to develop regulations that extend some of the tax and investment credits in the IRA—specifically, to allow U.S. battery and EV companies to source minerals from African producers.**

Treasury guidelines that allow vehicles assembled in the EU to qualify for the EV tax credits (provided they are leased, not purchased, by consumers) could serve as a model.⁴⁷ Because the design of regulations that operationalize the text of legislation is a continuous process, there is ample scope for defining guidance that allow U.S. companies to source both raw and processed minerals from African countries.

In considering elements of AGOA reauthorization, specific enhancements can be made to the text of the bill to enable an expansion of U.S.-Africa trade in transition minerals.

A model worth emulating is the new CMA, a focused agreement negotiated between the USTR and a partner country as a response to the constraints on EV batteries contained in the IRA. The first ever CMA was concluded with Japan on March 28, 2023, building on a 2020 limited trade deal, the U.S.-Japan Trade Agreement. There are negotiations underway on CMAs with the EU, the United Kingdom, Indonesia, and the Philippines.⁴⁸ Like Japan, Africa has a limited trade preference initiative with the United States, and AGOA could be the basis for a future CMA. In fact, AGOA provides an even stronger rationale for such a CMA because it already includes strong governance provisions that make access to the U.S. market conditional on meeting specific governance and human rights criteria. Therefore, as discussions around AGOA reauthorization continue, a key enhancement should be the incorporation of a CMA to the new congressional bill and ensuring that countries that do succeed by becoming high-income are not graduated out of the program but retained as mature trade partners.

Extend membership in the Mineral Security Partnership to African countries with a complementary investment promotion strategy for implementation.

The U.S. government should extend an offer of membership in its Mineral Security Partnership (MSP) to African countries, some of which are among the largest producers of specific minerals such as DRC with cobalt, Guinea with iron ore, South Africa with the platinum group of metals, and Zambia with copper. The MSP is the flagship **U.S. State Department** initiative focused on transition minerals with the aim of ensuring they are being “produced, processed, and recycled in a manner that supports the ability of countries to realize the full economic development benefit of their geological endowments.”⁴⁹ Current members include Australia, Canada, Finland, France, Germany, Japan, Korea, Sweden, the United Kingdom, the United States, and the EU, and more recently India. The United States should extend invitations to African countries, beginning with a few pilots such as DRC, Ghana, Zambia, and South Africa, and eventually extending to the AU, like the EU.

In expanding the MSP to include African countries, the U.S. government should incorporate a concrete private sector investment strategy for its implementation. This investment will require a more regional approach to such partnerships that also aligns with the priorities of African countries on regional integration and on domestic processing of these commodities before their exports. The continent is moving toward economic and trade integration with the African Continental Free Trade Area (AfCFTA) and integrating

even faster at a subregional level in the East African Community (EAC), Southern African Development Community (SADC), and the Economic Community of West African States (ECOWAS). To deliver results, the U.S. government should go with the grain of these African regional integration initiatives in designing and implementing mineral investments and security partnerships that also align with African aspirations for developing regional value chains around transition minerals processing and battery assembly. The task of extending the MSP to include African countries lies in large part with the Bureau of Energy and Natural Resources at the **U.S. State Department**, which oversees the program as well as the December 2022 MoU with DRC and Zambia to develop a battery minerals value chain.⁵⁰

With its correct emphasis on high standards in building minerals supply chains, the MSP should also specify how it plans to court and promote private sector investments.⁵¹ **Specifically, it should help identify, for the private sector, opportunities in the mining value chain in Africa and specify the kinds of support that the U.S. government can provide so that there is a concrete alternative to the elaborate networks of Chinese investments in the mining sectors of African countries.** Such support can include the deployment of **Commercial Officers from the U.S. Department of Commerce** working closely with **Prosper Africa** to specific countries and subregions (for instance, DRC, Tanzania, and Zambia in southern Africa, and Ghana, Mali, and Guinea in West Africa). These commercial officers can help scope out opportunities for the U.S. private sector to engage in higher-productivity activity in the mining value chain such as processing, refining, and elements of battery assembly in African countries and develop investment profiles of these subregions for downstream mineral processing in collaboration with the African regional economic communities. Prosper Africa and the Department of Commerce can also organize investment promotion activities, such as trade fairs and road shows, within the United States to showcase the commercial opportunities for American businesses in the transition minerals value chains on the continent.

Given the emphasis on minority-owned businesses in the IRA and other legislation, these investment promotion activities should also leverage the large diaspora, including formal entities such as the President's Advisory Council on African Diaspora Engagement in the United States. Other agencies should also be involved in this investment strategy. These include the **U.S. Trade and Development Agency** to provide project preparation support, **the U.S. African Development Foundation** to provide grants to small businesses in African countries that can supply input to large multinational conglomerates in the mining and clean energy value chains, and the **U.S. Development Finance Corporation** to provide equity and debt financing to support large-scale American companies in entering the African market.

Fund and support the African Minerals Development Centre to become a world-class center of excellence for natural resources management.

There is a compelling rationale for the United States to support the AMDC as the continent's center of excellence for analytics, advisory, and technical assistance on the mining sector.

The AMDC is, on paper, the AU's technical institution mandated to coordinate the implementation of the AMV of 2009 and more broadly, the realization of the Africa Commodities Strategy. However, it has not taken off since then owing to constraints around the slow pace of ratification of the treaty, lack of funding and more broadly, a lack of political commitment. Consequently, the African continent with nearly twenty mineral-dependent exporters has no coordinating agency for these resources that is adequately equipped to support countries in navigating the rising global demand for transition minerals. This gap presents a unique opportunity for the United States to step in—in a space where it previously has not engaged heavily—to help stand up the AMDC as an entity that provides thought leadership, collects vital data, generates relevant analytics, coordinates peer learning, and advances policy reforms to attract investments from U.S. companies. All of these elements would drive the value addition that African mineral producers aspire to obtain and enable them to be crucial partner entities for the United States to meet its supply chain security objectives. The Critical Minerals Mapping Initiative—already an international effort—could serve as a basis for this USGS-AMDC collaboration. This is also an opportunity for the United States to deploy tried, tested, and successful instruments of technical assistance from its foreign policy toolbox to advance the strategic priority around its mineral supply security through mutually beneficial partnerships with Africa, and therefore provide a crucial soft power boost.

The support for the take-off of the AMDC as an effective AU agency for transition minerals can draw on a previously successful American effort to stand up the African Centres for Disease Control and Prevention (Africa CDC). From 2013, the AU had plans to establish an Africa CDC that would act as a one-stop shop for data and analytics on the continent's health security and also reinforce countries' capacities for preventing and dealing with epidemics such as Ebola and meningitis. The Ebola epidemic in West Africa in 2014 prompted the AU to fast-track the center. The U.S. secretary of state and the chair of AU Commission signed a Memorandum of Cooperation (MoC) in 2015 to establish the basis for the partnership.⁵² The United States provided technical assistance, embedded experts, and deployed staff to work alongside the organization, and provided funding to support Africa CDC activities and staffing. The role of the Africa CDC in coordinating member states' responses to the coronavirus pandemic with timely sharing of data was globally applauded. At the 2022 U.S.-Africa Leaders Summit, a new MoC was signed that renews and expands the U.S.-Africa partnership on the Africa CDC.⁵³

Like in 2014 when the Ebola epidemic galvanized the AU and the United States to collaborate on the setting up a functioning Africa CDC, the rising demand for transition minerals to build clean energy hardware in a more competitive geopolitical landscape should propel a new U.S.-Africa partnership around the AMDC. What might be the tangible components of such a partnership to get the AMDC up and running?

Drawing on the successful model of U.S. support for establishing the Africa CDC, the following initial steps can be taken to set up the AMDC. The first step is to identify the U.S. government counterpart agency that will anchor this partnership with the AMDC.

The USGS, with its mandate around geological surveys and mapping, is a likely candidate.⁵⁴ Next, the United States and the AU should set up and sign a high-level MoC. The signatories should be a U.S. cabinet-level secretary from either the **Department of the Interior** or the **Department of State** and the chair of the AU Commission. The signatories will then make a high-level announcement of the political commitment for such a partnership. The MoC will also spell out the essential basis for cooperation in terms of the types of support to be provided, knowledge exchange, technical assistance, standards for compliance, and financing mechanisms, if applicable. Once this MoC is signed, an initial step toward implementation on the U.S. side could be to set up a working group composed of various entities, such as the **Bureau of Energy and Natural Resources, Bureau for African Affairs at the State Department, the Energy Information Administration, and the U.S. Agency for International Development**. On the African side as well, a working group convened by the AMDC alongside several pilot countries, such as DRC, Ghana, South Africa, Namibia, and Tanzania, could advance implementation. Finally, the USGS can provide technical assistance to the AMDC by seconding and colocating two to five experts at the AU to serve as long-term technical advisors to the AMDC. The USGS could also consider supporting fellowships for ten African geologists and mineral economists selected from a number of pilot countries to eventually staff the AMDC upon completion of their program.

African Governments and Regional Organizations

There is a lot at stake for African countries in the new U.S. clean energy supply chains. To harness these investments, trade, and data and analytics opportunities along these entry points (which are not the traditional aid, poverty reduction, and humanitarian programs), African countries must reorient aspects of their engagement with the United States. This reorientation would entail investing in their domestic R&D institutions, employing more dynamic approaches to understanding the U.S. government policy landscape—including mapping the congressional committees with relevant jurisdictions and select executive agencies—and through continuous outreach to the U.S. private sector.

Invest in repositioning domestic (national, regional, and pan-African) energy R&D and data and analytics institutions.

African countries must invest in strengthening their domestic policy R&D institutions to be effective counterparts to join the R&D, data, and analytics ecosystem of U.S. clean energy industries. Take the continent-wide pan-African institutions, for instance. In addition to the AMDC, there is the **African Union Development Agency – the New Partnership for Africa’s Development (AUDA-NEPAD)**, whose mandate is to “strengthen capacity of African Union Member States and regional bodies, advance knowledge-based advisory support, undertake the full range of resource mobilization and serve as the continent’s technical interface with all Africa’s development stakeholders and development partners.”⁵⁵ The **African Natural Resources Management and Investment Centre** at the African

Development Bank has a mandate to assist African countries to maximize development outcomes derived from natural resources by providing “practical knowledge and expertise, advisory services, technical assistance and advocacy for improved and transparent management.”⁵⁶ These crucial continent-wide organizations should provide the thought leadership and technical assistance to member states, be repositories of critical data and analytics on natural resources, and identify viable low-carbon economic pathways for the continent.⁵⁷

At least three actions are needed to position these pan-African R&D institutions to be effective counterparts to the U.S. public sector partners. **First, there should be a clear definition of the organizations’ statutory and operational mandates—which may entail, in some cases, a refresh of these mandates.** This was the case for the AUDA-NEPAD, whose mandate was redefined and updated in 2018 after a lull in its activities that lasted over a decade. Both the AMDC and its underlying guiding document, the AMV, may need such a refresh to be better positioned for helping the continent manage the rising global demand for transition minerals. This updated mandate should secure the high-level buy-in of the major mineral producers to start, and then extend to all AU members. As of July 2022, only three of fifty-five African countries had ratified the statute establishing the AMDC in 2016.⁵⁸ This needs to change. This overhaul of the pan-African organizations with a mandate on natural resources should also extend to their human resources management, especially around meritocratic hiring procedures and clearer performance metrics.

Second, these organizations need increased, stable, and sustained funding to effectively execute their mandates. It is an open secret that African research organizations tend to be poorly funded, often relying on unpredictable external donor grants for their daily operations. The AMDC, for instance, is “financed by the European Commission and UNDP [United Nations Development Programme] and implemented by UNDP at the request of the Organization for African, Caribbean and Pacific States.”⁵⁹ To overcome these financial constraints, these organizations need statutory funding that can be sourced from member state contributions, as well as soliciting contributions from the thirty sovereign wealth funds in the mineral-rich countries that would be immediate beneficiaries of the organizations’ services. Other funding sources can include African corporate philanthropies from the large middle-income economies. Finally, these organizations should establish dedicated divisions devoted to tracking trade, investment, and research partnership initiatives with the United States and other partners around clean energy supply chains. These tracking efforts can cover the AGOA and Prosper Africa, for instance, as well as manage partnerships with entities such as the USGS and EIA.

Empower the African diplomatic corps in the United States to better engage with U.S. policy and the private sector on clean energy supply chains.

African governments do not always have a good understanding of the U.S. policy landscape in large part because they do not adequately equip their diplomatic representatives in the United States. Consequently, with some exceptions, these diplomats are not always at the

forefront of advocacy for African policy issues in Washington, D.C. They often are caught off-guard on crucial policy shifts, not for lack of interest or intention but because they often are not adequately empowered by their home governments.

This situation can be remedied in the following ways. **At the level of individual country embassies, there should be a competent cadre of political and economic counselors—preferably staffed by two separate individuals or teams—who actively map and maintain dynamic relations with the crucial U.S. government individual and organizational actors beyond their country desk officers.** For clean energy supply chains, this mapping should include the various agencies at the Department of State, Department of the Interior and its constituent agencies, Department of Treasury, Department of Commerce, and USTR, among other executive entities. There should also be a mapping of members of the U.S. Congress, particularly those on committees relevant to Africa such as foreign affairs, energy, ways and means, and international development. The continent-wide organizations, specifically AMDC, ANRC, and AUDA-NEPAD, should second competent liaison officers to Washington, D.C., at the AU's Representational Mission to nurture vital relationships and monitor the relevant initiatives that help advocate for Africa in this emerging U.S. clean energy policy ecosystem.

This political and economic engagement by African diplomatic representatives must go beyond the federal government to the U.S. states as well as the private sector. American multinationals that African countries may want to court to invest in transition minerals extraction, processing, and refining often are headquartered across the fifty states. Some state governments seek to cultivate relationships with African countries and cities for specific reasons, for instance, the city of Los Angeles is currently developing an Africa outreach strategy. African diplomats should seek to fully utilize sister city partnership programs where relevant, especially in cases where the relevant states host national science labs that are receiving grants for clean energy R&D. **Finally, African diplomatic representatives should leverage a variety of nongovernmental actors to advocate for their cause.** These include the African diaspora in the private sector, given the emphasis on minority-owned business as key beneficiaries of specific provisions in the U.S. clean energy legislations. An important entity on this front could be the President's Advisory Council on African Diaspora Engagement in the United States. The political and economic counselors in African embassies should also seek to develop dynamic relations with the U.S. private sector and, in particular, the relevant business associations such as the Corporate Council of Africa and the U.S. Chamber of Commerce.

Nongovernmental Actors

Nongovernmental actors also have an important role to play in advancing a U.S.-Africa partnership in clean energy supply chains. These nongovernmental actors include the private sector, nonprofits, philanthropies, and scholars/academics.

The private sector should make the business and strategic case to the U.S. government for policy and regulatory carveouts to enable sourcing transition minerals from Africa.

Segments of the U.S. private sector that understand the commercial opportunities in Africa should make a strong business case for the sourcing of transition minerals from the continent. This is a role suited to individual companies as well as business associations such as the **Corporate Council on Africa** as well as the **U.S. Chamber of Commerce** and the **Presidential Advisory Council on Doing Business in Africa**. An articulation of this imperative should demonstrate the commercial gains to the United States and to African countries of sourcing transition minerals that African countries have in abundance as well as the strategic benefits to the United States of conducting some of the processing and refining of these commodities in African countries to be able to compete with similar in-country mineral processing initiatives by Chinese companies. The private sector—for example, via a working group convened by one of the business associations—should also identify the legislative, policy, and regulatory actions to be taken within the United States. These actions could include such as the necessary AGOA enhancements to facilitate transition minerals exports from African countries, and the regulations to be designed by the Department of Treasury to allow for U.S. companies sourcing input from African countries to qualify for the EV battery tax credits in the IRA and also provide input on the investment component of the MSPs. Finally, the private sector should communicate to African governments what they need to do to be able to attract U.S. investments in transitional minerals extraction, processing, and refining, including updated data and analytics and a more stable regulatory environment.

In addition to funding the uptake of final consumer renewable energy products, corporate philanthropies should invest in enabling upstream value-chain development in Africa for clean energy technologies.

A growing number of corporate philanthropies are funding the uptake of renewable energy and other clean technologies across Africa to achieve multiple goals of increasing electricity access, mitigating greenhouse gas emissions, and carving a new low-carbon growth pathway. The Global Energy Alliance for People and the Planet and Climate Works are both examples of consortia of major corporate philanthropies in the United States that support the shift to a clean energy future in developing countries and the scale-up of technology and policy solutions to address the climate challenge.⁶⁰ These philanthropies can be crucial partners in supporting African economies to join U.S. clean energy supply chains in various ways. **In the United States, they can provide grant funding in partnership with U.S. government agencies to facilitate private investments (for instance, through project preparation support) for mineral processing and refining in African mineral-rich countries destined for the American market.** On the African continent, **corporate philanthropies can provide grant funding to strengthen the domestic policy research and development institutions,** as discussed in 2(a) above at the continent-wide, subregional, and national

levels. **They can also provide seed capital to African small and medium-sized enterprises in the mining value chain, such as local companies engaged directly in the sector or those that supply goods and services to large multinational mining companies.**

Scholars should identify and bridge knowledge gaps on clean energy value-chain development in Africa by conducting country-specific and subregional analyses.

The entry points identified in this study may need to be distilled further for specific countries (for example, the DRC, Ghana, Namibia, South Africa, Zambia) and subregions (for example, EAC, ECOWAS, SADC). Individual scholars and political risk consultancies can provide policy-relevant insights by drawing on case studies as well as comparisons with other mineral-rich middle-income economies such as Chile and Indonesia. The high-level policy commitments called for above are a critical first step, but actually ensuring successful initiatives will require detailed technical analyses couched in both the physical and sociopolitical contexts of specific countries and subregions. Getting these details right, and ensuring the success of early programs, will be important for generating and sustaining momentum for further action.

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Annex 1: Detailed Legislative Provisions Across the Three Entry Points into U.S. Clean Energy Industries

Activity	Legislative Directive	Budget (if applicable)	Implementing Agency	Source Legislation
Battery Material Processing Grant Program	<p>Establishment of a Battery Material Processing Grant Program to provide grants of minimum \$50 or \$100 million to entities seeking to carry out demonstration projects, upgrade current facilities, or construct new battery material processing centers within the United States. Priority will be given to U.S. entities (defined as “institutions of higher education, national labs, nonprofit or for-profit private entities, state and local governments, or consortia of these”). The program objective is to ensure a viable supply of battery materials in North America, enhance U.S. battery manufacturing capacity, and reduce reliance on foreign competitors for critical minerals and technologies. “Priority” (but not exclusive) consideration will be given to entities located and operating in the United States, those owned by a U.S. firm, those using North American intellectual property, and those using supplies that do not originate from a foreign entity of concern, among other factors.</p> <p><i>NOTE: “foreign entity of concern” means a foreign entity that is (A) designated as a foreign terrorist organization by the Secretary of State; (B) included on the list of specially designated nationals and blocked persons maintained by the Office of Foreign Assets Control of the Department of the Treasury (commonly known as the “SDN list”); (C) owned by, controlled by, or subject to the jurisdiction or direction of a government of a foreign country that is a covered nation (as defined in section 2533c(d) of title 10, United States Code); (D) alleged by the Attorney General to have been involved in activities for which a conviction was obtained under (i) the Espionage Act; (ii) section 951 or 1030 of title 18, United States Code; (iii) the Economic Espionage Act of 1996; (iv) the Arms Export Control Act; (v) section 224, 225, 226, 227, or 236 of the Atomic Energy Act of 1954; (vi) the Export Control Reform Act of 2018; or (vii) the International Emergency Economic Powers Act (50 U.S.C. 1701 et seq.); or (E) determined by the Secretary, in consultation with the Secretary of Defense and the Director of National Intelligence, to be engaged in unauthorized conduct that is detrimental to the national security or foreign policy of the United States.</i></p>	\$3 billion	Department of Energy (Office of Manufacturing Energy Supply Chains)	Bipartisan Infrastructure Investment and Jobs Act

Activity	Legislative Directive	Budget (if applicable)	Implementing Agency	Source Legislation
Battery material recycling grant program	<p>Establishment of a Battery Manufacturing and Recycling Grant Program to provide grants of minimum \$50 or \$100 million to entities seeking to carry out demonstration projects for advanced battery and battery component manufacturing and recycling; construct new commercial-scale advanced battery component manufacturing, advanced battery manufacturing, or recycling facilities in the United States; and to retool, retrofit, or expand existing U.S. facilities determined qualified by the Secretary for advanced battery and battery component manufacturing and recycling. “Priority” (but therefore not exclusive) consideration is given to entities located and operating in the United States; owned by a U.S. firm; using North American intellectual property; or using supplies that do not originate from a foreign entity of concern, among other factors.</p> <p>NOTE: “foreign entity of concern” is defined as above.</p>	\$3 billion	Department of Energy (Office of Manufacturing Energy Supply Chains)	Bipartisan Infrastructure Investment and Jobs Act
Advanced Energy Manufacturing and Recycling Grant Program	<p>Establishment of a grant program to support “advanced energy manufacturing and recycling,” which covers technologies related to renewable energy sources (such as solar, hydro, geothermal), EVs and charging stations, and electric grid system components. The grant program is targeted at medium sized firms and prioritizes former coal communities. The projects themselves can vary in nature but must either be establishing new facilities or retrofitting older ones. Prospects of commercial viability are also considered.</p>	\$750 million	Department of Energy (Office of Manufacturing Energy Supply Chains)	Bipartisan Infrastructure Investment and Jobs Act
Critical Mineral Research Facilities	<p>Creation of two mineral research facilities—the U.S. Geological Survey (USGS) Energy and Minerals Facility (\$167 million) and Rare Earth Elements Demonstration Facility (\$140 million)—with the mandate to demonstrate commercial feasibility of integrated rare earth element extraction, separation, and refining.</p>	\$307 million	Department of the Interior (USGS); Colorado School of Mines; Department of Energy (Office of Manufacturing Energy Supply Chains)	Bipartisan Infrastructure Investment and Jobs Act

Activity	Legislative Directive	Budget (if applicable)	Implementing Agency	Source Legislation
EV Tax Credit Adjustment	<p>Reduction in the consumer tax credit for new clean vehicles if the critical minerals used in the batteries are not extracted, processed, or recycled in the United States or an FTA country, and applies the same penalty if the vehicle is not assembled in North America.</p> <p>The total consumer credit for “new clean vehicles” is \$7,500, broken into two equal (\$3,750) parts having to do with the value of the critical minerals used in the batteries and the value of the battery components manufactured or assembled in North America. To qualify for the critical mineral requirement, the percentages are based on the “value of the applicable critical minerals [in the battery] that were (i) extracted or processed in the US or [an FTA country] (ii) recycled in North America.” Presumably, this entails room for minerals extracted from African countries to qualify as long as they were processed or recycled in North America or an FTA country. The required percentage is 40 percent prior to 2024, and goes up 10 percent each year until capping out at 80 percent beginning 2027. To qualify for the battery components piece, the manufacturing or assembly must take place in North America. Prior to 2024, the relevant percentage of total value is 50 percent, and increases 10 percent each year until capping at 100 percent beginning in 2029. None of the critical minerals may have originated, nor can any processing have taken place, in a foreign country of concern. The program is set to expire in 2032.</p>	--	Internal Revenue Service	Inflation Reduction Act of 2022
Hydrogen Production Incentive Program	<p>Creates a ten-year incentive for clean hydrogen production with a multitier structure that encourages minimal CO₂ production throughout the generation lifecycle. The credit is calculated by multiplying the kilograms of clean hydrogen produced by a flat rate determined by the lifecycle CO₂ production used in generating the hydrogen. The rate is adjusted downward according to the following percentages based on CO₂ generation:</p> <p>20%: 2.5 < CO₂/kg < 4 25%: 1.5 < CO₂/kg < 2.5 33.4%: 0.45 < CO₂/kg < 1.5 100%: CO₂/kg < 0.45</p>	--	Internal Revenue Service	Inflation Reduction Act of 2022
Clean Energy Technology Production Tax Credits	<p>Creates a tax credit for the U.S. domestic production of clean energy technology components, including solar panels, wind turbine batteries, and the base critical minerals required.</p>	--	Internal Revenue Service	Inflation Reduction Act of 2022
Critical Minerals Subcommittee	<p>Establishment of a Critical Minerals Subcommittee of the National Science and Technology Council to advise on policy and coordinate federal efforts to ensure reliable supplies of critical minerals to the United States.</p>	--	National Science and Technology Council (Critical Minerals Subcommittee)	Bipartisan Infrastructure Investment and Jobs Act

Activity	Legislative Directive	Budget (if applicable)	Implementing Agency	Source Legislation
Processing, Development, and Recycling of Critical Minerals Grant Program	Establishment of a grant program for processing, developing, or recycling of critical minerals. Domestic entities receive priority, but foreign entities are also eligible, provided that they are not on the list of “foreign entities of concern.” Each individual grant is capped at \$10 million.	\$400 million	Department of Energy; National Science Foundation; Department of the Interior; Department of Commerce	Bipartisan Infrastructure Investment and Jobs Act
Research, Development, and Commercialization (\$40.07 billion)				
National Science Foundation Authorizations	Authorizes over \$80 billion to the National Science Foundation over the next five years, of which \$16.3 billion is earmarked for the Directorate for Technology, Innovation, and Partnerships.	\$16.3 billion	National Science Foundation	CHIPS and Science Act
Innovations in Battery Recycling Grants	Establishment of a series of grants focusing on innovations in battery recycling, including how to recover critical minerals. Some of these grants are only open to U.S. public entities, but one stream with a budget of \$60 million is open to private organizations and does not specify that these organizations need to be located/headquartered in the United States. These organizations are defined as “an industrial entity; a nonprofit organization; a manufacturing entity; private battery collection entity; a battery producer; a battery retailer; an entity operating one or more battery recycling activities.”	\$60 million	Department of Energy; Environmental Protection Agency	Bipartisan Infrastructure Investment and Jobs Act
EV Battery Recycling and Secondary Use R&D and Grant Program	Establishment of a program of research, development, and demonstration projects for EV battery recycling and secondary use applications (including scrapping for critical minerals). Includes a grant component for relevant private sector industries as well as the internal generation of a report on the current state of manufacturing and market opportunities in this space. Among the stated purposes of the program is to “establish alternative supply chains for critical materials that are found in electric drive vehicle batteries.”	\$200 million	Department of Energy	Bipartisan Infrastructure Investment and Jobs Act
EV Second Life Applications	Establishment of a project to demonstrate second-life applications of EV batteries to provide energy storage services to the electric grid.	--	Department of Energy (Office of Manufacturing Energy Supply Chains)	Bipartisan Infrastructure Investment and Jobs Act
Clean Hydrogen R&D Program	Establishment of a Clean Hydrogen Research and Development Program which, in collaboration with the private sector, will explore commercial use of clean hydrogen in the transportation, utility, industrial, and residential sectors. Activities include advancing the production of clean hydrogen from carbon capture utilization and sequestration systems, ethanol, biomass, and nuclear energy, among others.	--	Department of Energy (Hydrogen and Fuel Cell Technologies Office)	Infrastructure Investment and Jobs Act

Activity	Legislative Directive	Budget (if applicable)	Implementing Agency	Source Legislation
Bioenergy Research Centers	Authorizes the creation of up to six bioenergy research centers to accelerate research on advanced biofuels and bioenergy and help translate research results to industry.	\$180 million	Department of Energy (Bioenergy Technologies Office)	CHIPS and Science Act
Nuclear Energy Research	Additional funding support for nuclear energy research and advanced nuclear reactor (fission) research.	\$1.5 billion	Department of Energy	CHIPS and Science Act
Low-Emissions Steel Manufacturing	Created a DOE program of R&D and commercialization for low-emissions steel manufacturing; focus areas include carbon capture, smart manufacturing, and alternative materials.	--	Department of Energy	CHIPS and Science Act
Electricity Storage Research Initiative	Establishment of a program meant to ensure U.S. competitiveness in energy storage by fostering an ecosystem linking fundamental R&D to the deployment of storage solutions while minimizing the environmental impacts of energy storage technologies.	\$250 million	Department of Energy	CHIPS and Science Act
Carbon Materials Science Initiative and Carbon Sequestration Research and Geologic Computational Science Initiative	Establishment of a research initiative to expand the fundamental knowledge of coal, coal-wastes, and carbon ore chemistry useful for understanding the conversion of carbon to material products. The research program includes: (i) methods of extraction, processing, recycling, and utilization of the materials and valuable minerals contained in raw coal and coal-waste; (ii) methods of improving performance, cost, and availability of materials for use in carbon capture systems; (iii) unconventional pathways and materials for conversion of carbon dioxide molecules, minerals, and materials; (iv) gathering geologic data for pore space characterization, including improvements to geologic seismic imaging; (v) evaluating pore space quality, including evaluation of geologic samples, to determine appropriate sequestration zones for carbon; (vi) testing carbon sequestration; (vii) monitoring carbon migration in geologic formations; (viii) advancements in data analytics, including the analysis of seismic data, and computational science to improve the advanced computing, visualization, and imaging of geologic formations for the sequestration of carbon; and (ix) predictive understanding of coupled processes in complex subsurface geologic systems for secure carbon storage.	\$250 million	Department of Energy	CHIPS and Science Act
Foundation for Energy Security and Innovation	Establishment of a Foundation for Energy Security and Innovation affiliated with the DOE to engage with the private sector and raise funds that support the creation, development, and commercialization of innovative technologies that address tomorrow's energy challenges.	\$40.5 million	Department of Energy	CHIPS and Science Act
Regional Technology and Innovation Hubs	Calls for the creation of no fewer than twenty regional technology and innovation hubs in areas that are not currently tech centers for the purpose of job creation and expanding U.S. innovation capacity.	\$10 billion	Department of Commerce (collaboration with NIST and DOE)	CHIPS and Science Act

Activity	Legislative Directive	Budget (if applicable)	Implementing Agency	Source Legislation
Energy-Related Supply Chain and Key Technologies	Authorizes \$11.2 billion to the DOE to carry out research, development, and demonstration activities and address energy-related supply chain activities in key technology focus areas. Thematic areas include (among others) advanced manufacturing, industrial emissions reduction technology, grid modernization, and renewable power research.	\$11.2 billion	Department of Energy	CHIPS and Science Act
Clean Energy Technology University Prize Competition	Creation of a clean energy technology university price competition; a national clean energy incubator program; and a clean energy technology transfer coordination program.	\$95 million	Department of Energy	CHIPS and Science Act
Data and Analytics (\$320 million)				
Earth Mapping Resources Initiative	Establishment within the USGS of an Earth Mapping Resources Initiative with a mandate to accelerate the USGS mapping mission, with specific focus on critical minerals (as defined in section 7002(a) of the Energy Act of 2020).	\$320 million	Department of the Interior (USGS)	Infrastructure Investment and Jobs Act
Demand Modelling for Critical Minerals	In collaboration with the USGS, calls for demand modelling/forecasting of minerals used in the energy sector that could be designated as critical minerals. Assessment is intended to align analysis of demand with analysis of where minerals are produced, refined, and processed.	--	Department of Energy; Energy Information Administration; Department of the Interior (USGS)	Infrastructure Investment and Jobs Act
International Energy Data Resources	Expansion of the international energy data resources of the Energy Information Administration to further understanding of (among other objectives) the production and use of energy in various countries and the internationally changing patterns of energy use.	--	Energy Information Administration	Infrastructure Investment and Jobs Act
Alternative Fuel Vehicles Study	Commissioning of a study on emerging alternative fuel vehicles—characterized as a vehicle fueled by hydrogen, natural gas, or propane—and their support infrastructure.	--	Department of Transportation	Infrastructure Investment and Jobs Act
High-Friction Surface Treatment	Commissioning of a “high-friction surface treatment” study focusing on potential application of synthetic calcined bauxite.		Department of Transportation	Infrastructure Investment and Jobs Act

Notes

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