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Progress in the implementation of decisions of the African Ministerial Conference on the Environment and consideration of emerging environmental issues: critical minerals and their role in energy transitions in Africa

Environmental aspects of critical minerals in Africa in the clean energy transition**

Note by the secretariat.

I. Introduction

1. Critical, green, or strategic minerals, are essential rare earth minerals used in various industries, including renewable energy technologies and electric mobility. They play a crucial role in enabling the transition to a cleaner and more sustainable energy and transport system. Critical minerals refer to metallic and non-metallic elements that are essential for the economic and national security of states, especially advanced manufacturing, and technology, and that are at risk of supply chain disruption or, by some measures, have substantial environmental impacts associated with their extraction, use or disposal.[1,2]

2. The intersection of critical minerals and the environment is seen from a risk and opportunities perspective. On the side of risk, extracting critical minerals takes a toll on environmental resources and services. For example, over 50% of today's lithium global production is concentrated in areas with high water stress. On the other hand, critical minerals provide opportunities to enhance the socio-economic resilience of nations and communities through increased earnings while powering the world towards a net-zero emissions future which lowers the risk of escalated climate mitigation and adaptation costs.

3. In extracting, processing, and using critical minerals, there is often the risk of creating environmental and social challenges. These environmental and social challenges include habitat and landscape destruction, water and air pollution, human rights concerns, and labour issues. Therefore, there is an increasing need to adopt sustainable practices and ensure responsible sourcing throughout the supply chain. The application of environmental standards for due diligence and traceability

* AMCEN/19/EGM/1.

** The present document is being issued without formal editing.

[1] Nassar, N. T. & Fortier, S. M. Methodology and Technical Input for the 2021 Review and Revision of the U.S. Critical Minerals List Open-File Report 2021–1045 (US Geological Survey, 2021)

[2] Hayes, S. M. & McCullough, E. Critical minerals: a review of elemental trends in comprehensive criticality studies. Resource. Policy 59, 192–199 (2018)

standards is critical to ensure the prioritization of environmental sustainability and human rights in the minerals supply chain. Among key interventions in this aspect include habitat restoration after the closure of mines, pollution control, sustainable resource management, and circularity, among others.

4. The shift to clean energy systems, including in transport, to keep pace with the global net-zero emissions[3] by 2050 target is set to drive a huge increase in demand for critical minerals globally. This increased demand presents environmental, economic, geopolitical, and trade consequences for Africa. There is a need for the African region to capitalize on the drive for green transition to drive economic growth, support sustainable development, create green jobs and reduce poverty and inequality while minimizing the negative environmental and social impacts of critical minerals development.

5. This note highlights the immediate need for member states in Africa and other stakeholders, especially the ministries responsible for the environment, to take ambitious and collaborative action to prevent and minimize the adverse environmental impacts that could arise from the extraction of critical minerals in the continent.

II. The environment and extraction of critical minerals in transitioning to clean energy

6. The nexus between critical minerals and the environment is multifaceted and interconnected. The extraction of critical minerals often involves significant environmental impacts. Open-pit or underground mining can destroy habitats and landscapes, cause soil erosion, and water pollution. The extraction and processing of critical minerals require substantial land and resource use. This can lead to land degradation, deforestation, and conflicts with local communities over land rights. Critical mineral extraction may occur in areas with high biodiversity value. It is essential to assess and minimize the impacts on biodiversity, including protected areas and endangered species. At the same time, critical minerals offer the opportunity for lower emissions development processes and increased earnings, all of which enhance climate resilience.

7. Critical mineral extraction and processing often require significant water resources. Poor water management can lead to water scarcity, degradation of water quality, and competition for water resources with other sectors, such as agriculture. Sustainable water management practices are crucial to mitigate these impacts. Activities relating to the extraction of critical minerals can also generate large amounts of waste and tailings, which may contain harmful chemicals and pose risks to ecosystems and water sources. The processing of critical minerals can result in the generation of hazardous waste and pollutants. Proper waste management practices, including the safe disposal of waste and the use of advanced treatment technologies, are necessary to prevent pollution and protect the environment and human health.

8. The production of critical minerals, especially in mineral processing and refining, can be energy-intensive and result in greenhouse gas emissions. These emissions contribute to climate change and can offset the environmental benefits of using critical minerals in clean energy technologies. Critical minerals are needed in the development and use of renewable energy infrastructure and technologies, such as, wind, solar photovoltaic, concentrated solar power, geothermal, hydroelectric, green hydrogen, and green ammonia.

9. It is well known that rare earth elements are essential for permanent magnets that are vital for wind turbines and electric vehicle motors. Electricity networks need a huge amount of copper and aluminum, with copper being a cornerstone for all electricity-related technologies. Since 2010, the average amount of minerals needed for a new unit of power generation capacity has increased by 50% as the share of renewables has risen. The types of mineral resources used vary by technology. Lithium, nickel, cobalt, manganese, and graphite are crucial to battery performance, longevity, and energy density.[4]

10. An energy system powered by clean energy technologies differs profoundly from one fueled by traditional hydrocarbon resources. Building solar photovoltaic plants, wind farms and electric vehicles generally requires more minerals than their fossil fuel-based counterparts. A typical electric car requires six times the mineral inputs of a conventional car, and an onshore wind plant requires nine times more mineral resources than a gas-fired power plant.

[3] https://www.iea.org/reports/global-energy-and-climate-model/net-zero-emissions-by-2050-scenario-nze

[4] The Role of Critical Minerals in Clean Energy Transitions, International Energy Agency (IEA), 2021.

11. In a scenario that meets the Paris Agreement goals, clean energy technologies' share of total demand rises significantly over the next two decades to over 40% for copper and rare earth elements, 60- 70% for nickel and cobalt, and almost 90% for lithium. Electric vehicles and battery storage have already displaced consumer electronics to become the largest consumer of lithium. They are set to take over from stainless steel as the largest end-user of nickel by 2040.[5]

12. On one hand, critical minerals can help the world achieve climate mitigation and adaptation objectives towards a net-zero emissions future and on the other hand application of sustainable mining practices lowers the risk of biodiversity loss and minimizes the risk to water and other ecosystem services. It is therefore critical to lower the ecological footprint of critical minerals supply chains. Prioritizing mid- and downstream value-added supply chains increases income and earning opportunities to address the socioeconomic dimension of climate vulnerability and energy deficiency by increasing socioeconomic resilience.

13. At the fourth session of the United Nations Environment Assembly, held in Nairobi, Kenya, on 11–15 March 2019, member States adopted resolution UNEP/EA.4/Res.19 on mineral resource governance. The resolution requested the United Nations Environment Programme to collect information on sustainable practices, identify knowledge gaps and options for implementation strategies, and undertake an overview of existing assessments of different governance initiatives and approaches relating to the sustainable management of metal and mineral resources. Critical minerals were not specifically addressed but could be inferred in the context of sustainable mining and sourcing of raw materials to decouple economic growth from environmental degradation through approaches including resource efficiency, circular economy and reduction of the impacts associated with the materials needed for the transition to an innovative and environmentally friendly economy.

14. Furthermore, the "UN Framework on Just Transition for Critical Energy Transition Minerals" puts forth 5 modules – "building trust in the critical minerals supply chain", "enhancing producer capacities to overcome asymmetries of power", "strengthening trade potential", "protecting people and planet", and "strengthening the regulatory environment for just transition", that should underpin Africa's investment in the critical minerals space.

III. Critical minerals and their role in clean energy transitions in Africa

15. Africa is home to 30% of the world's critical mineral reserves, many of which are essential for renewable and low-carbon technologies. To meet the expected rise in global demand, the production of minerals and metals such as lithium, graphite and cobalt will need to increase by nearly 500% by 2050.

16. Critical minerals and their role in energy transitions in Africa raise important considerations related to non-renewable resources, environmental impacts, and the need for a just transition. African countries possess abundant reserves of critical minerals, and the sustainable management of these resources is paramount. The distribution of critical mineral resources is non-uniform and geographically concentrated. Only a handful of countries on the continent have these minerals, and these face significant global competition. The consequence is that the development of critical minerals through key sectors, including clean energy and electric vehicles, faces significant geopolitical risks, and presents opportunities for trade.

17. The Africa critical minerals strategy under development by the Africa Development Bank advocates for the deployment of critical minerals in low-carbon energy generation, distribution and use in low-carbon mobility or electric vehicles. It further calls for building on existing clean energy technologies deployed across the continent. The strategy is expected to build on the Africa mining vision that advocates for upstream value addition through various processes such as refining, processing, and manufacturing. Additionally, it builds upon the recently adopted African Union Commodity Strategy that recognizes the importance of Africa's natural resource endowment and envisages how to harness it for comprehensive development.[6]

[5] IEA. (2022). African Energy Outlook. Paris: International Energy Agency.

[6] AU. (2021). Draft African Union Commodity Strategy and Action Plan. Addis Ababa: Africa Union

18. Africa is already a major producer of several critical minerals, including cobalt, copper, lithium, manganese and rare earth elements. The growth of the clean energy sector in Africa is expected to drive demand for critical minerals. Africa can potentially become a major supplier and active user of critical minerals to the global market. Some examples of key critical minerals in Africa include[7,8,9]:

(a) Cobalt: Cobalt is a vital component in lithium-ion batteries used in electric vehicles and renewable energy storage systems. Africa is home to about two-thirds of the world's cobalt reserves, with the Democratic Republic of Congo being the largest producer.

(b) Copper is used in the wiring and other components of electrical equipment. Africa is home to about 10% of the world's copper reserves, with Zambia being the largest producer.

(c) Lithium: Lithium is another essential mineral used in lithium-ion batteries, making it crucial for electric vehicles and energy storage. Africa is home to about 30% of the world's lithium reserves, with the Democratic Republic of Congo and Zimbabwe being the largest producers.

(d) Rare Earth Elements: a group of minerals used in various green technologies, such as wind turbines, solar panels, electric vehicle components and a wide range of technologies, including magnets, sensors, and lasers. Africa is home to about 15% of the world's rare earth reserves, with the Democratic Republic of Congo being the largest producer.

(e) Chromium is a hard, corrosion-resistant metal that is used in a variety of applications, including stainless steel, pigments, and refractory materials. Africa is home to about 95% of the world's chromium reserves, with South Africa being the largest producer.

(f) Graphite: Graphite is a critical mineral used in lithium-ion batteries and is essential for electric vehicles and energy storage systems. Accounting for over one-fifth of the world's reserves, Madagascar, Mozambique, and Tanzania's combined graphite reserves will play a central role in the development of lithium-ion batteries, with the critical mineral serving as a crucial element for the development of EVs and battery storage technologies.

(g) Manganese: Africa accounts for about 30% of the world's manganese reserves. This makes Africa the world's largest producer of manganese. Manganese is essential for a number of industrial applications, including the production of steel, batteries, and fertilizers. As the demand for these products increases, so will the demand for manganese.

(h) Platinum Group Metals: including platinum, palladium, and rhodium, are used as catalysts in fuel cells for hydrogen-based energy systems. In 2021, Africa produced around 156.3 metric tons of platinum. South Africa accounted for roughly 142 metric tons of the mine production, while Zimbabwe produced some 15 metric tons.

(i)

19. The growth in demand for critical minerals presents a major opportunity for Africa, which is well positioned to become a major supplier of these essential minerals. Simultaneously, this demand presents environmental, geopolitical, and trade, as key factors that the continent needs to address. Africa's mineral wealth has historically been viewed as a springboard to modernization. It is often centered on grandiose projects that failed due to a combination of uncompetitive costs, lack of connecting infrastructure, weak skills base or poor governance. By rejecting a historical approach of operating in silos, African Heads of State adopted the African mining vision at the 2009 Africa Union Summit and laid the foundation for the way forward.[10]

20. The way forward for Africa's critical minerals needs is to leverage the geopolitical, trade, and environmental factors as key to avoid past mistakes and take advantage of the new opportunities that these minerals offer. Environmentally, the mining of critical minerals necessitates the responsible extraction and utilization of the same through restorative, circularity, pollution control, and sustainable resource management, among key strategies to lower the ecological or environmental footprint. On the other side, the transition to low-emission development enhances environmentally sustainable socioeconomic growth. If Africa focuses on building a competitive, low-carbon manufacturing sector,

[7] Critical Minerals in Africa: A Review of the Literature, African Minerals Development Centre, 2020.

[8] Critical Minerals for Clean Energy Transitions in Africa, African Development Bank, 2021.

[9] Africa's Critical Minerals: A Resource Guide, Mo Ibrahim Foundation, 2022

[10] AU. (2009). The Africa Mining Vision. Addis Ababa: African Union

the region can generate[11] an additional $200million - $2 billion in yearly revenue by 2030, while creating up to 3.8 million jobs over 30 years. It is crucial to ensure sustainable mining practices that minimize environmental harm and maximize the potential for greening the industry.

21. While critical minerals are essential globally, their extraction is geographically concentrated and not uniformly distributed. For example, in Africa, only countries like the Democratic Republic of Congo, South Africa, Zambia, and Zimbabwe are known to have significant deposits of these minerals.[12] In addition, Africa does not enjoy a monopoly supply and faces significant global competition. For example, while Zimbabwe, the sixth largest producer of lithium globally, can supply up to 20% of the global lithium market, it currently accounts for only 1% of global lithium supply, even though the country has been mining lithium for the past 60 years. In addition, 79% of graphite is extracted in China, 70% of cobalt from the Democratic Republic of Congo; 60% of proven rare earth elements are also in China, and 55% of lithium can be found in Australia. Processing operations are even more concentrated, mostly in China (35% for nickel, 50-70% for lithium and cobalt, and 90% for rare earth elements). Only a handful of African countries host significant amounts of these minerals. Africa's lithium production is also set to rapidly increase from 40,000 tonnes this year to likely produce 497,000 tonnes in 2030, the bulk of that coming from Zimbabwe. Mali in West Africa is reported to have estimated reserves of 108 million tonnes – the highest in the world – but these remain unexploited.

22. Africa's significant participation[13] in the global supply chain is limited to the upstream level and specifically mining, where it faces global competition, and with non-significant participation in processing and midstream refining into different components as well as consumption supply chains in products such as electric vehicles, wind, and solar technologies. It is also worth noting that countries like the Democratic Republic of Congo implemented restrictions on the export of raw minerals, but lack of local processing capacity presented a bottleneck to further advancement in value-added midstream activities that provide a better return. Increased regional collaboration and target partnerships at the global level are critical to surmounting geopolitical risks of processing capacity constraints, competition, especially at the upstream mining stage, and non-uniform distribution of sources which may disrupt supply chains through local policies such as export bans.

23. Trade provides an opportunity for inter-country complementarities to extract inclusive benefits of these minerals for the continent and manage geopolitical risks. Specifically, there is an urgent need to tap into the Africa Continental Free Trade Agreement to enhance the continent's advantages, especially in soliciting better outcomes, such as, enhanced participation in the midstream value chain. The Africa Continental Free Trade Agreement is projected to increase[14] trade demand by 28%, including in critical minerals and manufacturing.

24. Intra-regional coordination and trade is critical towards helping countries in the continent to take advantage of complementarities and develop harmonized green industrial and manufacturing policies that add value to mineral development, attract investments for processing of the minerals, and promote linkages with the local and regional economies. An example[15] of this is an ongoing collaboration between the Democratic Republic of Congo and Zambia (producers of copper, lithium and coltan) to manufacture electric vehicle batteries.

25. Africa, the least motorized region that accounts for only an estimated 1% of cars sold worldwide, will be expected to bridge this gap in coming years with electric vehicles, considering the growing market globally. The continent will also be expected to leverage solar power, the most cost-effective approach to enhancing electricity access in off-grid areas, a critical priority considering that the electricity access gap in Africa grew by 15 million people or 3% between 2019 and 2021. The Africa Continental Free Trade Agreement will be key to fuel intra-Africa capacity exchange for the growth of critical minerals processing and refinement into finished goods for the electric vehicle and solar power manufacturing for the African market.

[11] https://www.mckinsey.com/~/media/mckinsey/business%20functions/sustainability/our%20insights/africas%20green%20manufacturing%20crossroads/africas-green-manufacturing-crossroads-choices-for-a-low-carbon-industrial-future.pdf

[12] The Future of Africa's Critical Minerals, McKinsey & Company, 2021

[13] https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf

[14] https://www.globalcompliancenews.com/2023/01/27/https-insightplus-bakermckenzie-com-bm-international-commercial-trade-africa-the-impact-of-the-african-continental-free-trade-area-on-the-continents-mining-sector_01252023/

[15] https://www.uneca.org/stories/zambia-and-drc-sign-cooperation-agreement-to-manufacture-electric-batteries

26. On targeted global-level partnerships, the African region is a major trading bloc on critical minerals, mainly in unprocessed form. Many of these trading partners are also the leading global players in the midstream and downstream processing, refining and value addition into finished goods for the electric vehicles, wind, and solar sectors, as well as consumption. African countries, therefore, need to consolidate under the Africa Continental Free Trade Agreement and engage as a bloc with the rest of the world to advance their partnership beyond upstream mining operations to prioritize technology transfer and capacity building towards mid and downstream value-added activities that generate higher revenues.

IV. Actions taken by Africa on critical minerals in the clean energy transition

27. In recent years, African countries have taken a number of actions to position themselves as key players in the global critical minerals market. These actions include:[16]

(a) Improving the investment climate for mining companies. Many African countries have changed their mining policies, laws and regulations to make it easier for mining companies to invest. This includes streamlining the permitting process, providing tax incentives, and guaranteeing property rights.

(b) Developing the capacity to process and refine critical minerals locally. In the past, many African countries exported their critical minerals as raw materials. However, to capture more value from these resources, African countries are now investing in developing processing and refining facilities. This will allow them to produce higher-value products, such as batteries and magnets, which are in high demand for renewable energy technologies.

(c) Promoting regional cooperation. Africa is a vast continent with a diverse range of critical mineral deposits. In order to maximize the benefits of these resources, African countries are working together to promote regional cooperation. This includes developing common standards for mining and processing and sharing information on investment opportunities.

28. Several African countries are taking various actions to secure and develop critical minerals that are key components for energy technologies such as batteries, electric vehicles, and renewable energy systems. Here are some specific examples of actions taken by African countries on critical minerals in energy[17]. The list is not exhaustive of the situation in Africa.

(a) Democratic Republic of Congo is the world's largest producer of cobalt, which is a critical mineral used in batteries for electric vehicles and renewable energy systems. The government has introduced new regulations to increase transparency and ensure that mining sector revenues benefit the country's economy and people. In 2021, the government also announced plans to invest $10 billion in the development of a battery manufacturing industry. Democratic Republic of Congo and Zambia are also pursuing a battery mineral and electric vehicle value chain, with support from the United Nations Economic Commission for Africa, and other partners. The initiative will include a cross-border special economic zone, and centre of excellence for battery technologies.

(b) South Africa is rich in platinum group metals, which are used in fuel cells for clean energy technologies. The government has partnered with the private sector to develop a platinum group metals roadmap to boost the sustainable supply of platinum group metals for various industries, including energy. In 2022, the government also announced plans to invest $2 billion in the development of a green hydrogen industry.

(c) Morocco is a leader in the production of phosphates, which are essential for the manufacture of phosphoric acid used in batteries and solar panels. The government has established a national strategy to develop the country's phosphate resources while ensuring environmental sustainability. Morocco is also exploring pairing these endowments with existing vehicle manufacturing capacity for electric vehicles.

(d) Nigeria is exploring opportunities to expand the production of lithium, which is used in batteries for electric vehicles and renewable energy systems. The government has established a roadmap for the development of the country's mining sector, including plans to boost the production of critical minerals.

[16] https://mo.ibrahim.foundation/sites/default/files/2022-11/minerals-resource-governance.pdf

[17] https://mo.ibrahim.foundation/sites/default/files/2022-11/minerals-resource-governance.pdf

(e) Angola is developing its rare earth elements sector, which includes critical minerals such as neodymium and dysprosium that are used in magnets for wind turbines and electric vehicles. The government has initiated partnerships with global companies to develop mining and processing facilities for its rare earth elements.

(f) Ghana is developing its bauxite reserves, which is a critical mineral used in batteries for electric vehicles and in renewable energy systems. The government has initiated partnerships with global companies to build an integrated bauxite-aluminium industry that will promote the sustainable supply of critical minerals.

(g) In 2021, Namibia imposed an export ban on lithium concentrate to encourage the development of a local lithium processing industry.

(h) In 2022, Zimbabwe announced plans to invest $5 billion in the development of a lithium processing plant.

(i) In the pursuit of developing and safeguarding their critical mineral resources, African countries are implementing a range of measures while actively promoting sustainable practices within the mining sector. These decisive actions are of utmost importance as they position Africa as a pivotal player in the global critical mineral markets and contribute to the successful transition towards low-carbon energy systems. With its favourable position, Africa stands to gain significantly from the increasing demand for these vital resources, furthering the attainment of sustainable development goals within the region.

V. Gaps and opportunities for critical minerals in clean energy transitions in Africa

29. The growing demand for critical minerals and metals due to global trends in population growth, urbanization, and low-carbon energy, poses challenges and opportunities for sustainable development in Africa. Here are the main challenges and opportunities presented by this growing demand:

(a) Limited value addition: Despite being a major producer of critical minerals, Africa often exports raw materials without significant value addition. This locks the continent into the lower end of global value chains and limits economic benefits and negotiating capacity.

(b) Strengthening governance in the informal sector: it is estimated that over 9 million people work in artisanal and small-scale mining in Africa, and they are depended upon by 54 million for their livelihoods. In the Democratic Republic of Congo, which produces up to 70% of cobalt globally, an estimated 10-20% comes from artisanal mines. Strengthening standards in such artisanal operators is critical to lowering risks of social consequences of mining, such as human rights violations.

(c) Strengthen environmental governance: It is essential to assess and minimize the impacts of extraction and processing on the environment, on water sources, on biodiversity (including protected areas and endangered species) and on frontline communities. Robust environmental legislation, regulation and policies are critical for protecting the environment and human wellbeing, and for supporting sustained economic growth from natural resource wealth.

(d) Adapting to a changing technological environment: African countries will need to invest in innovation, research, and development.

(e) Tapping youth: tapping the mid and downstream supply chains of critical minerals offers an opportunity for Africa to address the youth bulge in a sustainable, inclusive way. Partnerships, including through Article 6.2 of the Paris Agreement, should be leveraged to enhance the capacity of technical and other tertiary institutions in Africa for mid and downstream processing of critical minerals into finished products and components to serve the continental market.

(f) Tensions between developed and African countries: The quest for securing access to critical resources for the green transition can create tensions between developed countries and African countries. Different development goals, such as promoting local processing and resource-driven industrialization, may conflict with securing access to raw materials.

(g) Strategic position as a producer: Africa’s significant mineral resources, including battery minerals like cobalt, manganese, graphite, and copper, provides an opportunity to leverage the continent’s strategic position in the transition to renewable energy.

(h) Local processing and value addition: Promoting local processing and value addition of mineral resources can create economic opportunities and higher-value stages in the mineral value chain. This can be achieved through regional cooperation, industrial development, and economic diversification.

(i) Regional integration: Regional cooperation and integration can facilitate the emergence of regional value chains, attract investments, and increase the competitiveness of African countries in the mining sector.

(j) Inward-looking development agenda: Shifting from raw material exports to local production, processing, and consumption, prioritizing e-mobility and increasing electricity access as a market can help Africa reduce its reliance on imports and build domestic industries. The African Continental Free Trade Area can support this agenda by removing tariff barriers and providing access to a large regional market.

(k) By prioritizing green mineral extraction and catalysing circularity in the extraction and processing of critical resources, African countries can leverage their mineral resources sustainably, minimize environmental impacts, and contribute to the broader global goals of mitigating climate change, protecting ecosystems, and promoting sustainable development.

VI. Possible environmental policy interventions for critical minerals in the clean energy transition in Africa

30. Solutions to the challenges associated with critical minerals and their role in energy transitions in Africa have been looked at over time, primarily from an economic and environmental sustainability point of view. Currently, there is enough evidence to show why addressing the supply and sustainable management of critical minerals is crucial for Africa's energy transition. The increased demand for renewable energy technologies, such as solar panels, wind turbines, and electric vehicle batteries, relies heavily on critical minerals like lithium, cobalt, rare earth elements, among others. These minerals are essential for producing clean energy technologies, and their availability and responsible extraction are key factors in ensuring the successful transition to a low-carbon economy.

31. Global level competition, coupled with a concentration of critical minerals in a few countries and low processing capacity, presents geopolitical risks that threaten the full relation of critical minerals potential in Africa. Simultaneous with environmental interventions, Africa must prioritize trade through the African Continental Free Trade Area, targeted partnerships, including harnessing Article 6.2 of the Paris Agreement for capacity enhancement in mid and downstream value-added interventions, and prioritized engagements in the mid-stream and downstream supply chains to minimize such geopolitical risks.

32. Critical minerals should be leveraged as strategic for furthering climate resilience both biophysically and socioeconomically. Specifically, policies prioritizing environmental standards, traceability and due diligence are critical to lowering environmental degradation risk following mining activities. Policies incentivizing the value addition and refinement of critical minerals into finished goods in the electronic vehicles and clean energy and continental and global trade of the same, are critical to strengthen the global transition to clean transport and energy, thus enhancing realization of net-zero targets. Lower emissions translate to a reduced risk of increased adaptation costs. Further, value addition increases earning potential to lower socioeconomic vulnerability, which is a leading source of Africa's disproportionate vulnerability.

33. The utilization of green minerals can facilitate resource-based industrialization in Africa. By incorporating these minerals into manufacturing processes and establishing forward and backward linkages, the continent can stimulate economic diversification, create employment opportunities, and foster sustainable development.[18]

34. Overall, the role of critical minerals in Africa's energy transition involves supporting the manufacturing of renewable energy equipment, expanding electricity transmission and distribution networks, enabling the production of batteries for energy storage and electric vehicles, and fostering downstream linkages and industrial development. By harnessing these minerals effectively, Africa can drive its energy transition while promoting economic growth, job creation, and environmental sustainability.

[18] ECA. (2018). 2018 Africa Sustainable Development Report: Towards a transformed and resilient continent. Addis Ababa: African Union, Economic Commission for Africa; African Development Bank and United Nations Development Programme.

35. Recognizing the value of Africa's natural capital, there is an opportunity for the continent to add value in the extraction of critical minerals through technology integration. This can be facilitated through regional and sub-regional approaches that promote collaboration, knowledge sharing, and technology transfer among African countries.

36. Effective governance serves as an enabler for sustainable mining of critical minerals. It involves establishing good contracts that adhere to high standards of environmental safeguards, enabling collective bargaining, developing regional guidelines, and providing access to technology to ensure responsible and inclusive mineral extraction.

37. Investment in areas that drive sustainable development and human capital is essential to achieve inclusive wealth through critical minerals. By strategically investing in education, skills development, healthcare, and infrastructure, African countries can maximize the benefits of critical minerals for their populations and foster long-term sustainable development.

38. Tapping critical minerals is an intersectoral task that transcends the environment. It calls for coherent policy and investment actions across different ministries – including the environment - from a regulatory standards dimension, energy, transport, trade, agriculture (the most inclusive sector in which value-added solutions of electric vehicles and clean energy are critical interventions along the value chain to optimize earnings), finance/economic planning, education, industry among key ones, and targeted partnerships cutting across all these areas for capacity enhancement for implementation.

39. Therefore, the strategic environmental policy interventions for critical minerals in the energy transition are as follows:

(a) Understand and measure the natural wealth of the Africa region, including its mineral wealth, by adopting metrics such as the inclusive wealth index that track how natural wealth is managed and optimized.

(b) Assess the environmental impacts of critical resource extraction, especially in fragile environments through project-level environmental impacts assessments and sector-level strategic environmental assessments. This includes understanding cumulative impacts and trade-offs between different land-use options site remediation, enhance circularity, decarbonization.

(c) Prioritize trade/ African Continental Free Trade Area, capacity enhancement for value addition as strategic, to lower the geopolitical risks associated with the concentration of critical mineral sources in a few countries and global competition in the extraction and export of unprocessed minerals.

(d) Implement policies that will allow greater transparency of commodity markets for critical energy transition minerals.

(e) Develop an Africa region-wide response on critical minerals for clean energy transition building on a strategic focus on electric vehicles and clean electrification, the “United Nations Framework on Just Transition for Critical Energy Transition Minerals”, the “Africa critical minerals strategy”, Africa Green Minerals Strategy, the African Continental Free Trade Area, strategic global partnerships aimed at capacity enhancement for midstream and downstream value-added interventions, and the informal sector for Africa’s sustainable development.

(f) Underpin Africa’s approach on critical minerals on tangible investment plans that clearly elucidate social, economic, financial, and policy enablers and opportunities for profitable investments in Africa’s critical minerals sub-sectors of electric vehicles, clean electricity and their various application areas.

(g) Develop regional and national collaborative and cooperative frameworks for capturing cross sectoral opportunities to benefit from the values of critical minerals for the sustainable development of Africa.