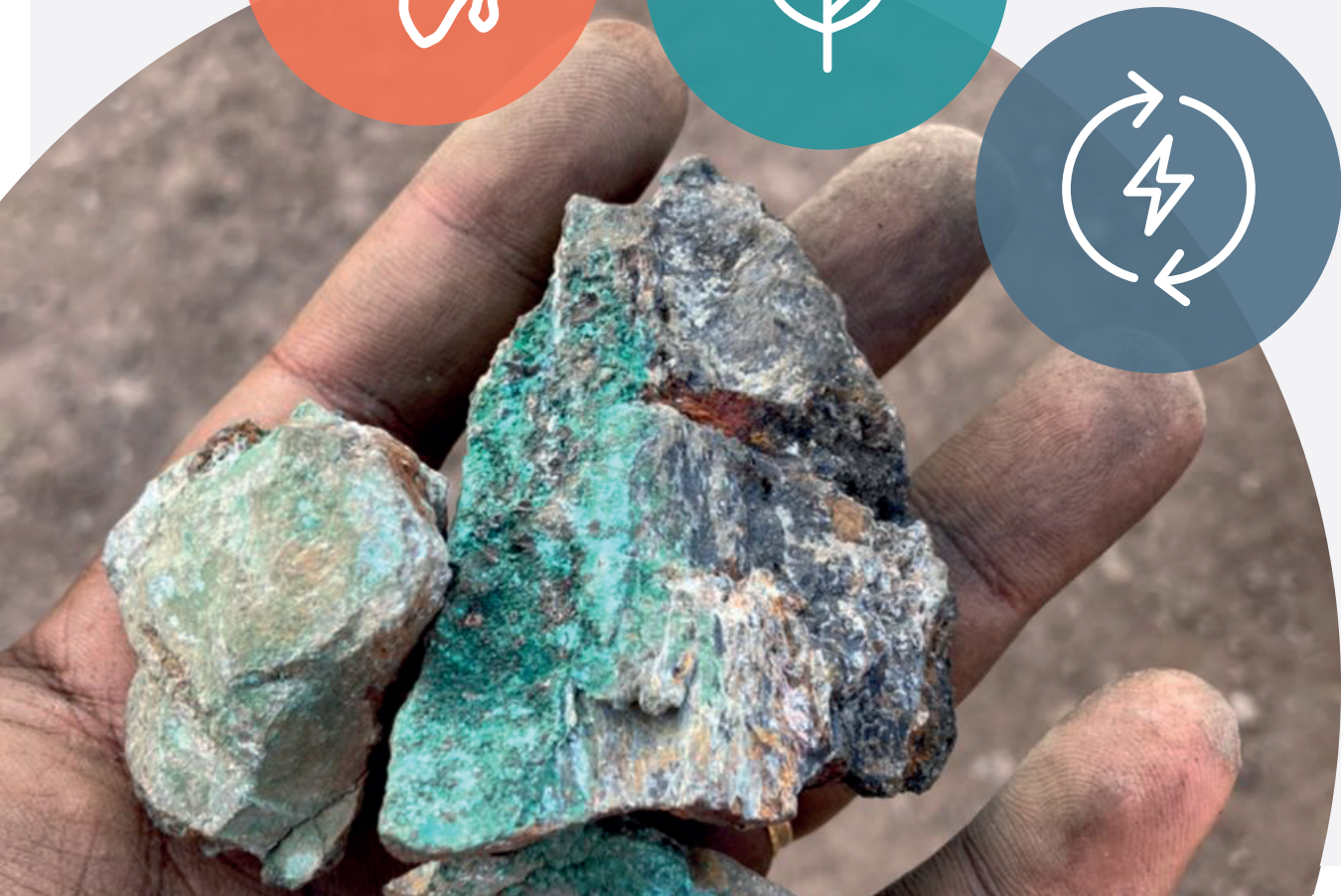



Triple Win

How Mining Can Benefit Africa's
Citizens, Their Environment and
the Energy Transition





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Cover page: Cobalt mining, Congo

This page: Tsavo East National Park Kenya, Kenya: Photo by Damian Patkowski on Unsplash

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Key messages

- **Africa's metals are essential to the rapid transition of energy systems away from fossil fuels.** Africa holds 19 percent of the global reserves of metals required to make a standard battery-powered electric vehicle. The continent has at least a fifth of the world's reserves in a dozen minerals that are critical for the energy transition.
- **This time must be different.** Africans have not benefited sufficiently from mining in the past, and mining has led to deforestation and pollution. The mining industry has contributed eight percent of total government revenues in the 15 most mining-dependent African economies but has generated few opportunities for African businesses in supplier segments and value chains using the minerals. Furthermore, globally, the metal mining industry contributes 10 percent of emissions on average and indirectly causes seven percent of deforestation.
- **A triple-win is possible and necessary.** A better deal for Africans will help reduce risks for investors, and support global industry efforts to secure more metals. While protecting the environment from mining will ensure efforts to move to a more sustainable way of life are not in vain. Mining governance must work for each of African citizens, the environment and the energy transition if it is to work for any of them.
- **Time is of the essence.** There are only 28 years remaining until countries representing two-thirds of the global economy aim to have "net zero" emissions, yet it takes on average 17 years for the mining industry to develop a mineral discovery and start production.

- **Success doesn't require "reinventing the wheel."** Numerous existing policy approaches will help. Seven stand out that require the combined action of international and regional authorities, companies and governments:



Establish "no-go" environmental zones



Support the development of African suppliers to mining companies



Fund geological surveys



Transfer knowledge



Develop value chains, including those that will benefit Africa's own energy transition



Coordinate across the region



Fund renewable energy for mining, processing and battery production

- **These won't work unless the foundations of governance are in place.** This means improved governmental capacity to design and implement policies, and transparent, accountable, and corruption-free governments and companies. Seventy percent of African countries with transition mineral reserves rank in the bottom half of indices measuring corruption. While only 16 percent of current producers systematically disclose all or most mining contracts.

A triple win for Africans, their environment and the energy transition

The world faces three related challenges. First: To stop average global temperatures from rising by more than 1.5 degrees, or at least well below 2 degrees, humankind must accelerate the ongoing transition from fossil fuel energy to renewable energy. Second: Governments of countries constituting two-thirds of the world economy aim to reach net zero emissions by 2050, only 28 years from now. Last: The technologies needed for the transition are metal-intensive, and so transition requires a significant expansion in metal supply.¹

However, mining and processing these metals creates two further challenges. These industries themselves emit large amounts of carbon dioxide, and cause deforestation and local pollution. It is in humanity's interest to ensure that this destruction does not counteract the climate benefits of energy transition.

Also, many of the mineral reserves needed for the energy transition are in Africa.² The history of mining in Africa is riddled with injustices, and few Africans can claim to have benefited from mineral extraction. Without further policy change, this will continue. Africans will see their minerals used to decarbonize the economies of wealthier countries and will not themselves benefit from the extraction—all while enduring some of the worst impacts of climate change. African officials and civil society actors have made clear that mining must change to benefit Africans in mineral-rich countries.

Meeting African demands is in the interest of energy transition industries and humanity more broadly. Mining companies must invest more in getting minerals out of the ground and processing them but have been reluctant so far.

This is because they have sought to avoid oversupplying markets and causing a slump, are uncertain of the pace of the energy transition, and wary of the risks of operating in parts of Africa.³ But mining companies can reduce these risks by forging better deals with mining countries to create more harmony between the governments, businesses and various parties involved in mining and the various industries producing technologies for the energy transition.

This is a “triple-win,” a set of policies to ensure that:

- people in African mining countries benefit from mining
- the global transition benefits from an increased supply of metals
- mining damage to the environment and communities is minimized and mitigated so that pursuing the transition is worthwhile

Furthermore, any one party only benefits if everyone else wins too. Cooperation is key.

How to achieve a triple win

Fortunately, this does not require a complete revolution in how governments and companies govern and operate within the mining sector. Officials, executives, and civil society actors know well and agree upon the broad areas of required policy.⁴ However, some changes to these established governance programs are still needed. This is to address four emerging problems.

First, development partners should identify successful approaches and fund and scale these across the continent, rather than reducing funding for economic development programs to focus on more explicitly climate-related work.

Second, African governments, with the support of development partners, must close the gap between policies and their implementation; many countries have passed quality policies but failed to implement them.⁵

Third, global powers have heightened concerns around energy security and increased awareness of the economic clout that dominance of clean energy technologies will provide. Government leaders are scrambling to create national renewable energy and e-mobility industries in China, Europe and North America. This has changed the parameters that climate donors and development partners must work within.⁶

Fourth, there is a dilemma between increasing mineral supply to meet climate goals and improving governance, an often decades-long process. Companies have exacerbated this by wanting to profit from current high prices, whilst also calling for speed in the name of addressing the climate crisis.⁷ While governments in mining countries fear missing out on the current boom in demand for their metals.

The race between the industrialized countries to develop their own industries to produce energy transition technologies and the urgency in preventing further catastrophic climate change puts low-income mining countries in a strong position to demand more benefits.⁸ But it could also encourage people with the power to make these decisions to strike backroom deals and fast-track extraction. Such impatience has previously worsened governance in the long-run and resulted in fewer benefits for citizens and more risks for companies.

The world therefore needs a rapid improvement in mining governance. Yet, in the past, donor programs have sometimes failed to achieve governance goals by pushing them too rapidly.⁹

Despite these challenges, all parties share an interest and have the potential to implement a triple-win deal. Climate policy makers in governments meeting at COP27; donors and international finance institutions in both the climate and development space; international authorities and African regional authorities (such as the African Union and African Development Bank); mining companies, energy transition technology industries and their investors (who are particularly incentivised to think short-term); governments in mining countries in Africa who owe a better deal to their people:

Humanity cannot afford to repeat the mistakes that have beset Africa's mining in the past. To achieve a triple win, this time must be different.

Policies for a mining triple win



A triple-win in mining is exemplified in the following seven policy recommendations, derived from the huge breadth of studies on these subjects. The remainder of the report gives details and additional recommendations. These ideas require further study but can form an agenda for discussion among various stakeholders and could inform the African Green Minerals Strategy and implementation of the Africa Mining Vision.



1. Establish mining no-go zones

Once prospectors discover reserves, companies and governments are subject to strong incentives to develop them. Once a mine is developed, environmental protection is typically weak. To prevent environmental destruction, governments should establish areas in which exploration is unlawful. These areas should include not only UNESCO World Heritage Sites, but vast tracts of forest and areas of valuable biodiversity. To create the incentive to maintain these zones, donors should link them with global financing, such as the funding that a group of them have committed to protecting the Congolese forests. Donors should predicate other policies recommended here on the condition that mining, processing plants and other linked industries are never established in a no-go zone.



2. Fund geological surveys

To expand Africa's mineral reserves, donors should fund surveys to reduce geological risk. The World Bank and others already fund such surveys, but more funding is needed. These surveys should also be conducted far outside no-go zones. If surveys identify more reserves outside these zones, governments may find it easier to stop extraction inside the zones. Private sector companies should have access to the data for exploration, and governments should improve their geological data management.



3. Develop value chains, including those that benefit Africa's own energy transition

Southern Africa's efforts to develop nickel, manganese and cobalt battery production might result in exporting Precursor material (see Figure 5). In addition, there is large potential demand in the region for electric two- and three-wheel vehicles, and stationary battery storage for use in household electrification and mini-grids. African industries based on lithium, iron and phosphate battery chemistry may also be viable. Africa doesn't currently produce much lithium, but African companies could start first with battery assembly and eventually ascend the value chain to produce cells and cathodes, ultimately using Africa's own minerals to feed these processes.



4. Fund renewable energy for mining, processing, and battery production

Africa has greater potential than most other regions to produce metals and processed goods in a low-emission way, but investors' risks are prohibitive. Climate donors and development partners could increase funds to governments and companies to de-risk renewable energy projects that power mining, processors, and the other energy-intensive activities along battery/electric vehicle value chains.



5. Support African suppliers to the mining industry

A competitive supply base for the mining sector would generate jobs for Africans and lower mining costs for the transition. But African businesses struggle to attract capital. African companies providing goods and services to the mining sector could benefit from funds jointly capitalized by governments, mining companies, and regional and international financial institutions, in addition to private capital.



6. Transfer knowledge

Establishment of competitive supplier companies and industries along these value chains requires African managers and workers with more skills and knowledge. Foreign and local companies should partner more, and donors should fund universities and other researchers in the region.



7. Coordinate across the region

Supplier companies and industries must operate at scale to be competitive, and multiple countries must cooperate to share minerals, workers and infrastructure to support robust value chains. Governments could coordinate to develop large-scale companies, and multinational mining companies could coordinate to set clear goods and services needs to inform supplier development plans. But regionalization will benefit some countries more than others. To encourage cooperation, the proposed the Southern African Development Community (SADC) Regional Mining Vision suggests mechanisms to coordinate and redistribute benefits across countries.

These policies must rest on firm foundations of governance, otherwise they will be poorly designed, unimplemented and unfollowed. In addition to pursuing these policy areas, donors and development partners, governments, and companies should continue to focus on improving government capacities and promote transparent and accountable public and corporate governance and anticorruption. Policy makers should heed the proliferating lessons from many years of governance programs. Including by partnering with African civil society to design and implement these policies to ensure that citizens' views are considered, to tap the available expertise in these organizations, and as a check on governments and companies.



A win for the energy transition



Photo by Anastasia Palagutina on Unsplash

Energy transition requires more investment in mining

Resource-intensive consumption by the wealthy is a major contributor to planetary warming. In 2019, the richest 10 percent of humanity (mostly in North America, Europe, but also the rich in East Asia and elsewhere) were responsible for 48 percent of global emissions. The bottom 50 percent were responsible for only 12 percent.¹⁰ In addition, climate change is impacting the poorest regions and the poorest people the most, because of both their geography and the sparse resources these societies must cope with change. Accelerating the energy transition should not further propagate such injustices. Resource-intensive consumption probably needs to fall.¹¹

However, until that time, manufacturers of the technologies required to decarbonize consumption require metals. In this way the energy transition is driving a shift from fossil fuel dependence to metal dependence. For instance, battery electric vehicles (BEVs) require twice the metal of a standard internal combustion engine car. Solar and wind plants respectively require three and four times the metal needed for an energy-equivalent gas-fired power plant.¹² This increases demand for both rarer “critical minerals” like cobalt as well as relatively abundant metals such as copper and aluminium. All these metals and minerals required in the “transition industries” that produce technology for the energy transition we call “transition metals and minerals.”

Manufacturers can obtain a portion of metal supply from recycling. But recycling is unlikely to replace the need to mine in the near future. Recycling of cobalt and lithium may only supply five and ten percent of the respective markets by 2030.¹³ As transition technologies such as BEVs, electric grid infrastructure and wind turbines proliferate, the amount of metal in circulation will fall short of expanding demand. In the future recycling might become a larger part of the solution as more metal comes into circulation, product design improves to aid the separation of metals during recycling, and recycling itself evolves to use less energy.

Furthermore, while technological innovation can translate into less reliance for some metals, it can also lead to increased demand for others. Engineers have already responded to metal scarcity; for example, the nickel, manganese and cobalt (NMC) 811 battery chemistry uses a quarter less cobalt than the original NMC 111 battery. Yet, the NMC 811 also uses 75 percent more nickel, a metal that the European Union and US Geological Survey recently added to their critical mineral lists.¹⁴

Therefore, until consumption is less resource-intensive and recycling is more viable, manufacturers will require miners to extract more metal from the ground—and quickly. Only 28 years remain until countries representing about two-thirds of the global economy aim to have “net zero” emissions.¹⁵ Reaching that goal requires producing millions of electric vehicles, wind turbines, and other transition technologies in the coming decades.

This in turn requires an even steeper surge in investment. Meeting climate goals may require a tripling of investment from 2021 to 2036, from about \$0.5 trillion to \$1.7 trillion.¹⁶ But so far companies have been unwilling to invest sufficiently in mines to accelerate the energy transition despite higher prices, which might slow the transition; the time it takes to develop mines is long and getting longer; and protests, disputes and other disruptions are all slowing supply. Africa, however, may hold the answer.

Africa is an essential source of transition minerals

The African continent already dominates global reserves of several transition minerals. (See Figure 1.)¹⁷ African countries hold 19 percent of the global reserves of metals required to make a standard battery electric vehicle.¹⁸ Most of Africa's transition minerals discovered so far are in southern Africa.

Not only does mining in Africa already matter for the energy transition, but the continent is still relatively unexplored and has the lowest concentration of known mineral wealth in the world. (See Figure 2.) More exploration would likely reveal new deposits to accelerate the transition and unlock new subsoil wealth for Africans.

Attracting exploration investment partly requires reducing geological risk for companies. To do this, African governments can fund geological surveys to provide companies with an initial indication of where reserves might be located. Companies can then confirm this potential with more intensive exploration. But these surveys are expensive. The World Bank has therefore been providing support. Recent World Bank-funded surveys have indicated the potential for significant reserves in Malawi and Uganda, for example.¹⁹ More funding for surveys from donors would reveal more minerals that would both supply the energy transition and benefit African government treasuries and mining industries. New surveys are especially needed as many previous surveys were conducted before the recognition that certain minerals are critical to transition technology.²⁰ As the African Development Bank's African Mineral Development Centre theory of change advocates, governments should also cooperate on surveys with neighboring countries.²¹ Geology doesn't respect national boundaries; knowledge about minerals on one side of a border can help exploration efforts on the other.

Discovery of new reserves in less environmentally sensitive areas could also reduce the push to explore in the most environmentally sensitive areas such as rainforests and sea beds. However, to truly be part of a triple win, governments, regional and international authorities should only commission surveys far away from these areas—establishing them as “no-go zones” where exploration and extraction are forbidden.

Figure 1. Africa's shares of global reserves of transition minerals²²

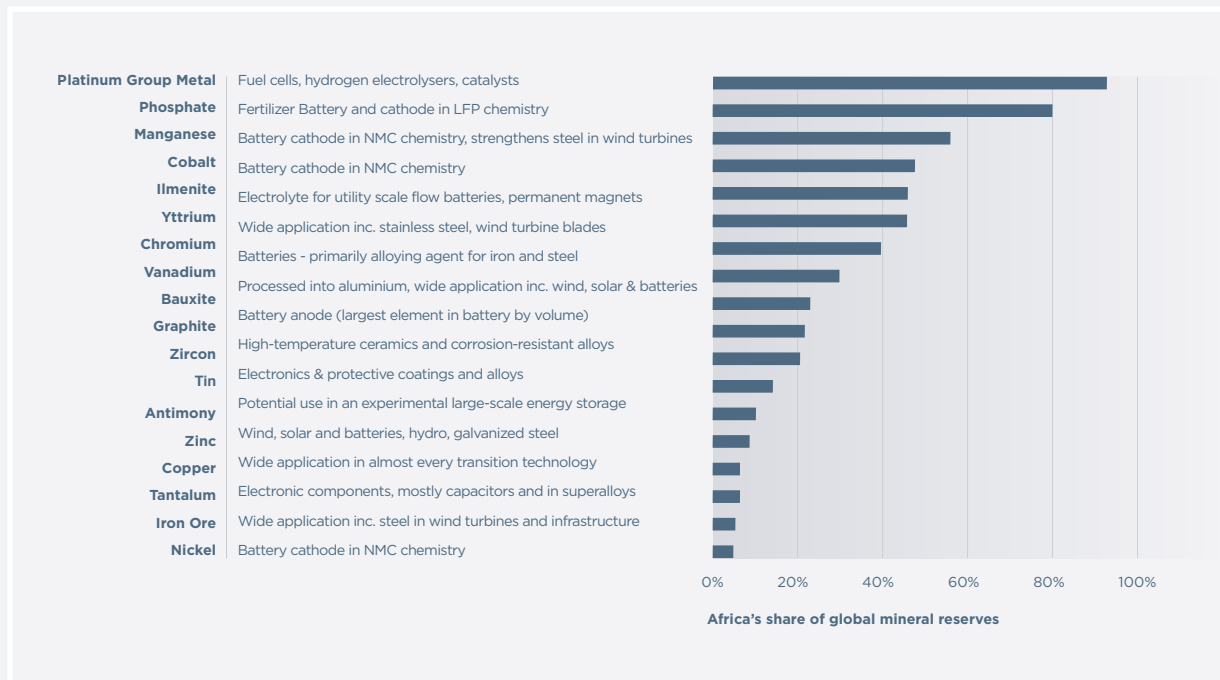
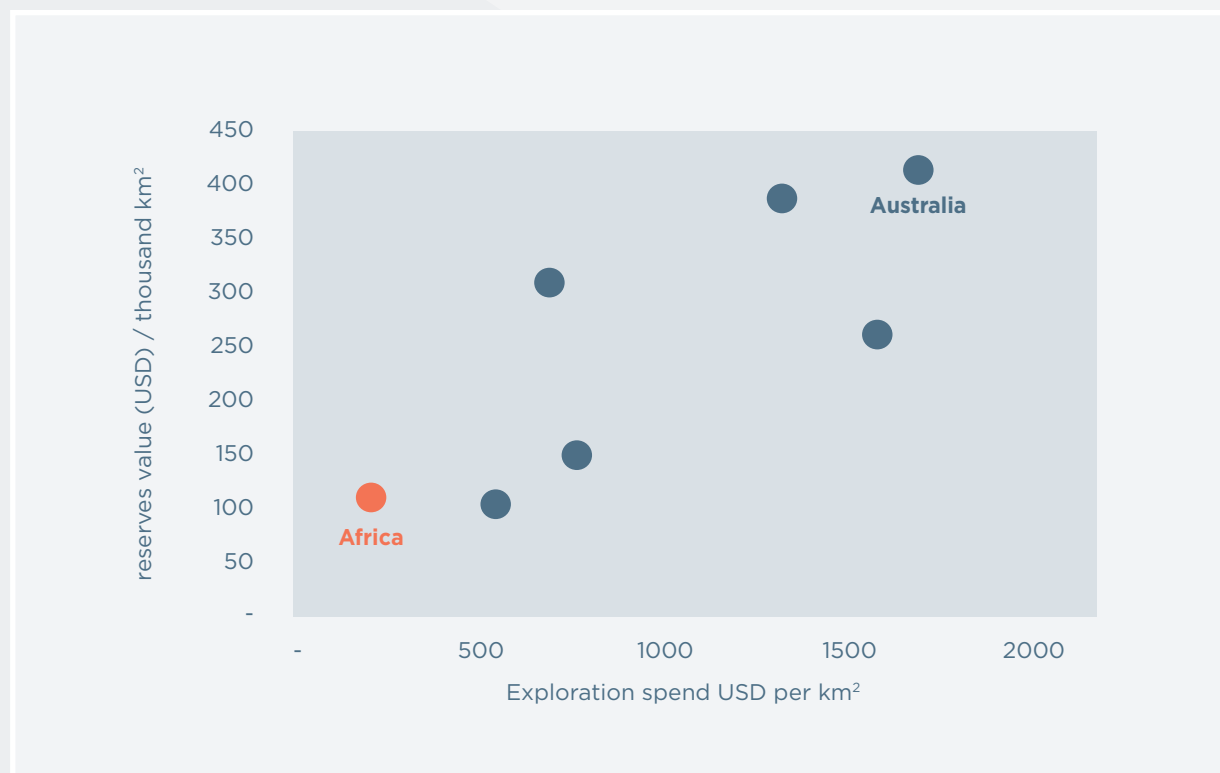


Figure 2. Comparison of exploration and mineral reserves per square kilometer across each region in the world²³

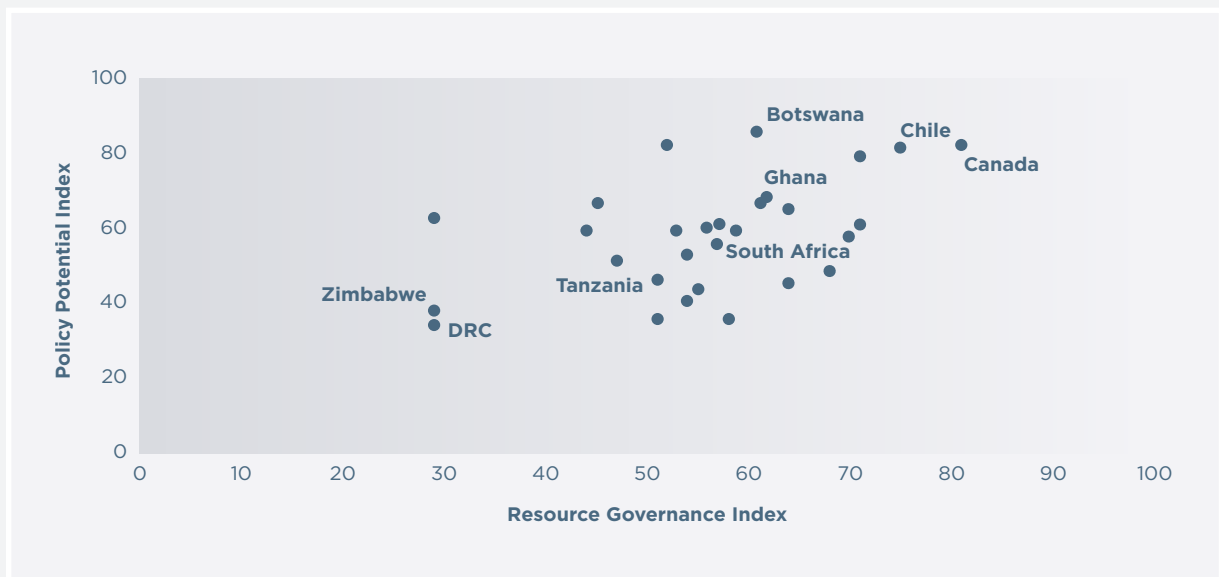


Notes: Total exploration for all metals except gold from 2002 - 2021, current value of reserves for transition minerals only. Source: S&P Capital IQ, NRGi analysis.

Better mining governance can accelerate the transition

Better governance can accelerate investment and shorten mine development times

Figure 3. Comparison of countries' mining governance quality and attractiveness to mining investors across the world²⁴



Africa is underexplored in part because mining authorities have inadequately managed geological data, and mining companies have considered much of the continent commercially risky.²⁵ For example, a South African strategy to boost exploration cites poor policy implementation, insufficient electricity, strikes and community unrest, and poor geological data.²⁶ Better governance—by ensuring mining communities benefit and in turn providing a more secure environment for investors—is strongly associated with increased exploration activity.²⁷ And quality of mining governance positively correlates with investors' perception of country attractiveness. (See Figure 3.)

Increased exploration is only one part of the solution. Discovery does not automatically lead to development. By amount of metal reserves discovered since 1950, companies have developed just over half of projects across the world.²⁸ Even mines that companies develop take an average of 17 years from discovery to the start of production.²⁹ For copper mines, most of this time (12.5 years) was for discovery, exploration, studies and permitting. The rest was for construction planning (1.8 years) and for construction (2.6 years).³⁰

28 years left until net zero, yet the average mine takes 17 years from discovery to production



Three factors shorten lead times.³¹ Higher market prices for minerals can hasten development, but at a delay. The price increases that began in 2004 only resulted in an acceleration in mine production in 2012. During that eight-year period the price of copper tripled.³² Nor is this a solution for the energy transition as it would increase costs for transition industries.

Two other factors are conducive to accelerating the energy transition. First physical qualities: large and high quality of deposit; mineral type (e.g., lithium and gold are faster than nickel and copper); shallower deposit depths; and further developing existing mines rather than starting from scratch with a greenfield development.

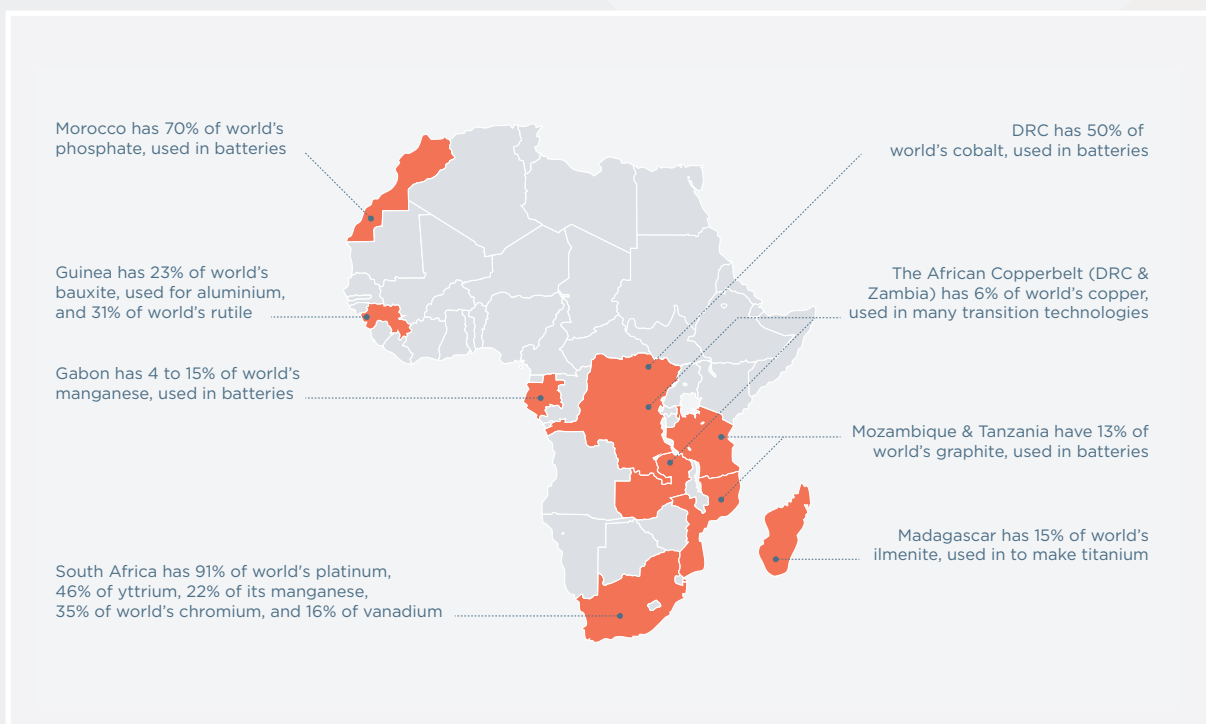
Two, higher-quality governance facilitates development. One study has indicated that if African countries improved their quality of governance to the level of Chile, they could shorten mine lead times by an average of two to three years.³³ Policy makers cannot control most of the physical factors of mining and market price, but they can control governance. Specifically, they can focus on improving management of surveys and permitting phases to shorten lead times while still ensuring fair deals for their countries' minerals.³⁴

Better governance can reduce disruptions to the highly concentrated supply of minerals across Africa

Stable supply relies on stable relationships between mining companies, governments and communities. Discontent leads to disruption which is a risk particularly for industries that require transition minerals that are geographically concentrated.

Resources can be concentrated both at the national level, as seen in Figure 4, and at the mine level. For example, in 2020, four mines—Kamoto, Tenke Fungurume, Metalkol RTR and Etoile—all in the Democratic Republic of the Congo (DRC), produced 41 percent of global cobalt supply.³⁵ In such cases a single company dispute with a government or local community risks cutting off large shares of global supply. These disruptions also increase risks to lenders who require higher interest rates from companies, thereby increasing costs and reducing returns.³⁶

Figure 4. African countries with large shares of global transition mineral reserves³⁷



Mining disruptions

Tax disputes and expropriation. In 2019 Vedanta became involved in a tax dispute with the Zambian government, leading to the seizure of its Konkola Copper Mines subsidiary, removing 90,000 tons per year of mined copper output and 310,000 tons per year of smelter capacity from global supply.³⁸

Labor strikes. Mining analysts typically assume strikes results in five percent of global production lost each year.³⁹ In 2019, workers at the world's largest copper producer, Codelco, began a strike at its Chuquicamata mine, removing 393 tons per day of copper from the market.⁴⁰

Environment. Vedanta's 400,000-ton-per-year Tuticorin smelter in the Indian state of Tamil Nadu has been offline since May 2018 after the company failed to protect the local environment.⁴¹ A similar dispute between MMG Ltd. and the local community caused local output at Peru's Las Bambas mine to drop 10 percent year-on-year.⁴² Serbia withdrew Rio Tinto's exploration permit in early 2022 after protests over plans for a large lithium mine.⁴³

Export bans. Governments ban mineral exports to encourage domestic downstream processing industries. In the case of Indonesia this has led to the development of some domestic processing, but it has taken a long time and in some cases has not happened. Tanzania attempted to establish domestic copper smelting by banning concentrate exports for several years, but failed due to insufficient economies of scale.⁴⁴ At the time of writing, the country's Ngualla mine—the world's fifth largest rare earth deposit—is currently stalled due to a government requirement for local refining.⁴⁵

Corruption. Alleged corruption and the resulting legal processes have held up development of the Simandou iron ore deposit in Guinea. The resource was discovered in the 1990s yet remains undeveloped. It holds the world's largest untapped iron ore deposits.⁴⁶



A win for citizens in Africa's mining countries



Listen to African governments and civil societies' demands for better deals

The extent to which African countries have benefited from past mining booms is unclear. Some studies suggest that many countries did benefit from the last boom, but that these benefits were less than many citizens hoped for. For example, socioeconomic indicators such as those in the Human Development Index on average improved in African countries with large mining sectors.⁴⁷

However, performance has varied. Analysis of the "adjusted net saving rate", which measures the amount each country saves and invests in economic assets less the decline in subsoil and other natural assets, indicates that countries like Zimbabwe and DRC have through disastrous governance effectively sold the national wealth for less than nothing.⁴⁸

Even countries that show higher adjusted net saving rates could possibly have benefited more with stronger governance.⁴⁹ For example, while governments do generate significant revenue from mining, recent IMF research suggests companies' avoidance of corporate income tax could be costing 15 African mining countries around \$600 million annually.⁵⁰ Governments have also struggled to develop local supplier bases ("backward linkages") and to add value to their raw minerals through processing ("forward linkages"). In some cases, citizens living near mining sites have struggled to benefit at all.⁵¹

As African governments and civil society have made clear, things must change. African civil society organizations have consistently called for a "new deal" in which mining draws on more locally sourced inputs and supplies downstream industries on the continent rather than simply feeding exports.⁵² Government officials in mining countries as well as the African Union (AU) and other regional bodies have echoed these demands, which are also informing the African Green Minerals Strategy.^{53, 54}

Following are key elements of a mining triple win. Some of the recommendations are not new, but African governments and their development partners have yet to systematically invest in them. Doing so now is crucial.

Develop E-mobility and battery storage value chains

Several African governments and regional bodies aim to establish industries within the battery value chain, for both e-mobility and electricity storage. The move to establish these and other value chains for energy transition technologies in Africa has climate benefits too; it could translate into cheaper and greener products for manufacturing elsewhere. Unlike most high-income countries, African states have significant spare renewable energy potential.⁵⁵ Some high-emission industrial activity—such as metal smelting—could relocate to Africa.

Figure 5: An electric vehicle battery value chain



However, few African countries with mineral reserves have succeeded in efforts to establish industries downstream from mining. To change that, policymakers should:

Secure a supply of minerals and pool supply to achieve scale

Most processes along the battery chain benefit from scale economies, which require a large supply of inputs. This supply must be dependable to ensure plants are constantly running near capacity. No single African country has all the minerals required to produce batteries, particularly lithium. Countries will need to pool mineral supply to achieve the minimum scale and reliability in case supply from one mine stops. (See page 14 and 15) And with a significant amount of production already committed to overseas buyers through offtake agreements, governments will need options for securing supply for an African value chain. Increased exploration and discoveries will go some way to reducing this tension.

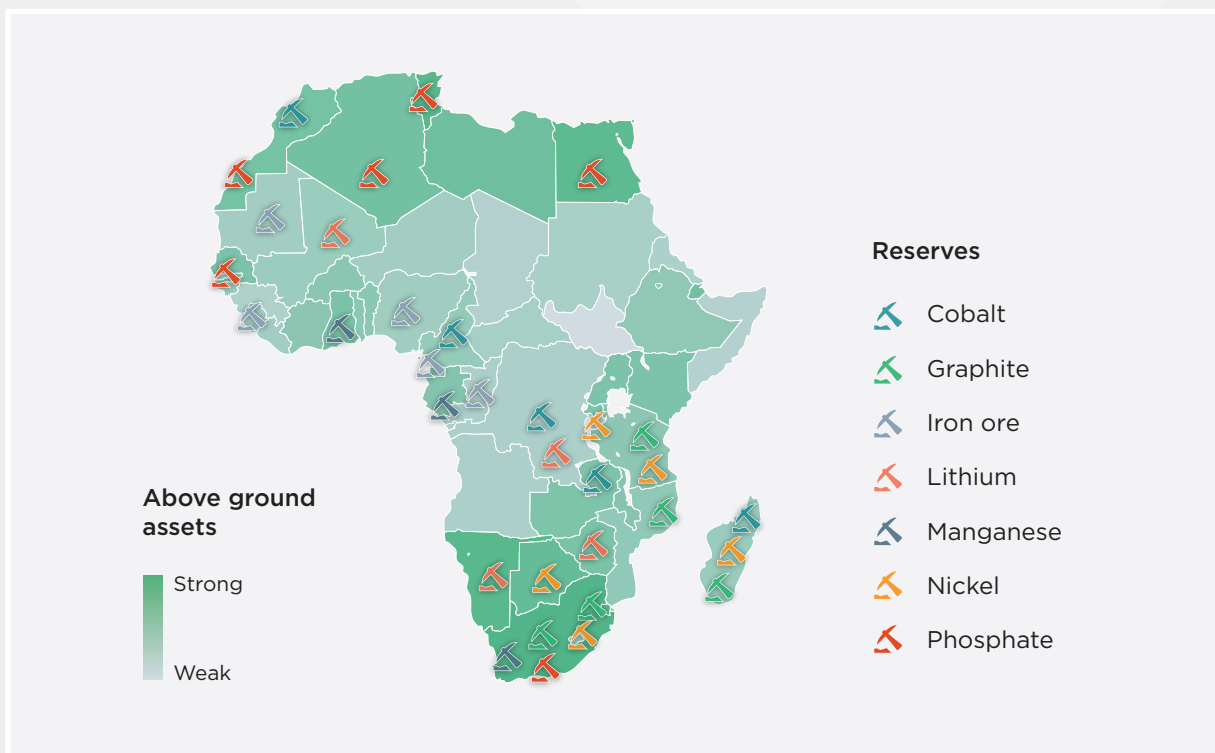
Provide cheap, reliable, and green energy

Metal processing requires substantial amounts of energy. Yet the DRC and much of southern Africa are short of industrial quantities of energy. The much-delayed Inga hydropower plants in the DRC will export their energy to South Africa. But if the Grand Inga dam is finally built, it could allow the DRC to process cobalt and copper with low carbon emissions.⁵⁶ The international community should expand its support to increase the availability of cheap, reliable, and green energy in Africa for industry. Ensuring there is surplus energy for households could also induce local communities to accept the industries operating near where they live.⁵⁷

Coordinate across the region

Governments in the region will have to closely collaborate and partner to create an African battery production industry. Recognizing this, the DRC and Zambia have established a “Joint Battery Council.”

Figure 6. Location of Africa’s battery mineral reserves and above ground assets needed for downstream industries ⁵⁸



The African Continental Free Trade Agreement (AfCFTA) and other existing sub-regional free trade agreements will also facilitate coordination. But the location and benefits of activity will not be equal, particularly as some countries already have more capacity than others (as highlighted by their “above ground assets” in Figure 6). Those with the most minerals but the least potential to benefit could block efforts to coordinate. As a failed attempt at establishing a regional coltan refinery in South Africa showed, regional authorities must explore mechanisms for sharing not just the profits from an activity but also the wider economic benefits with producer countries. The proposed SADC Regional Mining Vision proposes ways to ensure that disadvantaged countries can also supply other inputs, e.g., a common fund that pays the additional cost of transporting inputs from countries with weak transport infrastructure to where the activity is taking place.⁵⁹

Develop large downstream markets for electric vehicles (particularly two- and three-wheelers)

Paradoxically, proximity to the mineral source is only a small factor in the location of downstream industries, since processed metals are relatively easy and inexpensive to transport. However, transport cost is still relevant for products closer to the raw extraction stage. Zambia has succeeded in developing copper smelting and refining to reduce the weight of exports, from concentrates to cathodes. Conversely, there is only a small manufacturing sector using this copper.

More important than proximity to the mineral source is the proximity to downstream markets, making some parts of the value chain more viable than others. This matters across the value chain. Cobalt from mines in DRC and Zambia, despite its high grade, usually contains many impurities. The next link in the battery value chain is producing ‘battery precursor material’, chemicals that are a precursor to making battery cathodes, themselves the ‘positive’ end of a battery. To produce precursors material, companies need to remove the impurities in mined cobalt. This process is more viable if companies locate the process plants near a cluster of other chemical plants.⁶⁰

The next link involves creating battery cathodes. But these are difficult for companies to transport, so companies tend to locate cathode production close to battery cell manufacturing, the next link in the value chain.⁶¹ Lastly, cell manufacturing tends to be located close to EV manufacturers to benefit from quicker, more flexible delivery to customers.

Therefore, African industries along the battery value chain will be more viable if there is a market for battery-powered vehicles close by. It is even better if this market is large, since companies then benefit from scale economies.⁶² These factors matter in deciding which types of batteries to attempt to produce in Africa.

Given the DRC’s huge cobalt reserves, regional discussions have focused on developing industries in the nickel, manganese, and cobalt (NMC) battery value chain.⁶³ NMC batteries are currently used in electric cars like the Nissan Leaf, Volkswagen e-Golf and Hyundai Kona. However, the African market for such cars is likely to remain small. Few people in Africa can afford them, and they require a reliable grid and charging infrastructure. Electric cars of any kind might only be a small part of the future African market: perhaps only 14 percent of EVs in Africa will be cars (of any type) by 2040.⁶⁴

This makes it difficult for companies to be viable along the full value chain from mine to electric vehicle in southern Africa. One study suggests that producing battery precursor material could be viable if countries can coordinate to provide a reliable supply of minerals to a precursor chemical plant.⁶⁵ But given the difficulties of transporting cathodes, processes further downstream from precursor production may be unviable until there is a large regional market for electric vehicles that use NMC batteries.

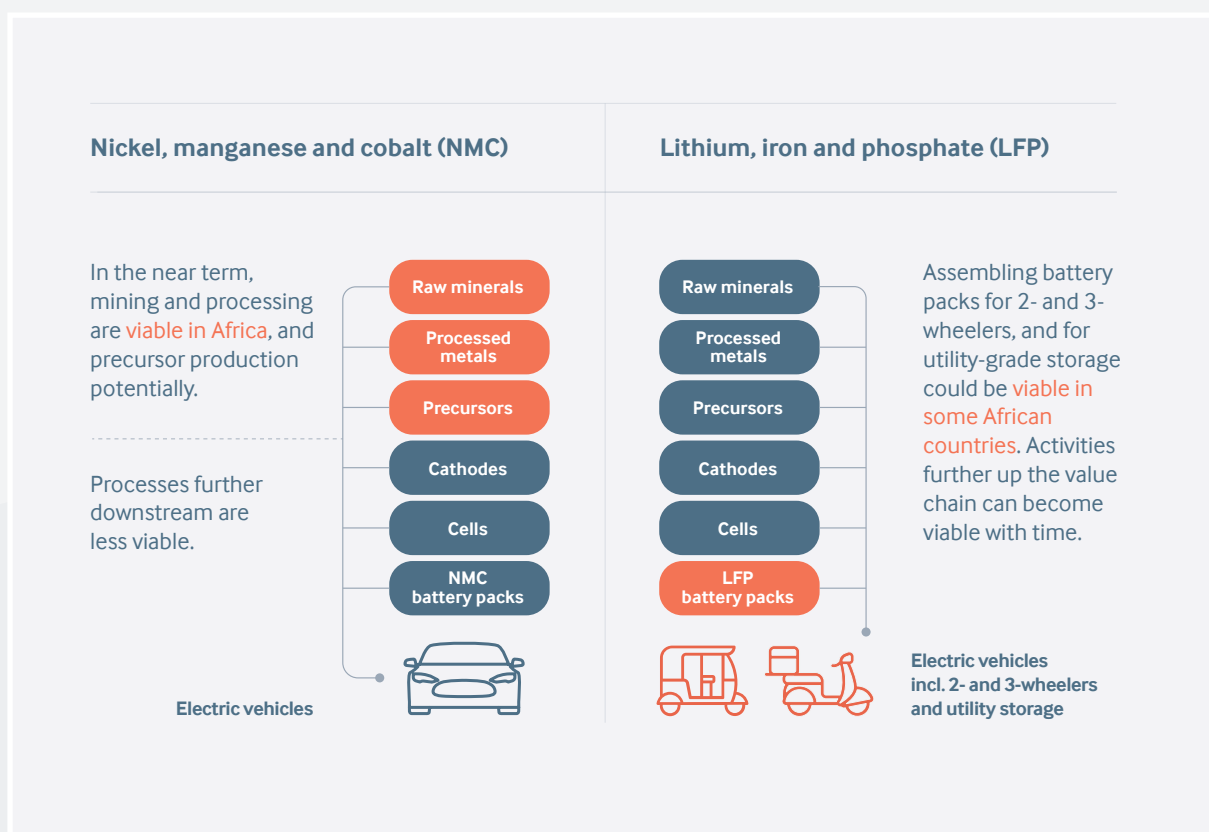
Conversely, Africa, following trends in India, is more likely to adopt electric two- and three-wheelers.⁶⁶ Current two- and three-wheel electric vehicle models use an alternative battery chemistry: lithium, iron, and phosphate (LFP). LFP chemistries are also used in stationary power storage, useful for providing off-grid electricity for Africa’s dispersed population.

Therefore, in addition to developing part of the NMC battery value chain, African industries based on the LFP battery chemistry might also be viable.

Given Africa doesn't currently produce much lithium, African industry might start at the other end of the value chain, with assembling battery packs from imported cells. South Africa already does this, assembling battery packs for mining equipment and refrigeration.

To go further up the chain, African industries need to invest in cell manufacturing plants. There is currently little incentive for investors, but three things could change this: a larger regional LFP market, more lithium discoveries and regional coordination on a lithium refinery.

Figure 7. Two options in locating parts of a battery value chain in Africa



Although the African market for electric two- and three-wheeled vehicles is growing rapidly, it needs to grow even faster to support a viable set of battery and EV production industries. There are different ways that governments could help a market to grow. Governments often protected infant markets from foreign competition. But protection on its own rarely worked. Governments have had more success by promoting local companies instead. Rwanda's recent e-mobility strategy paper suggests a promising shift in this direction.⁶⁷ Donors could support multinational companies to invest in the sector (including in joint ventures with local companies) and fund EV infrastructure (such as battery swap stations).

The AfCFTA can also help to develop this market for African producers by enabling African countries to focus on different links in the value chain. However, to realize this potential, governments must significantly reduce non-tariff barriers, such as procedural delays at borders. Governments within the trading region must also define and implement the AfCFTA Rules of Origin—the percentage of African materials used—to determine whether the AfCFTA applies. This will prevent foreign makers of semi-manufactured goods from avoiding tariffs and undercutting African producers.

Be ready for changes to battery technologies

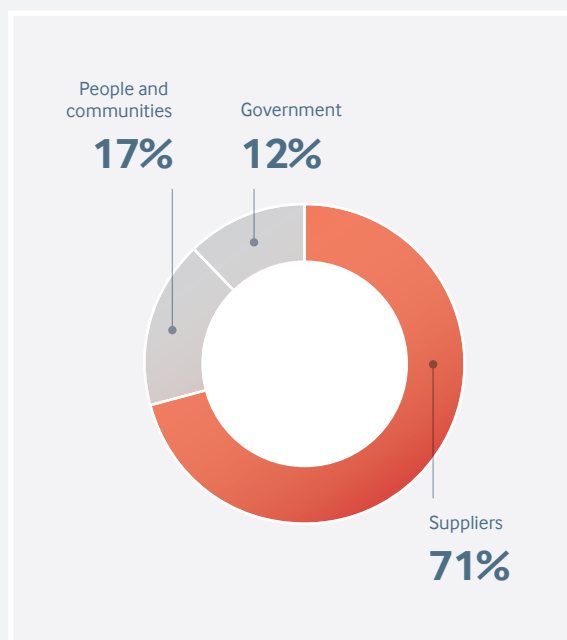
The battery chemistries in demand today may not be the batteries of the future.⁶⁸ Lithium-ion batteries—like NMC and LFP batteries—will likely dominate for at least the next decade.⁶⁹ But the cobalt content in NMC chemistries has already fallen significantly, and there is growing interest from manufacturers in sodium-ion batteries. Some capabilities are transferable between some battery technologies—for example, between different lithium-ion batteries, and between lithium-ion and sodium-ion batteries—but not between others. Policy makers must consider that investments made for one battery chemistry may become “stranded.” African countries can insulate themselves from this risk in part by developing chemistries suited to the region’s needs and geological mineral profile. Local and foreign companies, researchers and international partners could collaborate to create appropriate technologies.

Nurture mining suppliers

Both the energy transition and African countries could benefit significantly if governments nurture competitive local companies

Developing African suppliers to the mining industry has perhaps the most potential among all the benefits countries can derive from mining. Suppliers provide products and services to mining companies. This can range from products such pick-up trucks, tyres, drills, conveyor belts, and specific replacement parts, and services such as catering, surveying, and human resource management. To name only few of a whole host of products and services that suppliers provide. There are also many other mining and processing tasks that a mining company that holds the mining license might also sub-contract to other companies. In total, the procurement of goods and services usually amounts to 50 to 70 percent of all money spent in host countries. Usually more than payments to governments, worker salaries and wages, and community investment combined (see Figure 8).⁷⁰

Figure 8. Example of mining company spending in a producer country⁷¹



For the international community and companies, efficient local suppliers lead to lower costs for mining companies.⁷² Mining companies need to import fewer goods, and local expertise solves local problems. By procuring more from the local market and establishing a wide network of local suppliers, the mining industry also has stronger ties to their host countries, reducing disputes and discontent.

The countries that have achieved the most development from mining - such as Canada, Australia, Chile, and South Africa - all have significant supplier industries. In both Australia and Canada there are more people employed at supplier firms than in mining itself.⁷³

However, in African countries outside South Africa, much of procurement value is spent on imported goods resold by domestic suppliers, without creating many jobs, transferring business knowledge to other economic sectors, or substantially reduce mining costs. The challenge is to develop competitive African companies that can produce more of the supply chain themselves.

Policies to nurture competitive African suppliers

The Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF), the International Finance Corporation (IFC) and Mining Shared Value have contributed to a growing understanding of what works best in developing supplier companies in Africa.⁷⁴

African governments have often favored “local content” rules that stipulate how much mining companies should procure from local markets. But these have yielded mixed results. Governments usually do not monitor mining company procurement, and some mining companies have procured from suppliers with local political links rather than the most competitive. Most importantly, governments have often failed to pair local content rules with support to develop businesses that can meet mining companies’ demand. This is particularly important because cheap imports from China and other large developing economies means that African countries will struggle to create viable supply companies without government intervention.

But there are alternative approaches:

Capitalize supplier development funds

Funding for local entrepreneurs would overcome most African companies’ capital constraints. This could come from the government and companies, as is the case in South Africa.⁷⁵ Development finance institutions and donors could also capitalize venture funds for this purpose.⁷⁶ To encourage regional coordination on supplier development, regional authorities like the African Development Bank could manage some of these funds at a regional level.

Consult

Governments should research and consult business to identify what goods and services to target for supplying to the mining industry. The Ghana Minerals Commission and Chamber of Mines worked together to create a list of goods and services that companies must procure from Ghanaian suppliers, rather than using a blanket total percentage as a requirement.⁷⁷

Coordinate for scale

Supplier companies need scale economies to be competitive. A single mine is generally too small to create enough demand. However, mining companies working through industry chambers can coordinate and pool their demand for suppliers. At a regional level, mining countries could coordinate to create even more scale for suppliers. The proposed SADC Regional Mining Vision and the ECOWAS Model Mining and Minerals Development Act identify this as an opportunity; they suggest that a country should recognize local content created in other member states. The DRC-Zambia partnership on copper and cobalt mining is one opportunity to experiment with coordination for scale.

Learn from experienced suppliers

Many African countries lack operational capabilities and managerial knowledge. Those African businesses that have succeeded have learned from others. Joint ventures, where internationally competitive supplier firms partner with local suppliers, facilitate learning. In Canada and Australia, mining companies require large-scale suppliers to form joint ventures with Indigenous suppliers, allowing the Indigenous companies to develop their own capacity. Donors could also support trade fairs between foreign and African mining suppliers to help entrepreneurs network.

Market development and trade barriers

As with developing value chains, the African Continental Free Trade Area will be important in helping supplier companies develop.

Create jobs within supplier companies

Share of direct mining employment is already high and further growth is limited, so creating jobs with suppliers has more potential

Even though the mining sector is capital-intensive, companies still employ significant numbers of people. Workers involved in core mining activities tend to make above-average salaries in most countries.

In contrast to the share of procurement between host and investor countries, the share of Africans that are direct employees is already much higher. While expatriates from outside the continent commonly hold the most senior management roles in African mining, most direct employees—both permanent and contract staff—are nationals.

There are several reasons. One is cost. Internationally competitive salaries for expatriates are much higher than the equivalent African salaries and transporting and housing expatriates is hugely costly. Host country citizens are likely to enhance their skills and capacities by working in mining operations, which often involve on-the-job training. Companies can also exert much more control and monitoring of activities “inside the fence” compared to the activities of suppliers of goods and services.

Governments do aim to increase the share of national citizens in the direct employment of mining companies. Governments use “demand-side policies” that impose quotas and percentage limits on expatriate employees. “Supply-side policies” conversely entail developing skills, including the prerequisite competencies that act as a foundation for core mining tasks (for example mathematics and vocational education). Companies and the international community can facilitate government efforts by supporting standardization and increasing certification for skills that workers have acquired.

However, employment policies are unlikely to yield many more jobs. Automation and other industry changes mean direct employment will likely decline.

Governments could focus instead on training, prioritizing technical education and highly skilled mid-to-upper management. However, programs should focus on employees within supplier firms, rather than those directly employed by mining companies. Employment policies might best focus on developing supplier companies and helping them employ more Africans.

Collect and manage tax revenues

African countries earn significant sums from mining, despite large-scale tax avoidance by companies. Effective revenue management remains a priority.

Many African government officials and civil society actors are concerned that corporate tax abusers have cheated their public accounts of billions of dollars of tax revenue. The International Monetary Fund (IMF) estimated that treasuries across the 15 most mineral-dependent countries in sub-Saharan Africa have potentially lost \$600 million a year from companies avoiding mining corporate income tax.⁷⁸

This estimated tax loss is equal to about 5 percent of the total revenues the governments of these 15 countries earned from mining.⁷⁹ Addressing tax abuse⁸⁰ might increase revenues by this amount, but governments must also look elsewhere for further revenue. First, given how little exploration has occurred in Africa, improving governance (rather than just reducing tax rates), could radically expand the tax base.

A second area of focus is tax rate adjustment. While legislated tax rates have recently increased across the region,⁸¹ rates negotiated in contracts for individual projects remain low in many countries. This is due in part to governments competing to attract investment by offering tax incentives that are often unnecessarily generous.⁸²

Given the relationship shown in Figure 3, governments can make their countries more attractive to investors by improving other areas of governance, rather than lowering tax rates. Such missteps are particularly costly for governments that have legally agreed with companies that they will not change contract terms like taxes (known as stabilization clauses).⁸³

Despite these issues, African governments still collect substantial amounts from mining companies. For the 15 most mineral-rich countries in sub-Saharan Africa, 8 percent of total government revenues. Across the continent more generally, Africa's transition mineral reserves are currently worth about \$2.97 trillion.⁸⁴ Based on past collection rates including losses from tax abuse, and assuming no improvement in tax collection, Africa's transition mineral reserves could generate \$475 billion in taxes over the life of the reserves.⁸⁵

Furthermore, despite the benefits of value chain development and supplier policies, collecting and investing taxes remains the best way for governments of mineral-dependent economies to fund programs to alleviate poverty and to diversify their economies. These economies have suffered from volatile metal prices and "Dutch disease," which inhibits growth of other export sectors. Investing mining revenues in developing the rest of the economy ensures that these economies no longer depend on just one industry and helps lift citizens out of poverty.⁸⁶

Therefore, how governments use the tax revenues they receive is still of paramount importance. A country's "adjusted net saving rate" is one indicator of performance in revenue management. When compared to the potential revenues a government could collect (measured as resource rent), the adjusted net savings gives an approximate measure of how well countries actually collect and spend taxes from mining industries. By this measure, performance varies considerably. Since 2000, Zambia has received about the same rent per unit of GDP as Guinea, but Zambia's adjusted savings rate has been 17 percent, while Guinea's rate has been -11 percent. However, most African mining countries do not have fiscal rules for mining, and of those that do, few place controls on how governments spend the revenues.⁸⁷ The potential boom in revenues from transition minerals serves as a reminder of the importance of a robust revenue management framework.

Some countries have successfully implemented policies to collect and transform mining revenues into sustainable development

Below are a few examples that governments and donors could further support, strengthen and adopt:

Improve contract negotiation processes

Sierra Leone has moved away from negotiating tax terms for individual projects, reducing the risk of mistakes. Mali has reduced the stability period permitted in contracts from 30 years—significantly longer than necessary to ensure the bankability of projects—to 12 years from the issuance of a mining license.

Experiment with new tax designs

Governments are experimenting with new tax designs that balance the need to attract investment while minimizing the opportunities for companies to avoid taxes. Governments in Côte d'Ivoire, Guinea and Mauritania, among others, have levied "variable royalties" that accommodate the inherent volatility of metal markets while still being easier to administer than corporate income taxes which companies find relatively easy to avoid paying.⁸⁸

Resource tax authorities

Despite frequent changes to its tax code and disputes with taxpayers, Zambian authorities and donors have invested in the Zambia Tax Authority and mining ministry, significantly expanding the expertise and information they have to monitor the copper mining industry.

Coordinate and share expertise across the region

Several pan-African bodies are supporting tax policy making and administration; these include the African Development Bank, the African Tax Administration Forum and the African Tax Institute. Providing capacity building support on economic modeling, sharing expertise and experience across countries, and working on international aspects of taxation that can help tax officials perform their roles more effectively.

Disclose contract and payments to governments

Some governments have been increasingly transparent, enabling more public scrutiny, and therefore increasing the incentive for governments and companies to sign fair deals. However, there is room for much more progress: specifically within sub-Saharan Africa, 44 percent of countries have legislated contract disclosure, while only 16 percent systematically disclose all or most mining contracts.⁸⁹ Eighty-five percent in this group also disclose payments, though not always in a timely, accessible way.⁹⁰

Manage government revenues

Having collected revenues, a government must spend or save them wisely, and avoid problems of economic volatility, inflation and waste. Outside of Africa, Chile has done this effectively with its copper earnings. Chile has a rule that determines how much of its mining revenues the government can spend on present day needs and how much it must invest for longer-term projects. As copper revenues are so volatile, officials use its Economic and Social Stabilization Fund to save surplus revenues until the next downturn.⁹¹

Stamp out corruption

Corruption tends to worsen during booms; everyone has a role in combating it now

Seventy percent of African countries with transition mineral reserves rank in the bottom half of Transparency International's Corruption Perceptions Index.⁹²

Corruption reduces the benefits from mining for most Africans, while increasing the risk of social and environmental harm.⁹³ It also disrupts mineral supply by deterring investment, nurturing arbitrary and unpredictable regulatory environments, and potentially exposing companies to long-term liability and sanctions.⁹⁴

Past commodity booms corresponded with an increase in corruption, and this could reoccur as the world scrambles to meet the demand of transition minerals.⁹⁵ As profits soar, public and private sector actors are more likely to embrace risks, including engaging in or turning a blind eye to graft. During booms, government officials and company executives engage in frenzied, fast-paced dealmaking, which can facilitate corruption.

The integration of downstream companies (for example battery and EV players) in order to secure mineral supplies also means company executives are assuming new roles and negotiating unprecedented deals. They are managing unfamiliar risks, while regulators and oversight actors struggle to keep up, particularly as the dominance of powerful multinational companies across multiple stages of the supply chain can inhibit accountability.

How to fight corruption

Governments, the international community, and companies must all act to fight corruption. The following practices are derived from the Extractive Industries Transparency Initiative (EITI) Standard, the Organisation for Economic Co-operation and Development (OECD) Due Diligence Guidance for Responsible Chains of Minerals, and NREGI's work on corruption in the extractive sector.⁹⁶

Identify risks and develop mitigation plans

Governments and companies should proactively identify risks in their strategies, policies and activities, particularly in specific areas where corruption regularly occurs, including: the award of licenses, permits and approvals; the procurement of goods and services; state-owned enterprise activities; and commodity trading. Some examples of good practice are emerging. Colombia's mining agency recently mapped risks and released the analysis for public consultation, while mining company BHP now requires its subcontractors to provide beneficial ownership information.⁹⁷ Companies should also support other entities, such as their suppliers and customers, to integrate these checks.

Reduce the use of agents and intermediaries

One common form of corruption is company staff paying bribes to public officials via agents and intermediaries. Companies should follow the example of trader Trafigura, which has committed to no longer hiring third parties to perform "business development" functions.⁹⁸ They should exert extensive control over relationships with any remaining intermediaries.⁹⁹

Increase transparency

It is easier for authorities and civil societies to uncover corruption if companies and governments officials disclose contracts, payments and the beneficial owners of assets. As noted on the previous page, contract and payment disclosures are increasing, albeit not quickly enough. Beneficial ownership transparency is particularly lagging, though recent reforms by Ghanaian and Nigerian authorities to increase the coverage of their requirements are promising.¹⁰⁰

Support oversight actors

Transparency is not a solution on its own, however. Governments, as well as donors in the international community, must support civil society organizations, journalists, whistleblowers, and other anticorruption actors.

Link international assistance to anticorruption

The international community has a critical role in ensuring that African countries receive investment to develop their minerals and establish supply and value chains. Donors should acknowledge strong government efforts to tackle corruption with enhanced assistance.

Disable kleptocracy

Some transition minerals originate in countries where the political leadership systematically misappropriates the nation's resources, to benefit a small group of elites rather than the wider population. When engaging in such kleptocratic contexts, companies and the international community should assess whether their activities enable or strengthen kleptocracy, discontinue those which do, and disclose these assessments and the chosen responses.

“African officials and civil society actors have made clear that mining must change to benefit Africans in mineral-rich countries. Meeting African demands is in the interest of energy transition industries and humanity more broadly.”





A win for the environment and communities



Photo by Annie Spratt on Unsplash

Protect forests, water sources and biodiverse areas from the forthcoming surge in mining

Mining damage might increase as the energy transition progresses

Poorly practiced mining is environmentally destructive, threatens local communities and jeopardizes the planet-wide benefits of the energy transition. The collapse of a South African tailings dam in September 2022 swept away houses, polluted rivers and damaged thousands of hectares of farmland; this is just one recent

example of the damage mining can cause.¹⁰¹ Mining indirectly causes seven percent of global deforestation,¹⁰² and contributes 10 percent of global emissions.¹⁰³

Mining's impact on the environment could worsen.¹⁰⁴ The surge in demand for metals could encourage more activity in particularly environmentally sensitive areas. For example, the spike in coltan prices in 2002 led to a rush of mining in Kahuzi-Biega National Park

in eastern DRC. IEA analysis suggests that the life-cycle emissions of clean energy are still significantly lower than for fossil fuel technologies, but future production will involve more energy-intensive processes.¹⁰⁵ New discoveries are revealing deposits with lower ore grades, which require more extraction, and thus more emissions, to unearth the same quantity of minerals. The mining of many transition minerals requires particularly high water use, and some transition minerals, such as hard-rock lithium (Africa's likely primary source of lithium), carry particularly high contamination risks.¹⁰⁶ The start of lithium mining in countries such as Mali and Namibia could therefore exacerbate increasingly frequent droughts.¹⁰⁷

Knowledge on how to protect the environment has improved, but practice is weak

Many governments now require mining companies to produce environmental and social impact assessments (ESIAs) and resulting environmental management plans (EMPs).¹⁰⁸ These procedures have sometimes reduced the risk of environmental harm, however, their design and use are often problematic. Environmental risk from a mine can be so severe that even with a rigorous EMP, the expected damage outweighs any benefits that the project could generate for the country. But such mines often proceed nevertheless.

There are a range of solutions. One is setting no-go zones for exploration. (See also page 11.) Few governments exert control over company exploration, despite laws often providing them with the authority to do so.¹⁰⁹ Several African governments have issued exploration licenses in environmental protection zones, some of which do not sufficiently cover areas of environmental importance, including large tracts of intact forest in the Congo Basin.¹¹⁰ Once a company discovers a deposit, authorities have difficulty stopping exploitation of the mineral because of powerful financial incentives and corruption. But in some cases, exploration licenses provide companies with the legal right to mine following discovery. In some cases, companies sue governments that withhold a mining license after discovery, even if this is due to environmental risk.¹¹¹

Governments could improve their licensing decisions by incorporating environmental factors into their economic modeling, but this rarely happens.¹¹²

Generally, different governmental authorities are responsible for assessing environmental risks and the economic viability and benefits of a project, with little cooperation between them. Furthermore, authorities often allow mining companies to choose a method of measuring anticipated environmental damage, and sometimes waive the requirement for quantitative measures entirely, making assessments difficult to use in models. Authorities should in these cases consider existing guidance on good practice from the International Finance Corporation and IGF.¹¹³

Even with strong valuation tools, host governments often undervalue the environment. Officials often feel pressure to prioritize short-term revenues and jobs. Initiatives like the Central African Forestry Initiative to provide financing to Gabon to maintain its forests would change this calculus.¹¹⁴ Governments publishing clear criteria for investors on what constitutes unacceptable environmental risk would also help.

Having decided to extract, governments also often struggle to prevent risks from materializing. Hiring and equipping skilled staff is difficult.¹¹⁵ As companies use their own methods to measure damage, governments struggle to ensure that companies comply with regulatory benchmarks. Rapidly evolving mining technology and changing ecological understanding of environmental damage make it difficult for governments to protect the environment. Government efforts to increase environmental protection over time are often constrained by mining contracts, many of which still stabilize environmental provisions contrary to advice from the Organization for Economic Co-operation and Development and the United Nations.¹¹⁶

Regarding emissions from mining activities, governments may find carbon taxes a useful tool for incentivizing mining companies to reduce the greenhouse gases they produce. Many governments would need to strengthen their administrative capacities before carbon taxes are feasible, and stabilization clauses in mining contracts may also prevent their introduction. In the meantime, governments and the international community have some options for facilitating emissions reductions in the meantime. For example, while some companies are already turning to renewables to power their mines, they could increase support to expanding renewable energy systems in mining countries to further accelerate this shift.¹¹⁷

Local communities' voices are currently constrained

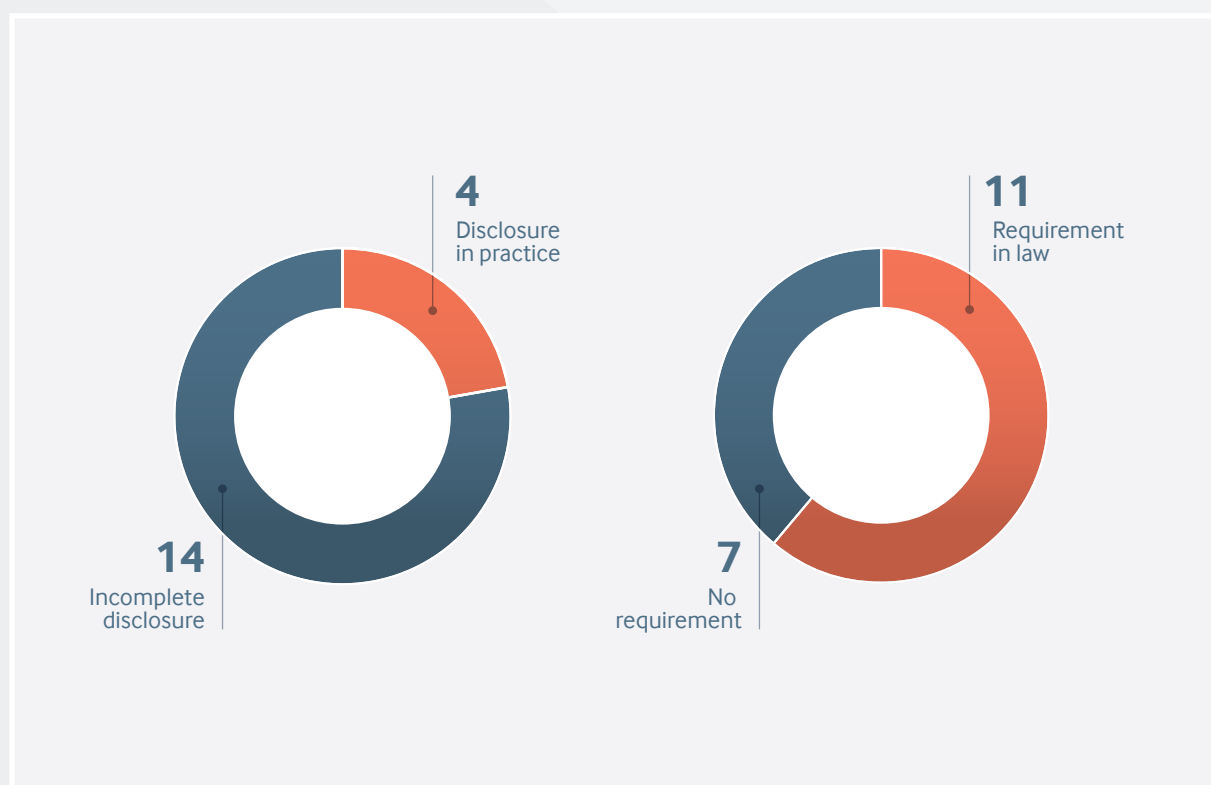
Communities within forests and other vulnerable areas have a critical role in protecting the environment directly, as recognized at COP26.¹¹⁸ For example, various studies have shown that deforestation is lower in areas managed by Indigenous peoples given their experience of, and interest in, sustaining it for their livelihoods and future generations.¹¹⁹ Community management of land is also often more cost-effective than government and company schemes. Nevertheless, the international community provides little climate finance to support this practice.¹²⁰

Given that environmental damage severely affects local communities, companies and governments must allow community members to participate in the decision to extract. In principle, governments and companies have increasingly recognized the need for “free prior and informed consent” from communities before allowing extraction.

However, this engagement is often meaningless. A recent survey of 26 African countries found that seven do not require public consultation until after companies have completed a draft ESIA, rather than during the drafting process.¹²¹ Even when companies do consult communities, they are rarely required to take local views into account.

Communities face similar challenges in monitoring the implementation of EMPs. While there are exceptions such as Ghana and Guinea, governments in many African countries do not systematically disclose these documents. African governments could learn from Latin America, where several countries have introduced participatory environmental monitoring committees—though such practices can only achieve so much without addressing the growing government hostility toward and violence against environmental defenders and community leaders.^{122, 123}

Figure 9. ESIA disclosures in law and in practice in African mining countries¹²⁴



Conclusion

Africa's mineral wealth is essential for the energy transition and for the hundreds of millions of people currently living in poverty in African mining countries. Whether and how governments and companies move to further extract this mineral wealth is not only economically and environmentally important for Africa, but also for the vital importance of protecting the world's rapidly diminishing forests.

Everyone therefore has an interest in mining governance. We all need a triple-win in mining. But governments and companies have a generally poor track record in governance of the sector. Few citizens in mining countries have benefited as much as they should have, corrupt actors have gotten away with ill-gotten riches, and investors remain reluctant to invest in some parts of Africa.

Some efforts by governments and development partners have helped to improve governance but given the possibility that African citizens could miss out on the next mining boom—and the need to supply an energy transition—these efforts must be both expanded and accelerated. With so much hanging in the balance, officials and executives cannot repeat past mistakes.

This report has highlighted some of the most promising approaches for obtaining a triple-win.

Developing downstream industries within e-mobility, battery storage value and indeed many other value chains; and developing a competitive supplier base within Africa would both benefit Africans and facilitate the energy transition. Improving how governments collect and manage tax payments from mining companies remains critical, both to fund programs to alleviate poverty and diversify economies dangerously dependent on the volatile mining sector.

Furthermore, authorities won't achieve a triple win until they establish and maintain no-go zones for mining and better resource environmental protection agencies. Companies must do their part and uphold the highest standards of environmental protection. Finally, none of these policies will succeed unless governments and companies are more transparent, held to account and stop corruption among their ranks.

Governments of countries responsible for two-thirds of the world economy aim reach net-zero emissions by 2050—28 years from now. But climate donors, development partners, companies, and governments have much less time to improve mining governance. Proceeding from the recommendations here, all parties must immediately engage in this vital task.

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