ISSUE BRIEF

USAID
FROM THE AMERICAN PEOPLE

GREEN ENERGY AND MINING: CHALLENGES AND OPPORTUNITIES

November 2021

Just as fossil fuels have been the backbone of global energy needs for over a century, several dozen minerals will make possible the green technologies of tomorrow's energy systems. Addressing the development challenges associated with mining is vital for a low-carbon future.

Photo credit: Pixabay

SUMMARY

***This Issue Brief summarizes the key findings of the report* Mining and the Green Energy Transition: Review of International Development Challenges and Opportunities (2021).**

If global warming is to be kept to two degrees by 2050, annual production of minerals like lithium, cobalt, and graphite will need to increase by up to 500% compared to today. The green energy transition is already having an impact on prices and mining investments in these and other minerals, including base metals vital to renewable energy like copper, nickel, and bauxite (aluminum). Recycling and circular economy approaches are vital but can offset only a part of projected demand.

Minerals used in green energy are mined across 70 USAID-presence countries. Top producers include the **Democratic Republic of Congo** (cobalt), **Indonesia** (nickel), **Guinea** (bauxite-aluminum), and **Chile** (copper and lithium). Speculation, exploration, and new mining is intensifying in dozens of other fragile countries, including **Madagascar** (chromium, nickel, cobalt, graphite, and rare earth elements), **Zimbabwe** (chromium, lithium, and copper), and **Burma** (rare earth elements).

Mining investments are long-term and often transformational in developing countries. The green energy mining boom affords new opportunities for revenue, infrastructure investment, and job creation. On the other hand, the boom could also lead to increased land and environmental conflicts, corruption, criminal activity, and human rights abuses.

Failure to leverage opportunities and address the myriad of challenges in mining will not only jeopardize USAID partner countries but also threaten the green energy transition globally. Conflicts, poor governance, and backlash by affected communities in producing countries could make it harder to develop new resources needed for green energy. This could slow the energy transition through supply bottlenecks and price volatility.

Moreover, mounting consumer and investor pressure in response to mining challenges like child labor, conflict, and environmental mismanagement could drive out investment from major companies, leaving only unscrupulous

actors to operate in fragile states, further exacerbating negative outcomes and creating sourcing challenges for green tech manufacturers and retailers.

Securing minerals for green energy requires a whole-of-supply-chain approach, especially considering China's dominance in mineral processing and manufacturing, and the growing involvement of both processors and manufacturers in mining investments and standard-setting. However, attention to and support of community- and country-level dynamics is critical in both major producing countries as well as in smaller emerging producers likely to be heavily impacted by the coming mining boom.

Development partners have often shied away from mining programming, but this is no longer a feasible option, and USAID can draw on its rich cross-sectoral experience addressing mining's development challenges across several dozen projects worldwide.

More explicit consideration of mining in country-level programming and multi-sectoral inter-agency approaches to climate change and green energy will help reduce risks for partner countries and leverage opportunities afforded by increased mineral demand. In this way, mining's vital role in the global effort to combat climate change can become better recognized and integrated into policy and action.

Table 1. Green energy minerals with highest projected demand increases by 2050 under 2-degree global warming[1]

Mineral	Green Energy Uses	Projected % increase from 2018 levels
Graphite		↑ 494%
Lithium		↑ 488%
Cobalt		↑ 460%
Vanadium		↑ 189%
Nickel		↑ 99%
Silver		↑ 56%
Rare Earth Elements		↑ 37%

KEY:
Environment · Labor & working conditions · Energy storage · Electric cars
Conflict · Land tenure · Wind · Geothermal
Governance · Economic growth · Solar

Table 2. Challenges and key USAID-presence producers associated with key green energy minerals

Mineral	Development Challenges	Key USAID countries
Graphite		Mozambique, Brazil
Lithium		Chile
Cobalt		Democratic Republic of Congo
Vanadium		South Africa
Nickel		Indonesia, Philippines
Silver		Mexico, Peru
Rare Earth Elements		Burma (Myanmar)

[1] Hund, K., La Porta, D., Fabregas, T., Laing, T., & Drexhange, J. (2020). Minerals for climate action: The mineral intensity of the clean energy transition. Pages 73 and 103. https://pubdocs.worldbank.org/en/961711588875536384/Mineral-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf

Table 3. Examples of development challenges associated with green energy minerals

Issue	Examples from green energy mining
	The chromium sector in **Kazakhstan** and **South Africa** have been marked by corruption and tax evasion. Iron has come under scrutiny for corruption in **Guinea**, with issues also in **Sierra Leone** and the **Republic of Congo**.
	Cobalt and copper in the **Democratic Republic of Congo (DRC)** has both child and forced labor. **South Africa's** mining sector (manganese, chromium, vanadium) have been marked by issues around worker rights.
	**Mozambique's** graphite mining is located in an area prone to terrorism. **South Africa** has been the site of mining-related violence (ilmenite-titanium ore). Community conflicts involving indigenous peoples are also documented in **Bolivia** (lithium) and **Guatemala** (nickel).
	Bauxite (aluminum ore) mining in **Guinea, Ghana, and Solomon Islands** are destructive for high conservation value areas. Nickel mining in **Indonesia** and the **Philippines** employs high pressure acid leading and deep-sea tailing dumps. The "lithium triangle" (**Chile, Peru, and Bolivia**) faces water stress due to high amounts used to process lithium from salt flats.

Table 4. Programming opportunities

Programming area
Policy dialogue, governance capacity-building, and reform. Build awareness and capacity to anticipate and plan for new mining; support inclusive policymaking and dialogue around mining; support supply chain transparency and governance initiatives nationally and internationally.
Transparency and anti-corruption. Support civil society and journalists to expose corruption and financial crimes involving mining; encourage disclosure and transparency standards; support multi-stakeholder governance and supply chain initiatives.
Environmental and social risk management. Support land-use planning and community land rights formalization; increase capacity for environmental monitoring and compliance; plan for and support policy to fund mine closure and post-mining development.
Formalization of artisanal and small-scale mining (ASM). Support policy and regulations adapted to small-scale sector; engage with communities and miners on reducing child labor; support dialogue and policy around coexistence of large and small-scale mining.

Table 5. Green energy mineral production in USAID-presence countries

(Countries with no current mining excluded; stars denote that the country is a current top producer of a given mineral)

* limited presence country	Aluminum	Chromium	Cobalt	Copper	Graphite	Iron	Lead	Lithium	Manganese	Molybdenum	Nickel	Silver	Titanium	Vanadium	Zinc	Rare Earths
Albania		✓		✓							✓					
Angola																✓
Armenia				✓						✓		✓			✓	
Azerbaijan				✓								✓				
Bolivia*				✓		✓	✓	✓	✓			✓			✓	
Bosnia and Herzegovina	✓					✓	✓								✓	
Botswana			✓	✓												
Brazil	✓	✓		✓	★	★	✓	✓	✓		✓	✓	✓	✓		✓
Burkina Faso												✓			✓	
Burma				✓			✓		✓		✓				✓	★

* limited presence country	Aluminum	Chromium	Cobalt	Copper	Graphite	Iron	Lead	Lithium	Manganese	Molybdenum	Nickel	Silver	Titanium	Vanadium	Zinc	Rare Earths
Burundi													✓			✓
Cameroon	✓															
Chile*				★		✓		★		★		✓			✓	
Colombia	✓			✓							✓	✓				
Côte d'Ivoire									✓		✓	✓				
Cuba		✓	✓				✓				✓				✓	
DRC			★	✓				✓				✓			✓	
Dominican Republic				✓							✓	✓				
Ecuador				✓								✓				
Ethiopia												✓				
Gabon*									★							
Georgia				✓					✓							
Ghana	✓							✓	✓			✓				
Guatemala							✓				✓					
Guinea	★					✓								✓		
Guyana	✓															
Honduras							✓					✓			✓	
India	✓	✓		✓	✓	✓	✓		✓			✓	✓		✓	✓
Indonesia	✓		✓	✓		✓	✓		✓		★	✓			✓	
Jamaica	✓															
Kazakhstan	✓	★		✓		✓	✓	✓	✓	✓		✓	✓		✓	
Kenya									✓				✓			
Kosovo							✓				✓				✓	
Kyrgyz Republic				✓								✓				
Laos				✓		✓						✓				
Liberia						✓										
Madagascar		✓	✓		✓						✓		✓			✓
Malawi													✓			✓
Mali								✓				✓				
Mauritania				✓		✓										
Mexico		✓		✓	✓	✓	✓	✓	✓	✓		★			✓	
Mongolia				✓		✓	✓			✓		✓			✓	
Montenegro	✓						✓								✓	
Morocco			✓	✓			✓					✓			✓	
Mozambique	✓				★								✓	✓		
Namibia			✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓
Nicaragua												✓				
Nigeria						✓	✓								✓	
North Macedonia				✓			✓					✓			✓	
Pakistan	✓	✓		✓	✓	✓	✓								✓	
Panama				✓								✓				
Papua New Guinea*			✓	✓							✓	✓				
Peru				★		✓	★	✓	✓	✓		★			★	
Philippines		✓	✓	✓							✓	★				
Republic of the Congo						✓										
Senegal						✓						✓	✓			
Serbia															✓	
Sierra Leone	✓					✓							✓			
Solomon Islands*	✓															
South Africa		★	✓	✓		✓	✓		★		✓	✓	★	★	✓	
Sri Lanka					✓								✓			
Sudan		✓														
Tajikistan				✓			✓					✓			✓	
Tanzania	✓			✓								✓				
Thailand						✓										✓
Ukraine						✓			✓				✓			
Uzbekistan				✓	✓		✓			✓		✓			✓	
Vietnam	✓	✓		✓	✓	✓	✓		✓				✓		✓	✓
Zambia			✓	✓					✓		✓					
Zimbabwe		✓	✓	✓	✓			✓			✓					