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Prospects and challenges for the export of rare earths from Sub-Saharan Africa to the EU

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Abstract

The African continent is increasingly becoming a battleground in the race between superpowers for access to critical minerals needed for the 'Green Revolution', such as rare earth minerals (REE). Companies from China, the USA and Russia play a major role. In most cases, critical minerals are mined by international mining companies supported by their governments and organizing complex global value chains. So far, China has dominated supply chains and has secured mining contracts across sub-Saharan Africa (SSA). Currently, China produces 58% of all REEs worldwide. It is the main importer of minerals from Africa, with mineral exports from sub-Saharan Africa to China totalling USD 10 bn in 2019. Its dominance of the global rare earths market is rooted in politics, not geography. Rare earths are neither that rare nor that concentrated in China. Beijing has adopted a strategy of imports, dumping and control of rare earths that is hardly consistent with WTO rules. Therefore, in June 2022, a newly founded 'Minerals Security Partnership', consisting of the USA, the EU, Great Britain and other Western industrialized countries, invited mineral-rich African countries to counter Chinese dominance. These included resource-rich countries such as South Africa, Botswana, Angola, Mozambique, Namibia, Tanzania, Zambia, Uganda and the Democratic Republic of Congo. The West's push became even more urgent after Beijing imposed export controls on the strategic metals gallium and germanium in July 2023, sparking global fears that China could be next to block exports of rare earth or processing technology. Because African markets are small, they are forced to rely on foreign financing. However, so far, foreign direct investment in rare earth production has confirmed the 'pollution haven' hypothesis about the environmentally harmful effects of FDI flowing into the affected countries. Although the full potential of rare earths in SSA has remained largely untapped due to low exploration, the dark side of the energy transition is becoming increasingly visible. These include pollution of soil, air and water as well as inadequate disposal of toxic residues and intensive water and energy use, occupational and environmental risks, child labour and sexual abuse as well as corruption and armed conflicts. In August 2023, Nigeria, Africa's largest economy, suspended certain illegal Chinese mining activities within its borders, including the activities of Ruitai Mining Company due to its involvement in illegal titanium ore mining. Namibia and the DR Congo followed suit.

Keywords: *Rare Earths, Energy Transition, Climate Change, Pollution, Emerging Markets, Sub-Saharan Africa, Eu, Minerals Security Partnership, South Africa, Nigeria, Dr Congo, African Studies*

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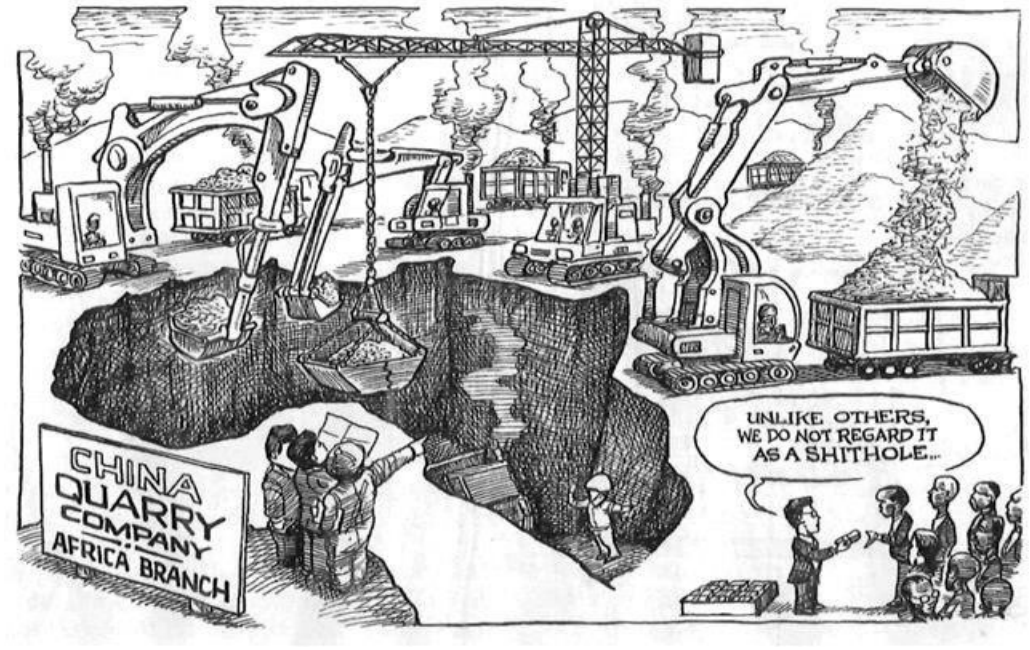


Cartoon 1: Chinese Control Over African Mining

Source: © Kevin KAL Kallaugher, The Economist, Kaltoons.com

1. Introduction

Critical minerals such as rare earth elements (REEs) are essential in renewable energy supply chains to combat the effects of global climate change. They are of utmost geostrategic importance. REEs are critical components in military industries, energy efficiency, and technologies key to climate change response. Contrary to what the name suggests,

Figure 1: Wide Range of Applications of Rare Earth Elements (REES) in Modern Technological Devices in Various Areas of Industry Today

Source: Temga et al. (2021)

Atomic Number	Element	Symbol
21	Scandium**	Sc
39	Yttrium	Y
57	Lanthanum	La
58	Cerium	Ce
59	Praseodymium	Pr
60	Neodymium	Nd
61	Promethium*	Pm
62	Samarium	Sm
63	Europium	Eu
64	Gadolinium	Gd
65	Terbium	Tb
66	Dysprosium	Dy
67	Holmium	Ho
68	Erbium	Er
69	Thulium	Tm
70	Ytterbium	Yb
71	Lutetium	Lu

Table 1: 17 Essential Rare Earth Elements

Source: Gibson (2023)

rare earths are not geologically scarce and can be found almost anywhere in the world. However, rare earths are rarely pure, so it is hard and expensive for processors to separate them and take advantage of their individual properties. Their production requires enormous effort and large amounts of raw materials to be processed. It takes a minimum of a decade for industrial REEs-mining materialises into significant profits (Expert Speak, 2022).

For a number of the most critical materials for clean energy transition, including lithium, cobalt, and REEs future reserves are much more concentrated in a much smaller number of countries than oil and natural gas (Klare, 2021; IEA, 2022). Moreover, the extraction and processing of rare earth metals is controlled by a limited number of companies. For example, 90% of the lithium market is in the hands of five companies. This concentration of extraction and production capacity risks replacing the current dependence on fossil fuels with a dependence on rare metals (Zacharie, 2023). This is why the United States (US) and the European Union (EU) have established lists of critical and strategic minerals and metals to secure their supplies. The US identified 50 critical raw materials in 2022 and the European Commission identified 34 in its latest classification published in March 2023. The draft European legislation on critical raw materials sets targets for 2030 to improve the European Union's extraction, processing, recycling and supply capacities. The EU and the US are also negotiating a cooperation agreement to promote transatlantic supply chains for critical minerals needed to produce electric vehicle batteries (Zacharie, 2023). As far as Sub-Saharan Africa (SSA) is concerned, for example, two-thirds of the world's cobalt reserves are concentrated in the Democratic Republic of Congo (DR Congo) and 70 % of platinum from South Africa (Zacharie, 2023).

The International Energy Agency (IEA) estimates that existing mines and projects are expected to cover only half of the world's lithium and cobalt needs, and 80 % of copper demand. The European Union (EU) is particularly dependent and vulnerable since it concentrates 20 % of global demand for these metals while it only provides 3 % of global production (Zacharie, 2023).

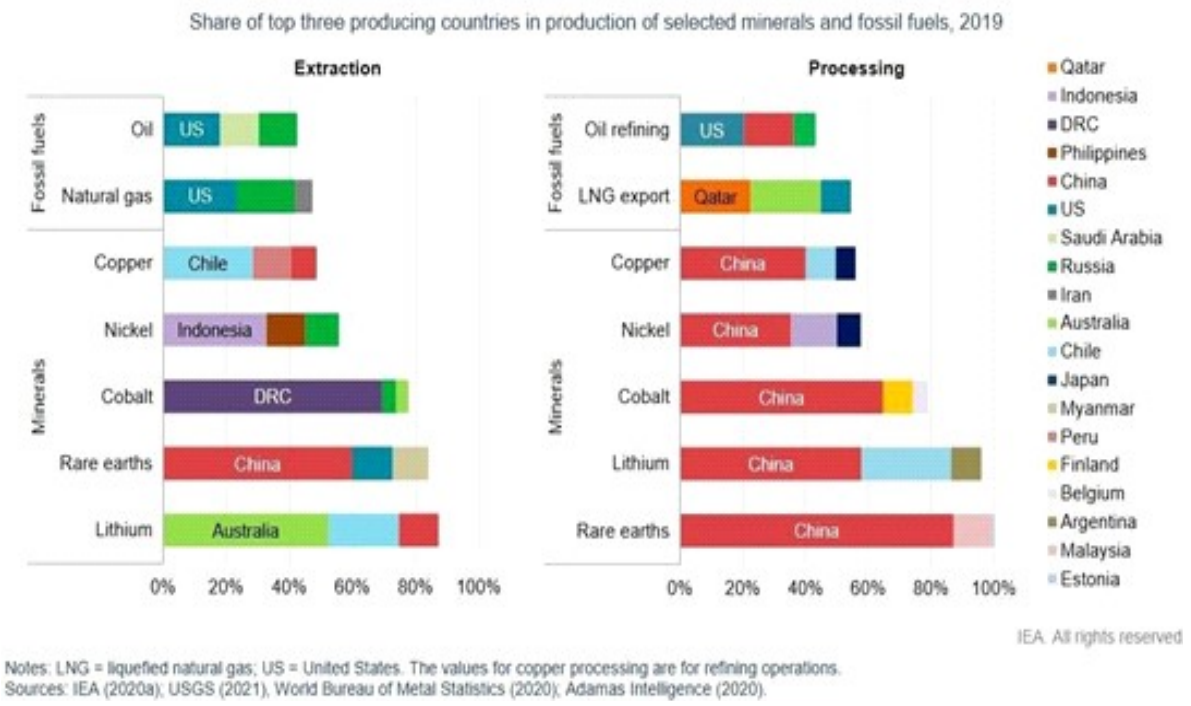


Figure 2: Production of Many Energy Transition Minerals Today is More Geographically Concentrated than That of Oil or Natural Gas

Source: IEA (2022)

Last, but not least, the Western industrialized nations (G7) should include the establishment of a circular economy making it possible to recycle and reuse metals. The EU would also be well advised to consider opening new mines and refineries that respect social and environmental standards. Both would be important not only to reduce imports but also to avoid a beggar-thy-neighbour policy of shifting the environmental damage caused by their extraction and production to developing countries with lower standards and control facilities (Zacharie, 2023).

The production process is extremely harmful to the environment. As a result, the countries that export rare earths are up to date even rarer than the countries that export oil and natural gas (Vekasi, 2021). In 2021, global demand for rare earths reached 125,000 metric tons. By 2030, it is forecast to reach 315,000 tons (Baskaran, 2022). Overall, the market for magnet rare earth oxides, like didymium, dysprosium and terbium, is set to increase five-fold by 2040, from an estimated US $10.8 bn 2023 to US $56.7 bn by 2040 (Staff Writer, 2023).

That is why the global race for rare earths involves difficult choices. Hard choices will have to be made between ramping up dirty industries at home or concerning partnering with problematic bedfellows abroad (Foroohar, 2023). Right now, the US, for example, has only one operational rare earth mine, owned by a company called 'MP Materials' and located in the Mojave Desert, focussing on Neodymium-Praseodymium (NdPr), a rare earth used in high-strength permanent magnets powering motors in electric vehicles, robotics, wind turbines and drones. It mines about 14% of the world's supply of rare earths. But the Mojave mine has changed hands several times, and its previous owner went bankrupt in 2015. This underlined the boom-bust cycles inherent in mining, and many other resource industries. Even now, with very modest shortfalls in the market for the geostrategic mineral lithium during the past two years, one observed prices increase by around 800 %. Several times larger shortfalls are projected from around 2027, which could amount to around a quarter of global demand by 2030 (Foroohar, 2023).

China was one of the first global players to recognise the important geostrategic role of these minerals and to reorient its industrial policy accordingly. Back in the early 1990s, Chinese leader Deng Xiaoping famously said that 'the Middle East has oil, and China has rare earths', referring to the 'first oil shock' of October 1973, when members of the Organisation of Arab Petroleum Exporting Countries (OAPEC) imposed an oil embargo on countries that had supported Israel during the Yom Kippur War (Vekasi, 2021). Since then, Chinese industrial policy has produced a competitive advantage in all stages of the rare earth extraction and refinement process, building an extensive rare earth value chain inside China as

Cartoon 2: The Rare Earth Race Entails Difficult Choices

Source: © Matt Kenyon, Foroohar (2023)

well as overseas. It applied a strategy of entry, dumping and control of rare earths that hardly complied with the rules of the World Trade Organization (Fontanel, 2021). The market is dominated by China, which produces about 60 % of the world's rare earths, processes and refines around 80 %, and is the central player in the global supply chain. The world's major economies (US, 80%; EU, 98%) are all currently heavily dependent on Chinese imports (Raimondi, 2021).

Moreover, China secured access to rare earth resources and production in many countries of Sub-Saharan Africa (SSA), including Nigeria and DR Congo, thereby it took advantage of the low environmental and social standards in China and SSA. In 1994, China controlled only half of the global production, but by the 2000s, Chinese mines were producing around 90 % of the global supply. In 2017, China generated about 80 % of global rare earth output, which decreased to approximately 60 % in 2020. This large market share is a product of Beijing's systematic state policy of increasing centralisation and control. Policies have included export and production quotas, investment in research, education and development, and centralised national control of the industry. In short, Chinese dominance in the global rare earth market is rooted in policy, not geography or geology (Vekasi, 2021).

The use of rare earths as a geo-strategic weapon came first into the focus of the international community and political risk analysts in 2010-2011 after the Chinese allegedly imposed an export ban of rare earths to Japan amid a territorial dispute about fishing rights. However, these allegations were later revealed as largely unfounded, as were similarly alleged patterns of disruption of China's shipments of rare earths to G7 members and Australia from 2010 to 2019 (Evenett and Fritz, 2023).

Nevertheless, following this perceived use of economic coercion, rare earth prices were extremely volatile, sparking global discussion about establishing sources outside of China to protect against supply chain and price risks (Vekasi, 2021). This is especially true as China has halved its export quotas for rare earths since 2010. More recently, in 2019, China allegedly used its control of the global supply of rare earths as a strategic weapon in its trade dispute with the US The US, the EU and Japan have also embraced policies, such as the US's Prosper Africa Initiative, launched in 2018 to secure future access to critical minerals like lithium, nickel, cobalt, manganese and graphite that are crucial to battery performance, longevity and energy density (Andreoni and Roberts, 2022).

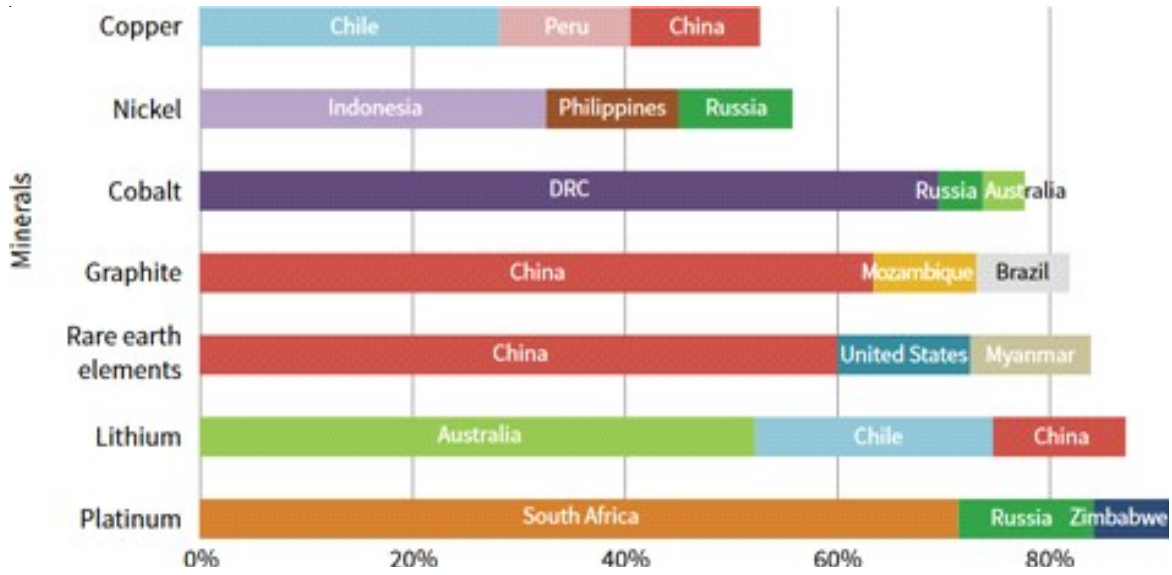


Figure 3: Production and Processing of Critical Minerals, 2019 Share of Top Three Producing Countries in Total Production for Selected Critical Minerals

Source: Andreoni and Roberts (2022)

Initiatives of Western highly industrialized states to develop independent supplies of critical minerals took on added urgency after Beijing imposed in July 2023 export controls on the strategic metals gallium and germanium, raising global fears that China could next block exports of rare earths or processing technology (Scheyder and Onstad, 2023).

Recent efforts by the Californian MP Materials, the Australian Lynas and other companies that tried to refine their own rare earths highlighted the difficult task the rest of the world faces in breaking China's stranglehold on the key group of 17 metals needed for the clean energy transition (Scheyder and Onstad, 2023).

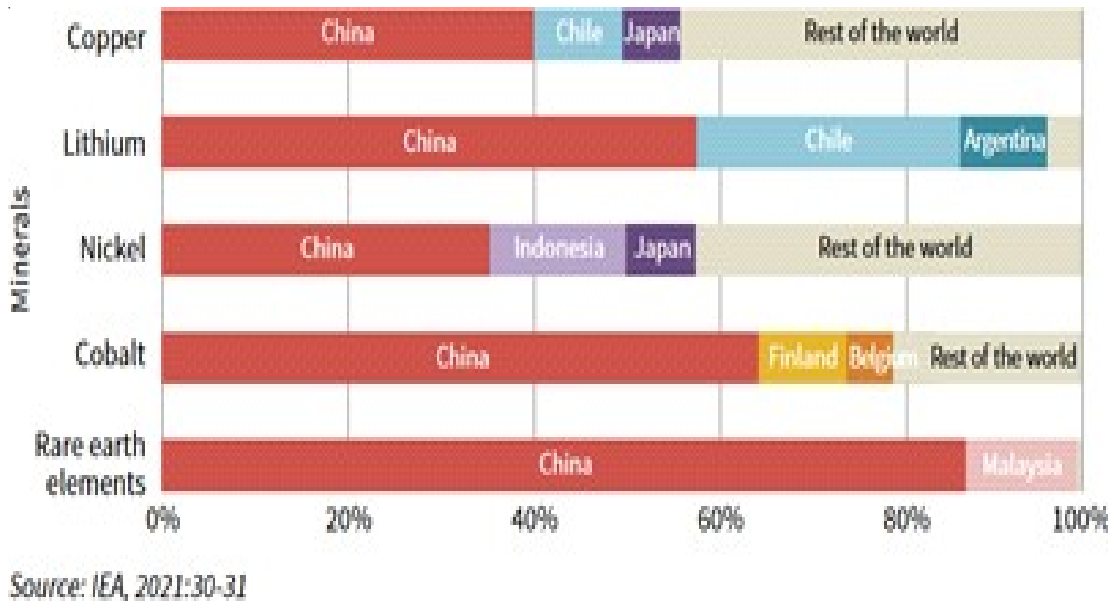


Figure 4: Share of Processing Volume by Country for Selected Critical Minerals, 2019

Source: Andreoni and Roberts (2022)

Sub-Saharan African countries could use this search for new sources of rare earths to generate much-needed revenues to finance key socio-economic objectives and reduce poverty. They could strengthen global trade partnerships by using the African Continental Free Trade Area (AfCFTA) and its regional economic development organisations (SADC, ECOWAS, CEMAC, etc.) to improve value chains. However, Africa's full potential for rare earths remains largely untapped due to low levels of exploration (Baskaran, 2022; Galeazzi *et al*., 2020).

African countries have significant reserves of metals needed for the green energy transition. They also lead the world in reserves and production of bauxite, cobalt, chromium, platinum- group metals and tantalum. They are also significant producers of copper, lithium, zinc and nickel ores. Namibia and the Democratic Republic of Congo have long been the main suppliers of germanium to world markets (Abramova and Sharova, 2023).

Sub-Saharan Africa is home to numerous rare earth deposits, especially in East and Southern Africa, including South Africa, Madagascar, Malawi, Kenya, Namibia, Mozambique, Tanzania, Zambia and Burundi. However, as things stand, Africa has not yet moved beyond the stage of great potential. The only current mining operation is at the Gakara Rare Earth Project in Burundi, located about 20 kilometres south-southeast of Bujumbura, exploited by companies of the Russian steel tycoon Vladimir Iorikh. The South African Steenkampskraal mine (thorium mine) had been operated already by Anglo American plc from 1952 to 1963. It has one of the highest grades of rare earth elements in the world and contains 15 elements and 86,900 tons of total rare earth oxides, with large deposits of neodymium and praseodymium (Baskaran, 2022). New, extended mining operations are to start soon, managed by UK-based Frontier Rare Earths (AfricanMining, 2019).

In addition, several SSA countries have started to implement projects at various stages, including Namibia (Lofdal Heavy Rare Earths Project, in partnership with the Japanese JOGMEC), Malawi (Kangankunde, financed by Mkango Resources, a Canadian explorations firm, expected to commence production in 2025), Angola (Longonjo Project, financed

Métaux précieux	Principal producteur	Autres
Antimoine*	Chine, 87%	Russie, Afrique du Sud, Bolivie, Mexique
Baryte*	Chine 44 %	Inde, Etats-Unis, Maroc
Arsenic	USA 90 %	Etats-Unis
Borate	Turquie 38%	Etats-Unis, Chili, Chine
Bismuth*	Chine 82%	Afrique du Sud, Mozambique, Argentine
Caoutchouc	Thaïlande 32%	Indonésie, Inde, Vietnam
Cobalt*	RDC 64%	Nouvelle Calédonie, Chine, Canada
Gallium*	Chine 73%	Japon, Australie, Kazakhstan
Germanium*	Chine 67%	Etats-Unis, Russie
Graphite naturel*	Chine 69%	Inde, Brésil, Sri Lanka, Suède
Hafnium*	France 43%	Etats-Unis, Chine
Hélium	USA 73%	Canada, Pologne, Russie
Indium*	Chine 57%	Canada, Pérou, Russie
Iridium	Afrique du Sud 85%	Zimbabwe, Russie, Etats-Unis
Magnésium*	Chine 87 %	Turquie, Russie
Niobium*	Brésil 90%	Canada, Australie, Rwanda
Palladium	Russie 46%	Afrique du Sud, Canada
Phosphore	Chine 58%	Maroc, Algérie, Syrie
Phosphorite	Chine 44%	Etats-Unis, Russie
Platine*	Afrique du Sud 70%	Russie, Zimbabwe, Canada
Rhodium	Afrique du Sud 83%	Russie, Zimbabwe
Ruthénium	Afrique du Sud 93%	Zimbabwe, Russie
Scandium*	Chine 66%	Etats-Unis, Australie, Birmanie
Silicium métal	Chine 61%	Brésil, Norvège, Etats-Unis, France
Spath Fluor*	Chine 64%	Mexique, Mongolie, Russie, Afrique du Sud
Tantale*	Rwanda 31%	Australie, Brésil, Canada, RD Congo
Tungstène*	Chine 84%	Russie, Canada
Vanadium*	Chine 53%	Russie, Afrique du Sud, Etats-Unis
Terre rare légère*	Chine 93%	Australie, Etats-Unis, Russie
Terre rare lourde	Chine 95%	Australie, Etats-Unis, Russie

Table 2: Main Producers of Rare Minerals, Including SSA Countries (European Commission, September 2017)

Source: Fontanel (2021)

by the UK government's Automotive Transformation Fund), Tanzania (Ngualla Rare Earth Project), Uganda (Makuutu Project, an open-pit mining development by Ugandan company Rwenzori Rare Metals (RRM)), Madagascar (Ampasindava mine, owned by Tantalus Rare Earths Malagasy), Mozambique (Xiluvo REE Project, within a mining license held by Promac lda) and South Africa (Glenover and Phalaborwa Projects) (AfricanMining, 2019; Baskaran, 2022; Raimondi, 2021).

This having been said, the heavy environmental pollution caused by the production of rare earth brings also the threat of conflict between corporations seeking to exploit these resources and the people who live on the land, who risk displacement, loss of livelihoods, health hazards and environmental contamination. These risks are particularly acute in Sub-Saharan Africa (Stein *et al.*, 2023). Yet, there is a paucity of studies investigating REM production, deposits and associated health impacts in the African context. Measures such as proper mine management, adequate safety protocols, sustainable processing methods and waste management systems have been identified and proposed globally. However, the nature and extent of implementation of these management protocols on the African continent has been less clear. Experts caution about REM mining in Sub-Saharan Africa invoking similar terrible environmental aftermath of REM mining in China (Oladipo *et al.*, 2023).

In many African countries, the dark side of the green energy transition has become already visible. The most serious impacts have included local pollution of soil, air and water, unsafe or inadequate disposal of toxic residues, intensive use of water and energy to the detriment of other users, occupational and environmental risks, child labour and sexual abuse, and corruption and armed conflict (Andreoni and Roberts, 2022).

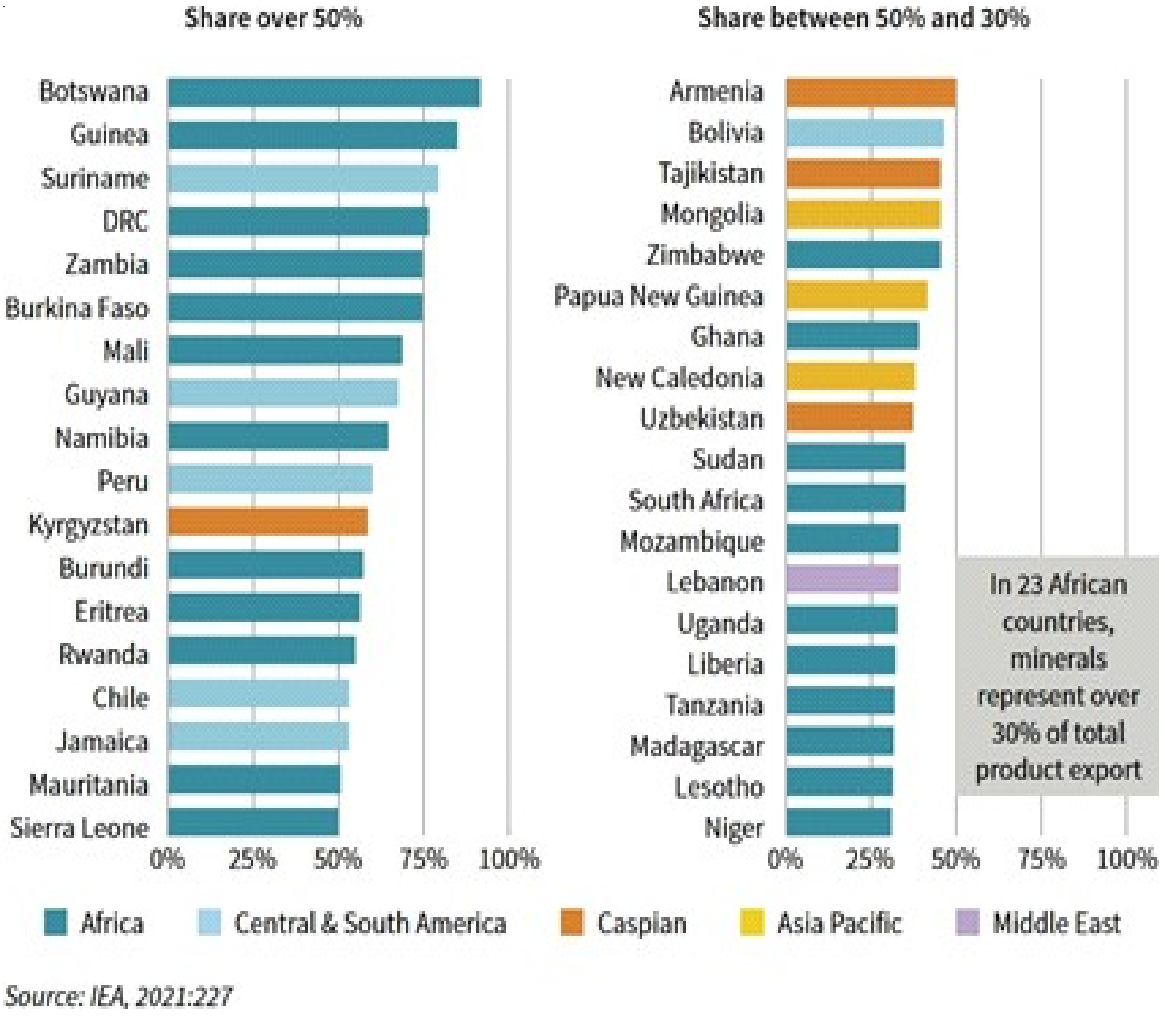


Figure 5: Mineral and Metals Dependence (Share in Total Product Export), 2019 in 23 SSA Countries Minerals Represent Over 30 % Of Total Export Production

Source: Andreoni and Roberts (2022)

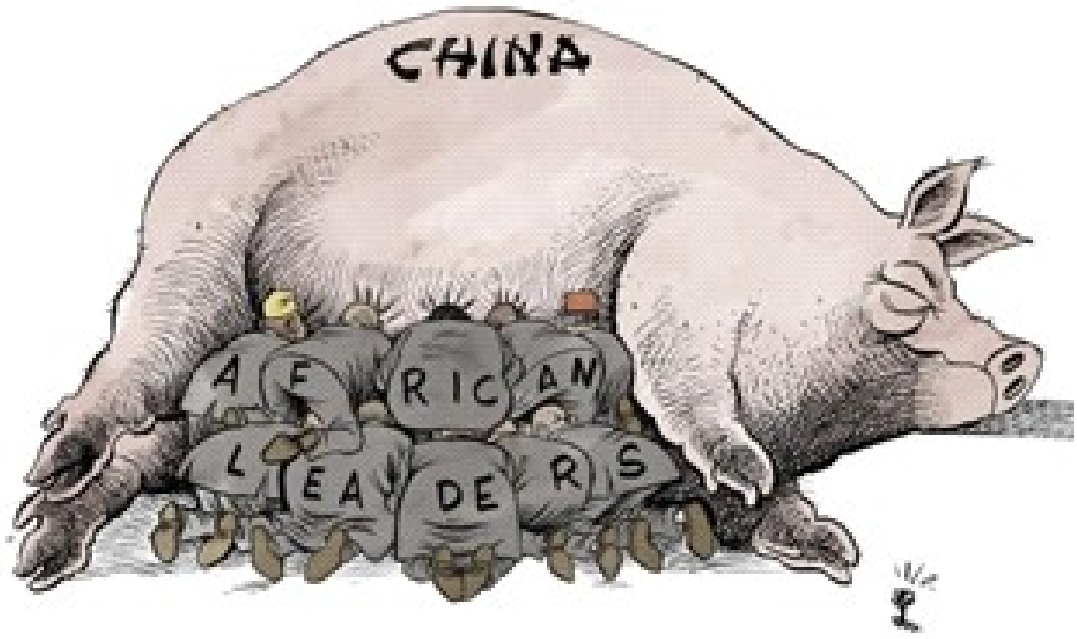
The green 'resource curse', the paradox of plenty, unleashed by rare mineral mining, has been exacerbated by companies and producing countries such as China, looking for the cheapest options in terms of resources and labour, with the necessary access to the requested land and materials (Stein *et al.*, 2023). The heavy dependence of SSA countries on the exploitation of their mineral resources has hurt their environmental conditions. This often led to environmentally unsustainable practices, thus confirming the pollution haven hypothesis (Gao *et al.*, 2023). These environmental and social problems are likely to become increasingly unsustainable as pressure mounts on the extraction of critical minerals in the major industrialised economies. Promoting domestic productive capacity must take into account that critical mineral-based industries are dominated by a few multinational corporations. Individual African countries have little power to shape this evolving geopolitical scenario. However, strategic alliances at the regional level, such as the SSA regional economic groupings (SADC, ECOWAS, CEMAC, etc.) and the continent-wide African Economic Community (AEC), could perhaps prevent a race to the bottom characterised by social and environmental exploitation (Andreoni and Roberts, 2022).

Sub-Saharan Africa has increasingly become a battleground in the race between superpowers to secure access to critical minerals, with companies from China and Russia playing a major role. In most cases, critical minerals are extracted by international mining companies, backed politically and financially by foreign governments, which orchestrate complex global value chains (Andreoni and Roberts, 2022).

In the following, case studies on the production of rare earths and the challenges they face in SSA countries will be analyzed, using South Africa, Nigeria and the Democratic Republic of the Congo (DR Congo) as examples. It will then consider the implications of EU imports of rare earths from SSA, including the 'Minerals Security Partnership' between Western highly industrialised countries, including the US, the EU and Great Britain, that invited SSA countries to ensure a stable supply of raw materials for their economies (Mitchell, 2022).

2. Case Studies on the Production of Rare Earths and the Challenges it Faces in SSA Countries

Up to now, China dominated rare earth mining in Sub-Saharan Africa. It is the primary recipient of minerals sourced from Africa, with mineral exports from Sub-Saharan Africa to China totalling US$ 10 bn in 2019, according to the Washington DC-based think tank, the Wilson Centre (FP Staff, 2023). However, the United States wants to compete with Chinese control of African minerals. By pledging to do mining more responsible and differently, both from how China does it now and how the West has in the past, Washington said it would help transform African economies (Editor, 2023).



Cartoon 3: On The Sow's Side - African Leaders At The Sow's Teats

Source: © Gado; Editor (2023), 28 March 2023

As Sub-Saharan Africa has emerged as a viable alternative source of rare earth minerals, the United States Africa Command (US AFRICOM) identified the exploitation of rare earths as a central part of US strategic objectives in the region in the 2010s (Ferreira *et al.*, 2020). At the same time, the US also wanted to counter the perpetuation of China's global monopoly on these critical resources and Beijing's grip on the African governments involved. Washington wanted to help transform African economies by helping to solve two problems. First, it tried to address the global shortage of minerals needed to meet Africa's climate goals. Second, it wanted to guide its development agencies to 'de-risk' projects, as it had already done before in the agricultural and energy sectors. Thirdly, it envisaged a more active diplomacy in Africa. But African powers such as Nigeria, while welcoming renewed Western interest in African mining, feared that America's push to link ESG-friendly investment with mining would not continue under a Republican president like Donald Trump. While many African governments would like to see more American involvement, they were in no hurry to abandon China. They were eager to increase competition so that African governments could get better deals (Editor, 2023).

At the beginning of 2015, there were 11 advanced REE projects in Africa, i.e. projects for which formally defined resources had been published which included prospects for at least 20 years of project life at annual production levels of 5,000 t and 10,000 t, the magnitude of production generally required for a sustainable and environmentally conscious non-Chinese operation (Harmer and Nex, 2016).

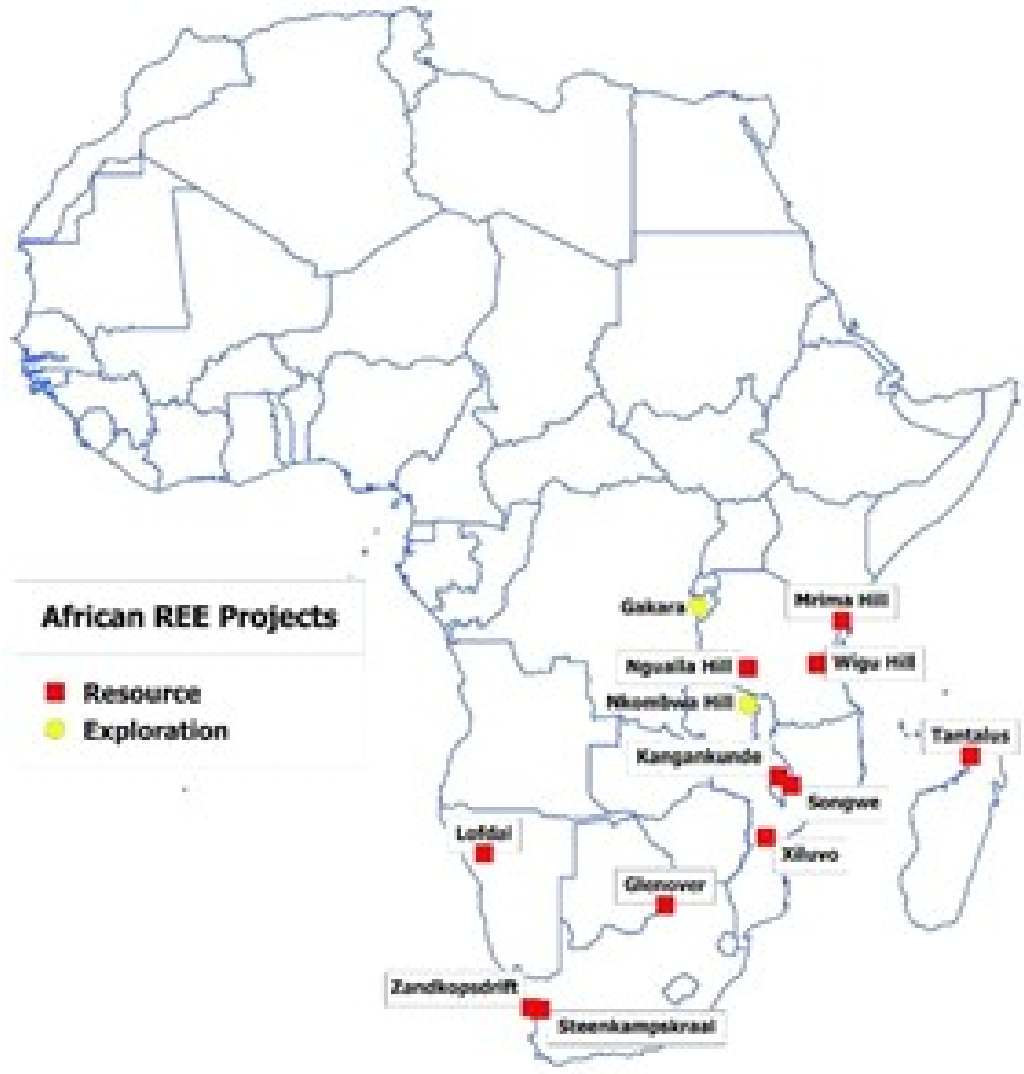
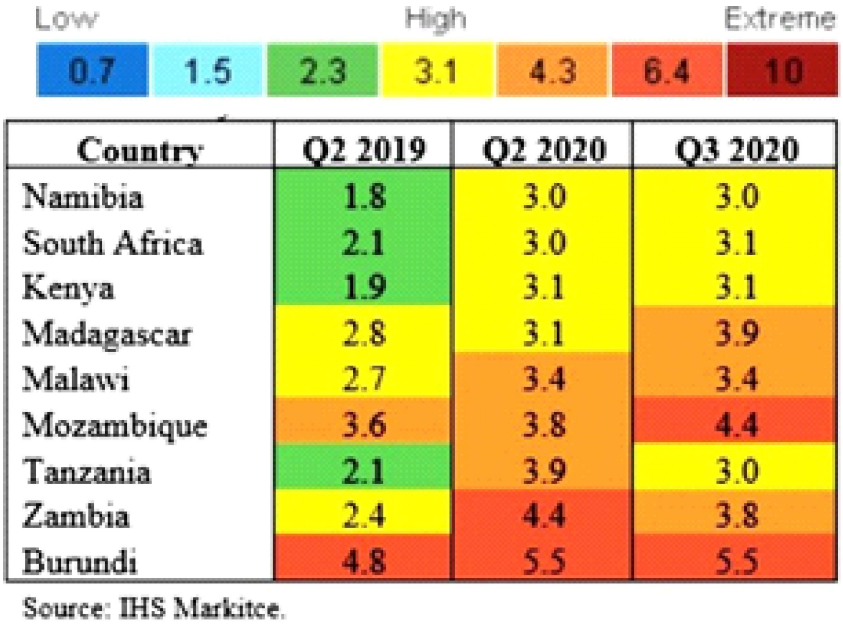


Figure 6: Locations of the African REE Projects (with REO Values of 100 and 200 kt -TREO Contents)

Source: Harmer and Nex (2016)

However, many of the Sub-Saharan African countries with REE reserves are now in 'debt distress' and at risk of defaulting on their international debts (Ferreira *et al*., 2020). They have accumulated unsustainable levels of international debt and are now at high risk of being unable to repay it. The IMF has repeatedly warned of unsustainable debt in highly indebted SSA countries which had often been aggravated by China's debt-trap diplomacy. Such adverse economic conditions provide a unique opportunity for China to flex its economic muscle and consolidate its access to mineral resources in Africa (Ferreira *et al*., 2020). Economic recessions and increases in sovereign credit risk are often linked. Together they may have a compounding effect on each other. Resource-rich countries such as Namibia, South Africa, Kenya, Madagascar, Malawi, Mozambique, Tanzania, Zambia and Burundi, most of which are highly dependent on natural resource exports, are vulnerable to commodity price shocks that may significantly reduce the value of their exports (Ferreira *et al*., 2020).



Country	Q2 2019	Q2 2020	Q3 2020
Namibia	1.8	3.0	3.0
South Africa	2.1	3.0	3.1
Kenya	1.9	3.1	3.1
Madagascar	2.8	3.1	3.9
Malawi	2.7	3.4	3.4
Mozambique	3.6	3.8	4.4
Tanzania	2.1	3.9	3.0
Zambia	2.4	4.4	3.8
Burundi	4.8	5.5	5.5

Source: IHS Markitce.

Figure 7: SSA Countries Economic Risk Score, 2019 - 2020 of Countries Having Potential for Rare Earth Exploitation

Source: Ferreira et al. (2020)

This in turn will lead to a depreciation of the exchange rate and an increase in foreign currency debt. Thus, DR Congo and Mozambique have already defaulted on some of their loans. Six other African countries are now on the verge of defaulting and making only intermittent loan payments: Chad, Eritrea, Somalia, South Sudan, Sudan and Zimbabwe. Finally, Zambia and the Central African Republic are at risk of defaulting in the near future. In 2019, economic risk increased in all African countries identified as having potential for rare earth exploitation. In the third quarter of 2020, all of these economies were considered to be at high economic risk, with Mozambique and Burundi moving into the extreme risk category (Ferreira *et al*., 2020). Under these adverse conditions, it will be particularly difficult for the US to gain a foothold in the REE market in SSA.

In addition, US and other international investors seeking to enter the African REE market face extremely high economic and financial risks. In the early stages of the life of a potential mine and country, investors have to spend a lot on exploration, much of which is inherently unsuccessful. In 2021, Africa had the second lowest levels of exploration expenditures in the world (Baskaran and Ordu, 2023).

It would therefore be wise to join forces. In this respect, a recent US Memorandum of Understanding (MOA) of 18 January 2023 with DR Congo and Zambia to strengthen the electric vehicle battery value chain was exemplary, essentially ensuring that they minimise the export of raw materials and add value at home before exporting these products (Baskaran and Ordu, 2023).

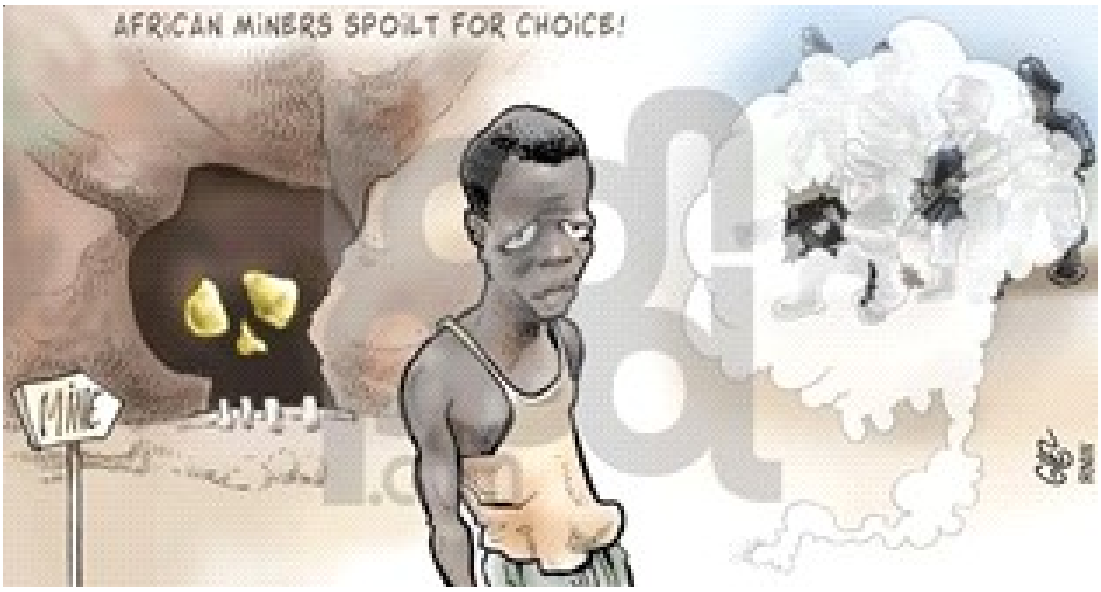
The African regional economic communities and even the African Continental Free Trade Area (AfCFTA) could be active facilitators of this process. But first of all, African governments would have to consolidate their revenues and strengthen and stabilize their tax policy to stem the uphill task of investing in sustainable REE exploration and production. However, higher taxes for foreign investors could deter the latter. One possible solution to this dilemma would be to

move away from resource nationalism to a continental approach (Baskaran and Ordu, 2023). Yet, historical examples, like the failed indigenisation policy of Nigeria and other SSA governments in the 1970s and 1980s, including export bans to support domestic economic development goals and beneficiation, as well as the meagre results of decades of African economic regionalization policies, showed that such visions, for nationalist selfish policies, are rather pious wishes (Kohnert, 2023).

In this respect, the African Growth and Opportunity Act (AGOA), which is up for renewal, could offer promising prospects (Baskaran and Ordu, 2023). It is a valuable tool to reduce reliance on external debt and donors. In 2021, approximately $4.8 bn of non-oil goods were exported to the US under AGOA, compared to $ 3.8 bn in 2019. Currently, many of the firms benefiting from AGOA are Chinese, particularly in the manufacturing sector. Examples include Chinese textile and apparel firms in Lesotho and Eswatini (Swaziland), both AGOA beneficiaries and the Hawassa Industrial Park in Ethiopia (Baskaran and Ordu, 2023). The Chinese-built park is a blend of Western free-trade models, Ethiopian import substitution aspirations and Chinese practices and requirements for foreign textile and garment companies (Xinhua, 2019). However, in 2022 the US government removed Ethiopia from the AGOA's duty-free access to US markets because of gross HR violations of Ethiopia's armed forces during the Tigray War, which resulted in factory closures and job losses (Baskaran and Ordu, 2023). This also demonstrated the volatility of such trade-enhancing arrangements, particularly in the political context of autocratic African regimes.

2.1. South African Rare Earth Production and Challenges

South Africa's REE mines are poised to begin commercial production soon, making it the second REE-producing country in Africa after Gakara in Western Burundi, the only African country with an REE mine that has produced commercial quantities to date (Bekoe *et al.*, 2022). Most of these mines are in the west and the north of the country (see Graph 10). South Africa currently has four rare earth projects under development, i.e. Zandkopsdrift, Steenkampskraal, Glenover and Phalaborwa (Garbarino, 2021).



Cartoon 4: African Miners Spoilt for Choice!

Source: © Damien Glez, toonpool.com, 22 August 2012

South Africa has a mature mining industry and ranks higher than its African peers in terms of in terms of the World Bank's ease of doing business index, although there has been some recent deterioration. Namibia and South Africa contain the two largest amounts of rare earth- bearing mineral deposits in Africa. A significant number of the minerals in Namibia and South Africa bear REEs greatly demanded by the products defining the green economy, defence-related sectors, and growing industries. Notably, both Namibia and South Africa have relatively larger deposits of monazite and bastnasite, which are considered among the most common rare earth-bearing minerals. Moreover, apatite deposits are available that can be used in television screens and nuclear reactors, among other things, as well as euxenite, used in lasers, superconductors, and some cancer treatments (Bekoe *et al.*, 2022).

Figure 8: South African Rare Earth Sites

Source: Rare Earth, South Africa, Google Maps

South Africa's most advanced REE project is the Steenkampskraal mine, located in the Western Cape Province. The mine was formerly operated by the Anglo American plc, but was abandoned in 1963 after global demand for thorium declined. It is currently owned by South Africa's Steenkampskraal Monazite Mine, with Steenkampskraal Holdings and Steenkampskraal Worker's Trust holding 74 % and 26 % stakes, respectively (Bekoe *et al.*, 2022). The mine was fully licensed and permitted in 2019. It is believed to contain primarily light rare earths but is an above-average grade deposit. The latest estimate is 799,700 tonnes of ore containing 69,400 tonnes of REEs including neodymium, praseodymium, dysprosium, terbium and yttrium (Bekoe *et al.,* 2022). The first monazite concentrate is expected to be produced by December 2024 (Parker, 2023).

The problem the industry is currently facing is that rare earth prices are dependent on Chinese national policy. China can control rare earth prices simply by adjusting supply. China exercises a lower level of environmental and legislative control and as a result, 40 % to 50 % of rare earth production is grey or illegal (Parker, 2023).

Also, Canada's Great Western Minerals Group announced in February 2022 that it would commence a new drilling programme at Steenkampskraal, as well as explore the area surrounding the mine. Once mining begins, Steenkampskraal is expected to produce approximately 30,000 tonnes of ore per year for the next 30 years. In addition, in the same year, a rival company applied for a permit to develop the mine, causing a delay in production. There are several other projects in various stages of development. The Zandkopsdrift mine, 60 miles north of Steenkampskraal, has been owned since 2008 by the Luxembourg-based company Frontier Rare Earths, which signed an agreement with Korea's Kores Resources Corporation in 2011 to develop the project (Garbarino, 2021). A pre-feasibility study was carried out in 2015 (Bekoe *et al.*, 2022). Frontier's plan to develop a separation plant near the mine will make it a viable alternative to China's well-established separation and processing plants in Ganzhou, Jiangxi Province (Garbarino, 2021). In November 2020, Rainbow Rare Earths, which owns Africa's only commercially viable rare earth mine in Burundi, announced the Phalaborwa project in Limpopo province as a joint venture with Bosveld Phosphates. Rainbow Rare Earths has a 70% interest in the project. Also in Limpopo Province, South African company Afrimat acquired the Glenover Rare Earth Project in December 2021. It was previously owned by Galileo Resources, a British company (Bekoe *et al.*, 2022).

South Africa accounts for half of the world's platinum group metals deposits, 36% of gold, and 20% of cobalt. Already in the past, the intensification of heavy-metal production in the region has exacerbated negative human and environmental health impacts. In recent years, mining waste generated from industrial and artisanal mining has significantly affected the ecological integrity of SA aquatic ecosystems due to the accelerated introduction and deposition of heavy metals (Ouma *et al.*, 2022). These negative environmental and socio-economic problems will be aggravated by future rare earth production.

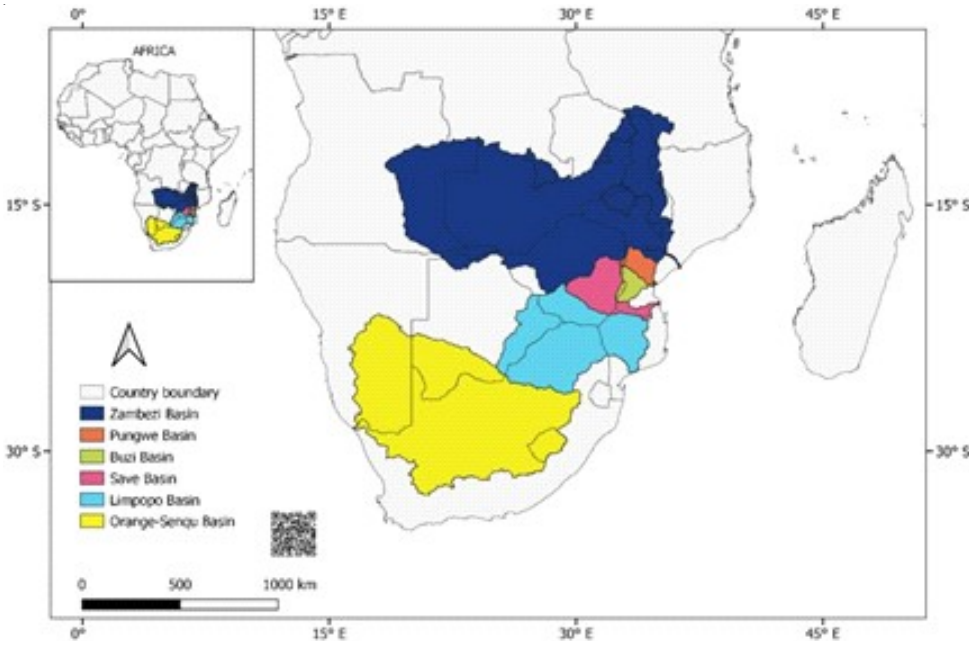


Figure 9: River Basins of Southern Africa Threatened by Aquatic Pollution from Heavy-Metal Mining and Processing

Source: Map Shapefiles from FAO GeoNetwork, Ouma et al. (2022)

Experts were cautious about invoking the terrible environmental precedence of REM mining in China on South Africa. They concluded that the environmental hazards of REM mining in the region are difficult to predict. While politicians have so far tended to focus on the geopolitical and economic implications, and communities in mining areas seem to be more concerned about the expected positive socio-economic impacts in terms of job creation than the environmental or public health impacts, the latter seems to be largely ignored, including the risks associated with radioactive waste from REM mines (Oladipo *et al.*, 2023).

2.2. Nigeria's Rare Earth Production and Challenges

Nigeria, a resource-rich country, is by far the largest African state in terms of population, land area and economic capacity, and the most important African middle power after South Africa. According to the website of the Nigerian

Cartoon 5: Illegal Gold Mining: Foreigners Steal Nigeria's Wealth

Source: © Ajaja (2021)

Ministry of Mines and Steel Development, there are several mineral buying centres trading in rare earth in Nigeria, mostly in the Plateau and Nasarawa states, in the Nigerian Mesozoic Granite layers of the Ningi-Burra complex in the Jos Plateau region. However, their licences have all expired (30 entries, filtered from 103 total entries). Rare earth exploration in Nigeria dates back to the late 1970s (Bowden *et al.*, 1979). More recent exploratory studies have revealed promising prospects for the economic extraction of rare earth elements (REEs) and carbon nanoparticles (CNPs) from Nigeria's vast Cretaceous coal reserves (Akinyemi *et al.*, 2021).

Nigeria's Minister of Solid Minerals Development, Oladele Alake, recently announced that Nigeria's critical solid mineral resources are valued at over US$ 700 billion, a development that signals the country's readiness to play a significant role in meeting global demand for critical minerals (Isaac, 2023).

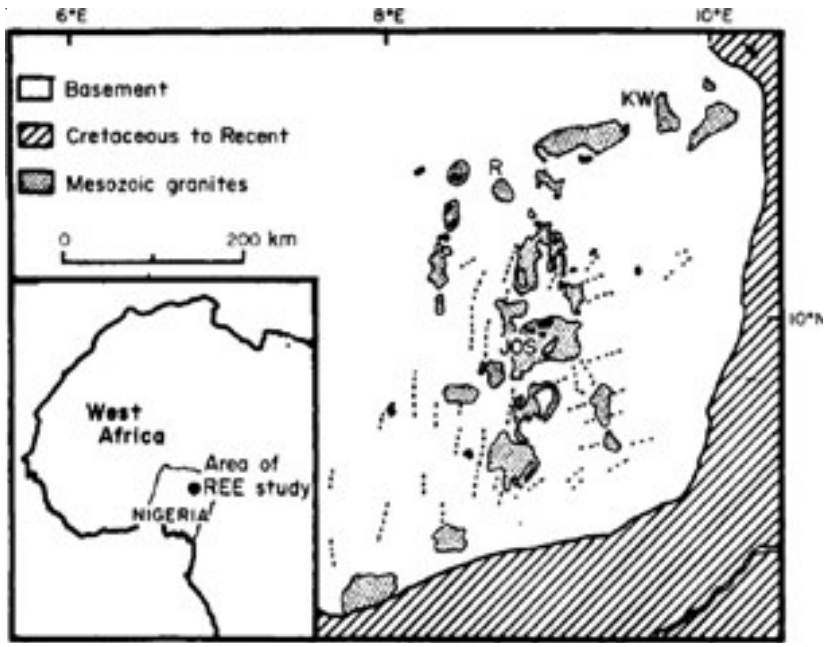


Figure 10: Rare Earths in Nigerian Mesozoic Granites, Jos Plateau

Source: Bowden et al. (1979)

From 2012 to 2022, Nigeria was the fastest-growing member country of ECOWAS in terms of exports of the compounds of rare-earth metals, of yttrium or scandium or mixtures of these metals. As Nigeria was the major African export country, the average price level was determined by prices for Nigeria (IndexBox, 2024). However, in terms of global production, Nigeria is still an also-ran. Within ECOWAS, the countries with the highest volumes of production of REE in 2022 were Cote d'Ivoire, Mali and Guinea, together comprising 61 % of total production. Benin, Togo, Sierra Leone, Liberia and Gambia lagged somewhat behind, together comprising a further 35 % (IndexBox, 2024).

In 2021, Nigeria exported US$ 1.38k worth of rare earth metal compounds, making it the 59th largest exporter of rare earth metal compounds in the world. In the same year, REE compounds were the 870th most exported product in Nigeria. The main destination for exports from Nigeria was Benin ($1.38k) which emerged as the fastest-growing importer in ECOWAS (oec-world, 2023; IndexBox, 2024).

Nigeria is believed to have significant deposits of lithium. The government has issued licences to encourage lithium mining and has insisted on beneficiation rather than export of raw ore (PWC, 2023). Recent developments include China's Ming Xin Mineral Separation Nig. Ltd.'s lithium processing plant currently being built in Kaduna State. In September 2023, the company was accused of collaborating with Islamic terrorists to develop deposits in Niger and Kaduna State (247-Ureports, 2023). Another recent example of increasing attention for Nigerian rare earth production is the 'Made in Nigeria Baryte' in Port Harcourt and a baryte cluster in Cross River that was initiated as part of efforts towards the development of value chains of these industrial minerals. Nigeria has the fourth largest baryte reserve in the world estimated at 20 million tonnes, however, the country has not been recognized as a major producer (PWC, 2023). A significant proportion of the baryte used in the oil industry is imported. Abuja has launched an initiative (made-in-Nigeria baryte) to increase production capacity, boost Government revenue, conserve foreign exchange and promote the local industry. Baryte exists in Taraba and Cross River which accounts for about 80% of the reserves. Cross River

State in Nigeria is known to have one of the largest deposits of baryte in Africa. Most mining of baryte is performed by artisanal small-scale miners and is mined in small amounts (PWC, 2023).

Also, the Monazite Sand export business in Nigeria represents a promising opportunity in the global minerals market. Monazite Sand is a rare earth mineral rich in thorium, cerium, and other valuable elements. Nigeria and several African countries, including South Africa, Mozambique, and Madagascar, have substantial Monazite Sand deposits. These reserves are estimated to be in the millions of metric tons, providing a substantial resource base for export. The Nigerian Geological Survey Agency (NGSA) has identified deposits in South-Eastern states like Akwa Ibom and Cross River. Local mining companies are increasingly focusing on Monazite Sand extraction (Edom, 2023).

A major handicap of mining in Nigeria is illegal mining. This has also affected the rare earth minerals sector. In August 2023, Nigeria suspended certain illegal Chinese mining operations within its borders, including the cessation of the activities of the Ruitai Mining Company due to its involvement in illegal titanium ore mining (FP Staff, 2023).

Illegal gold mining, for example in Osun and Zamfara State, has also become routine in Nigeria. In addition to the loss of revenue to the government, illegal mining has caused severe environmental degradation. Farmers have been abruptly evicted from their farms, their water, such as the Osun River, has been polluted, and life has been made difficult for local people (Ajaja, 2021). In addition to those who do it for survival and other economic reasons, some of the miners are believed to work for top monarchs and government officials, while some security agents protect them in the mining fields. Politicians and traditional rulers have been accused of sponsoring the miners. Chinese artisanal miners have also been arrested for illegal mining, allegedly working for Nigerians in high places. So far, hundreds of illegal gold miners, including Chinese nationals, have been arrested. But illegal mining is festering like a bad sore. On 4 May 2020 alone, 17 Chinese nationals, 10 locals and one community leader were arrested in the Ilesa and Ife areas (Ajaja, 2021).

2.3. DR Congo's Rare Earth Production and Challenges

The Democratic Republic of Congo (DRC) is a mineral-rich country with vast deposits of minerals needed for low-carbon technologies. The DRC currently provides the vast majority of mined cobalt and has significant untapped reserves of copper, tin and gold (Gibson, 2023). In addition, the DRC is endowed with other REE mineral resources. Deposits have been found in carbonatite complexes around Bingo (North Kivu), Lueshe and Kirumba, as well as in other regions of the DRC, including Numbi, Manono-Kitotolo, Kampene, Kobokobo and North Lugulu, which cover most of the major cities and regions of the country (see Graphs 12 and 13). At least 60 % of coltan reserves are found in the DRC, where digitisation is increasing, and the development of 5G technology will increase demand for Congolese coltan (Gibson, 2023).

Cartoon 6: Congolese in Search of Treasuries Beneath Their Own Homes The Dark Side of Congo's Cobalt Rush[3]

Source: © Illustration by Pola Maneli; Niarchos (2021)

The alluvial placers of Kabengelwa, Mashabuto, and Obaye which are enriched in monazite and other rare earth minerals are typical examples of placer deposits. With more research and exploration, the DRC could be a hub for future REE projects (Kasay *et al.*, 2022).

However, the precise extent of the DRC mineral deposit is unknown due to a lack of resource exploration, rainforest protection legislation and the cost of processing. The latter is crucial because the main issue with REEs is not simply finding new resources, but the sustainable chemical and energy-intensive processing required for producing them (Gibson, 2023). Illegal or under-regulated rare earth projects can produce wastewater and tailings ponds that leak acids, heavy metals, and radioactive elements into groundwater. They might increase market pressures for cheap and reliable rare earth on project managers to skimp on environmental protections (Gibson, 2023). Given the number of stakeholders in the REE supply chain, from miners and workers to surrounding communities, local and international regulators, investors and end users, diverse partnerships are essential for REE projects. Each stakeholder is key to a stable and efficient supply chain, and each stakeholder has a valid and significant interest in the system (Gibson, 2023).

Figure 11: Mineral Deposits in DR Congo

Source: La Lionne info, Facebook, 8 July (2021)

In 2007, the Sino-Congolais des Mines (Sicomines), a consortium of Chinese companies (Sinohydro and China Railway Engineering Corporation), negotiated with the DRC an agreement that was hailed as the deal of the century. It was a resource-for-infrastructure deal that gave Chinese companies access to cobalt, copper and other minerals in exchange for infrastructure investment, including the construction or rehabilitation of 6,600 km of roads, two hospitals and two universities (Baskaran *et al.*, 2023). China invested around US$ 3 bn in infrastructure development in return for Chinese companies receiving mining rights to US$ 93 bn worth of deposits near Kolwezi in the south-eastern region of the country. In addition, there were no requirements for responsible mining or the protection of local communities. Recently, however, there has been a growing consensus that resource-for-infrastructure deals can do more harm than good. The DRC is reviewing its resource-for-infrastructure deals with Chinese investors amid concerns that some mining contracts are not benefiting the country enough (Baskaran, 2023).

There is an uneasy coexistence of the two faces of the DRC's cobalt industry. If large groups like Glencore, Umicore or BHP provide 80 % of total Congolese cobalt production, the rest comes from more or less legal artisanal exploitations, where 200,000 so-called 'diggers', risk their lives working with rudimentary tools and without any protective equipment (Belkaïd, 2020). The official sites of industrial mines run by multinationals like Glencore are sealed off by concrete walls and wire fences. On the other side are the 'artisanal diggers' or 'creuseurs',

i.e. informal, mostly illegal, miners with hellish, unsafe conditions that feed underground Chinese trading networks. In the ideological language of a gold rush, this is presented as 'cobalt, it makes you dream' (Niarchos, 2021). Some 'creuseurs' secure permits to work freelance at officially licensed pits, but many more sneak onto the sites at night or dig

their own holes and tunnels, risking cave-ins and other dangers in pursuit of buried treasure. Teenage boys often work dangerous shifts navigating rickety shafts. Prostitution of women and young girls is rife around large mines. Other women wash the raw mining material, which is often full of toxic metals and in some cases slightly radioactive. Working with heavy metals such as cobalt can increase a pregnant woman's risk of stillbirth or having a child with birth defects (Niarchos, 2021; Gibson, 2023).

Yet this small-scale mining generates about 15 % to 30 % of the DRC's cobalt supply, which in turn produces about 70 % of global output. Demand for the resource is projected to triple by 2035, mainly for electric vehicle batteries (Dempsey, 2023).

In 2016, Amnesty International, the UK-based NGO Rights and Accountability in Development (RAID) and other HR organizations drew attention to child labour and inhumane working conditions in the country's informal cobalt mining sector. An estimated 40,000 children are exploited in artisanal cobalt mines. Working conditions are dramatically dangerous (Thomas, 2020). Boys as young as 14 have to climb down narrow holes up to 25 metres deep to carry 50 kg sacks and wash ore to extract the cobalt. Some shafts sink even up to 100 metres deep, three times the legal limit. The prices paid by Chinese traders are grossly unfair. Nevertheless, the incentives to mine are high. The workers can earn upwards of US$ 400 a month digging for cobalt compared with $100 a month for a teacher (Dempsey, 2023).

Therefore, the 'Responsible Minerals Initiative', constituted by the wealthy, US$ 7.7 bn club of miners, carmakers and electronics manufacturers, including Glencore, Volkswagen, Microsoft and Apple, continue to rigidly exclude artisanal cobalt from what they consider 'responsible' sources (Dempsey, 2023). But critics say that while this exclusion helps companies protect their supply chains and their reputation, it does little to improve conditions for those risking their lives in unregulated mines, or to bring development to one of the world's poorest countries, including ethical supply chains (Dempsey, 2023).

Out of the 19 cobalt operations in the DRC, 15 are either owned or co-owned by Chinese entities (FP Staff, 2023). China's quasi-monopoly in refining cobalt produced only 2,000 tonnes of blue metal from its own mines in 2019, but it provided 80 % of the refining of all global production (Belkaïd, 2020). For example, in Tenke Fungurume, on track to be the world's largest cobalt mine, the children and young men are not employees of CMOC, the Chinese operator that bought the mine from US rival Freeport-McMoran in 2016. They belong to the local community that has swollen from 30,000 to 400,000 people in 15 years (Dempsey, 2023). This also threatens to give China, which has looser human rights standards than its Western rivals, the upper hand in securing critical minerals, while leaving the populations of resource-rich nations hostage to kleptocrats and international criminal gangs (Dempsey, 2023).

Cartoon 7: 'Something Less Wise and More Bad Boy, Please' The Dark Side of Congo's Cobalt Rush

Source: © Navied Mahdavian; Niarchos (2021)

How far companies like Glencore should go in formalising artisanal mining raises tough questions about the extent to which, and for how long, they should take on government responsibilities in a so-called failed state (Dempsey, 2023). The government in Kinshasa called on the West to rethink its approach and make bigger commitments if it is serious about bringing lasting change and competing with China. But unlike the Chinese, who have invested heavily in the sector without political strings attached, the Europeans insist on good governance as a precondition for further involvement. Between the DRC government, mining companies, their end-users and NGOs, there is a constant blame game over who is to blame for the failure to reform and secure artisanal mining (Dempsey, 2023).

The Chinese group Huayou Cobalt Co., Ltd, the leading cobalt refiner in the DRC, announced on 28 May 2020 that it was stopping purchases from artisanal mines. Until then, the 'diggers' sold their output to traders, who were primarily of Chinese origin. The Chinese middlemen, who are mainly based in Lualaba province (in the former Katanga province), provided Huayou and other refineries with the necessary supplies. The traders' role remained highly opaque. They purchased cobalt from various sources for refining and sold it to anyone interested in buying it. There is no organisation capable of fully monitoring its activities. Allegedly, Huayou's suspension of cobalt purchases from 'diggers' was only temporary until the media frenzy caused by the International Rights Advocates (IRA) complaint died down (Belkaïd, 2020). In 2021, Kinshasa reviewed a US$ 6 bn infrastructure and mining deal with China amid concerns that the contract did not adequately benefit the country. Despite China's insistence that the deal was mutually beneficial, the Congolese government remains wary of Chinese companies and their control of the supply market (Expert Speak, 2022).

The Congolese government seemed to be incapable of influencing the course of events significantly. On November 24, 2019, it declared cobalt a strategic mineral, in the same way as coltan and germanium to show that it intended to protect the country from intensive exploitation. Furthermore, it engaged in a standoff with mining companies by enacting a new mining code, which provides that the royalty rate on the extraction of these minerals increases from 3.5 % to 10 % (Belkaïd, 2020).

However, African markets are small and have a limited fiscal base, forcing them to turn to international sources of finance. Moreover, it takes a minimum of a decade for REEs to materialise into significant profits. Since the 2000s, China

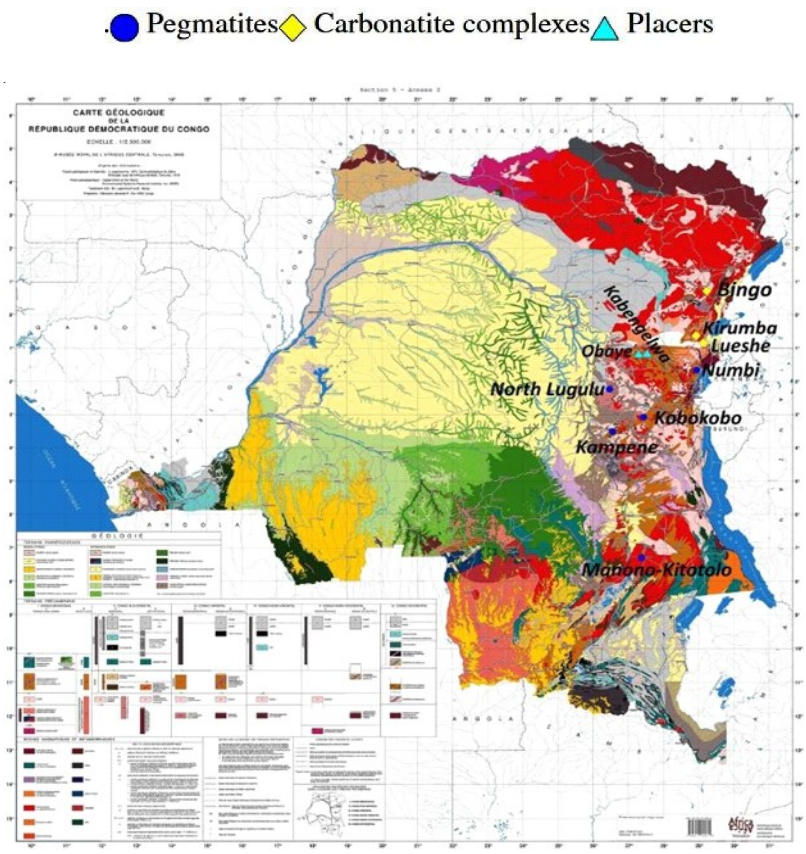


Figure 12: Geological Map of the Drc Showing Major REE Sources

Source: Kasay et al. (2022)

has been the largest single creditor to Africa and has played a key role in bilateral financial negotiations and strategies. Given the transactional nature of foreign policy, China uses its economic leverage to achieve its long- term goals on the African continent (Expert Speak, 2022).

Cartoon 8: The EU and The Century of Strategic Metals

Source: © Julie Graux, Zacharie (2023)

3. Rare Earth Imports of the EU from Africa and the 'Minerals Security Partnership'

Major highly industrialized Western countries, comprising the United States, the European Union, the UK and other wealthy countries like Australia, Canada, India, Japan, and South Korea, turned in June 2022 to Sub-Saharan Africa in their quest to loosen China's grip on the critical minerals required for the green energy revolution, e. g. to make electric cars, mobile phones, semiconductors and even fighter jets. They formed a Minerals Security Partnership (MSP). SSA states invited included Angola, Botswana, South Africa, Uganda, Mozambique, Namibia, Tanzania, Zambia and the DR Congo (Mitchell, 2022; US Dept. of State, 2023). At the Investing in African Mining Indaba conference in Cape Town, South Africa, on 7 February 2023, the MSP partners also announced their support for the following principles for a shared commitment to high environmental, social and governance (ESRS) standards, aiming at achieving an equitable and just energy transition (US Dept. of State, 2023).

The critical minerals supply chain is a complex system combining economics, politics, technology, and sociology. It has to integrate resource, economic, political, environmental, social and technological elements and explore the security strategy of the critical minerals supply chain from the perspective of the whole value chain trade. Therefore, national strategies for critical minerals should go beyond the traditional thinking of security evaluation. They need to consider primary mineral supply, process technology property rights, geopolitical landscape security, and environmental and human rights issues in an integrated manner (Shiquan and Deyi, 2022).

African countries producing rare earths should rely on international law to control the issues related to delocalized pollution (Ngom, 2022). In the face of the geo-economic stakes, geopolitical challenges and environmental hazards associated with the exploitation of African rare earths, there is a need for enhanced global environmental awareness and an international legal framework, which, however, is still in the process of being established. As far as the EU is concerned, the EU-Africa partnership agreements need to be strengthened to promote responsible sourcing. African partner countries benefiting from rare earths mining should industrialise without disregarding preserving their environment through good land management. Irresponsible exploitation of African land or natural resources raises issues of global importance, including the worsening of deforestation and pollution, expropriation and unemployment of young farmers, social and food insecurity, the mounting urbanisation in SSA and irregular migration to the EU (Ngom, 2022).

In short, the political economy of mining is paramount. It is characterised by two striking developments (Riofrancos, 2023). Firstly, Western governments are promoting domestic rare earth projects to increase their 'supply chain security'. Second, these same governments have officially committed themselves to 'sustainable sourcing'. American and European policymakers are now prioritising territorial control over the supply chains of critical minerals for green technologies. At the same time, they are promoting sustainable mining for 'geo- economic' reasons, hoping that Western companies can out-compete their Chinese rivals on environmental and ethical credentials (Riofrancos, 2023). It is debatable whether the competing goals of national security, environmental sustainability and corporate profitability can coexist in balance, or whether one will prevail over the others. However, social movements, both grassroots and international, might increasingly act as a countervailing force. As the critical minerals sector expanded, indigenous and environmental protests erupted in major exporting countries such as Chile and Argentina, as well as in new sites in Spain, Portugal, Serbia and the US. Their efforts reflected shared suffering. They coordinated awareness-raising campaigns through transnational networks denounced the impacts on water, ecosystems and livelihoods, and called for the enforcement of community consent (Riofrancos, 2023).

4. Conclusion

The global demand for rare earth elements (REEs) has surged in recent years due to their critical role in high-tech industries, renewable energy technologies, and defence applications. Sub-Saharan Africa (SSA) endowed with substantial REE deposits, stands as a potential supplier to meet this rising demand. However, the export of rare earths from the region to the European Union (EU) presents a myriad of challenges, ranging from geopolitical and ethical considerations to infrastructural limitations. Rare earth plays a crucial role in the manufacturing of various advanced technologies, including electric vehicles, wind turbines, and electronic devices. As the global demand for these elements grows, SSA has emerged as a potential key player in the supply chain. The multifaceted challenges faced by SSA in exporting rare earths to the EU have been analyzed, while also examining potential avenues for collaboration and sustainable development.

Political instability and governance issues in some Sub-Saharan African countries pose significant challenges to the export of rare earths. The EU, concerned with supply chain security and ethical sourcing, may hesitate to engage with

Figure 13: Lithium, Cobalt and Rare Earths: The Race For Post-Oil Resources

Source: Klare (2021)

regions facing political uncertainties like the DR Congo. Developing stable governance structures and fostering transparent business practices are essential steps for SSA to build trust with EU partners.

The extraction and processing of rare earths often involve environmental hazards and can lead to adverse social impacts. The EU, committed to sustainable and ethical sourcing, may demand adherence to strict environmental and social standards both from its member countries and major companies involved. Sub-Saharan African countries should be obliged to invest in environmentally friendly extraction methods, adopt responsible mining practices, and address social issues to align with EU expectations.

Limited infrastructure for mining, processing, and transportation poses a significant challenge to exporting rare earths from SSA to the EU. Inadequate transportation networks and energy infrastructure hinder the cost-effective and timely delivery of rare earths. Collaborative efforts between SSA and the EU to improve infrastructure, through investments and technology transfer, could enhance the competitiveness of rare earth exports.

However, the rare earth market is highly competitive, with dominant players such as China influencing global prices. SSA countries entering the market should be assisted in navigating pricing uncertainties and market fluctuations. The EU, as a major consumer, can collaborate with African nations to establish fair pricing mechanisms and stable trade relationships.

Also, investing in research and development is crucial for SSA countries to enhance their capabilities in rare earth extraction, processing, and refining. Collaborative initiatives between African and European research institutions can foster technological innovation, creating a win-win situation for both regions.

In short, while there are many challenges to exporting rare earths from sub-Saharan Africa to the EU, these can be overcome with strategic planning, collaborative efforts and a commitment to sustainable development. By addressing geopolitical, environmental, and infrastructural issues, SSA countries can position themselves as reliable and responsible suppliers of rare earths to the EU, contributing to the growth of both regions and the global rare earth market.

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