EUROPEAN UNION IN THE SEARCH FOR RARE EARTH ELEMENTS

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Abstract: In 2023, the production of rare earth elements in the world reached 350,000 tons. China, with almost two-thirds of the world's production of rare earth metals, has an undisputed monopoly in this domain. On the other hand, large importers of these strategic raw materials such as the USA, the EU, Japan and other countries are exposed to critical dependence. It is known that the industry of the European Union needs 10% of the world's rare earth elements every year. By 2030, due to the intensive development of advanced electronics and robotics, experts predict that the European Union's needs for rare earth elements will increase tenfold. This has forced European experts to seek a way out of the current unfavorable situation. Europe is forced to invest in the exploitation of mineral deposits in Europe and above all in Sub-Saharan Africa, in the industry of processing and refining of massive ore but also in the recycling and environmental protection of the regions in which the extraction and processing of the ore for the extraction of rare earth elements is carried out.
Keywords: Rare Earths, Critical Metals, European Union, China, Africa

1. INTRODUCTION

The mention of rare earth elements and their extraction spontaneously recalls the conditions for extraction, the social situation of the people who carry it out and the risks that this activity carries in terms of the emergence of colonialist tendencies that could still characterize the world. But rare earth elements are now indispensable in the production of high-tech products. In the current context, the issue of rare earth elements, in my opinion, has great industrial and geostrategic importance, since China controls their exploitation by destroying foreign competition and providing 90% of global production.(Carroué, L.,2022,15,p,) This context of scarcity and imbalance presents a critical situation in several respects: 1 – The concentration of production and supply could make it a geopolitical weapon. 2 – The ever-increasing use of rare elements could have a direct impact on technological industries. 3 – Finally, at this stage of technical and scientific knowledge, other alternative materials are still unknown. Of course, when it comes to rare earths, China possesses them in abundance, but at the same time this wealth could be transformed into a powerful weapon and a source of fear for the developed West. But we must remember that its dominance in resource extraction is also the culmination of a long-term industrial policy with multiple effects. China maintains a vast network for refining raw materials, which has led many producers around the world to export their ores there. Furthermore, China has filed more patents for rare earth minerals than the rest of the world combined. (Goetz, E.&Fouquet, C.,2025) Therefore, the conquest, or re-conquest, of a great industrial ambition seems to be a matter of the utmost importance. At the same time, the uncontrolled explosion of digital and data development represents a new type of pollution, the growth of which must be regulated.Global demand for rare earth metals is expected to increase sharply by 2030 due to the growth of low-carbon technologies and advanced electronics and robotics. The Commission estimates that demand for critical raw materials will increase tenfold by 2030. To secure its supplies of rare earth metals and critical raw materials, the European Union (EU) must invest in mining activities, as well as in the refining, processing and manufacturing industries, as well as in recycling. With this in mind, on 11 April 2024 it adopted a regulation establishing a framework for ensuring a secure and sustainable supply of critical raw materials.

2. THE EUROPEAN UNION PIONEER IN THE SEARCH FOR RARE EARTHS

The question of the importance of rare earths, which were designated as “critical raw materials” in the 1970s, was first raised in the European Union. At that time, the EU was called the European Economic Community, which in 1975, raised the issue of rare earths. It was in 1975 that Brussels published the European Mineral Yearbook, which was a kind of record of the availability of European mineral resources. In the period of three decades, the topic of rare earths did not become a top topic of the EU, and it can be concluded that symbolic progress was achieved between 1975 and 2005. However, the border incident in the China Sea between the Japanese coast guard and a Chinese fishing boat resulted in an embargo on Chinese rare earth elements to Japan and a general change in the previous Chinese export policy of rare earths to the world. An initiative of the European Union in terms of securing strategic rare earth elements and creating greater independence from the Chinese monopoly began in November 2008 with the provision of the EU Commission [COM(2008) 699] After 2008 onwards, the imposition of restrictions on the export of rare earth elements has had a negative effect on the developed countries of the West in Europe, the USA, Japan and others towards such a move by Beijing. At the same time, the aforementioned Chinese embargo on the export of these strategic raw materials has made the major world powers aware of the need to search

for alternative solutions. In this context, the European Union initiated an ambitious program in the field of rare earths in 2008, the platform of which consisted of three strategic points: a) sustainable supply and production of rare earth elements, b) increased control of trade links that supplied EU countries with rare earth elements and c) encouragement of recycling projects and environmental safety in the areas where the huge quantities of ores from which rare earth elements are obtained are refined. (Hache, E. 2023, p,8.) However, the biggest handicap of these three strategic pillars is the fact that a sustainable industrial policy was not established in parallel. Four years later, a list of rare earth elements and critical raw materials, or metals, was drawn up within the EU. (Charles,N.,Tuduri,J.,Lefebvre,G., Pourret,O.,Gaillard,F. & al..2022) Here we will recall the differences between rare earth elements and critical metals. Rare earth elements are specific elements, experts also call them strategic metals with similar properties as critical metals. However, critical metals are a much broader category characterized by both their economic and geostrategic importance and the dangers posed by supply embargoes. Namely, despite the epithet "rare", rare earth elements are not rare. The term rare is only a personification of the complexity of extraction, refining and the necessary exploitative concentrations. Finally, critical metals represent a concept related to the deposit in a country or region, and are improved over time and demand. On the other hand, rare earth elements represent a chemical classification.

3. EU ACTION PLAN ON RARE EARTHS

When the list of critical metals and rare earth elements was published in mid-2011, the EU Commission decided to update this list every three years. The European strategy will be significantly intensified from 2014 onwards (within the framework of the European Commission's budget for 2014-2020), in particular in the areas of eco-efficient use of minerals, research and international cooperation. Initially, the list included 14, then 17 rare earth elements, and finally, together with the critical metals, this number of strategic raw materials was increased to thirty-four elements. Among them, the 17 rare earth elements were highlighted, namely: Five lanthanides: Lanthanum; Cerium; Praseodymium; Neodymium; Promethium; Samarium; Europium; Gadolinium; Terbium; Dysprosium; Holmium; Erbium; Thulium; Ytterbium and Lutetium, as well as Scandium and Yttrium. It is necessary to emphasize that the fruits of the Fourth Technological Revolution such as the production of batteries, digital technologies, military missiles, electric vehicles, airplanes, radars, LED lights, etc. have increased the need for rare earth elements. After 2017, the initiative for the creation of the European Battery Alliance and the Raw Materials Alliance was registered in the EU. In this way, the EU implemented part of its Action Plan on Rare Earth Elements and Critical Metals, promoted by the European Commission of the EU since September 2020. The aim was to strengthen the EU's autonomy in the domain of rare earth metals and to take a step towards China's monopoly in this domain. In this sense, on April 11, 2024, at the proposal of the EU Commission, the European Parliament adopted the regulation on the permanent provision of Europe with rare earth elements. At the same time, the EU has engaged with the US, Japan, Australia, Canada and other allied countries to take joint legal action against China within the framework of the GATT (The GATT, an acronym for the General Agreement on Tariffs and Trade). The GATT was replaced in 1995 by the World Trade Organization (WTO). This initiative, which concerned the restrictions on free trade in minerals imposed by China, has borne fruit. In this way, China has been disciplined to a certain extent, but this does not mean that it will continue to abuse rare earths as a geopolitical weapon. However, there are opportunities for Europe to reduce this dependence: the potential for mining rare earth elements in the European Arctic, the prospects for recycling, especially for permanent magnets, and the transition to superconducting technologies. These strategies would allow Europe to regain a degree of sovereignty if all three are implemented fully, and not just one or the other. (Jacques,F. 2021)

4. RARE EARTH SUPPLY IN SUB-SAHARAN AFRICA

While Western countries have perceived China as a "national security threat", their narrative is that it is necessary to invest in areas where China cannot establish a monopoly on rare earths. Regardless of the ambitions to develop supply chains that will operate independently of China, it is unlikely that this will happen in the short or medium term. Regarding the guarantees that need to be provided for the extraction and processing of rare earth elements, other missions have been initiated in the EU concerning the exploration of abyssal and deep-sea environments, which are also very interesting for the exploitation and extraction of rare earth elements. However, one gets the impression that the most serious partner and challenge may be the rare earth countries of sub-Saharan Africa. (Antonio, A. &Roberts, S. (2022).African countries possess significant reserves of the metals needed for the transition to green energy. They are also world leaders in reserves and production of bauxite, cobalt, chromium, platinum metals and tantalum. They are also major producers of copper, lithium, zinc and nickel ores. Namibia and the Democratic Republic of the Congo have long been major suppliers of germanium to global markets. Sub-Saharan Africa is home to numerous rare earth metal deposits, particularly 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 reached its full potential. The only current mining operation is in Burundi, at the Gakara rare earth metals project, located about 20 kilometers southeast of Bujumbura, operated by companies owned by Russian steel magnate Vladimir Yorich. The South African Steenkampskraal mine (a thorium mine) was previously operated by Anglo American plc from 1952 to 1963. It has one of the highest concentrations of rare earth elements in the world, containing 15 elements and a total of 86,900 tonnes of rare earth oxides, with significant deposits of neodymium and praseodymium. New, expanded mining operations, operated by UK-based Frontier Rare Earths, are expected to commence soon. Furthermore, several countries in Southern Africa have started implementing projects at various stages, including Namibia (Lofdal Heavy Rare Earths Project, in partnership with the Japanese company JOGMEC), Malawi (Kangankunde, funded by Mkango Resources, a Canadian exploration company, which is expected to start production in 2025), Angola (Longonjo Project, funded by the UK government's Automotive Industry Transformation Fund), Tanzania (Nguala Rare Earths Project), Uganda (Makutu Project, an open-pit mining development by the Ugandan company Rwenzori Rare Earths (RRM)), Madagascar (Ampasindawa Mine, owned by Tantalus Rare Earths Madagascar), Mozambique (Xiluvo REE Project, under a mining permit held by Promac Lda), and South Africa (Glenover and Phalaborwa Projects) (AfricanMining, 2019; Baskaran, 2022). Raimondi, 2021).

5. SUSTAINABLE DEVELOPMENT GOALS IN SUB-SAHARAN AFRICA

Africa is rich in rare earth elements, especially sub-Saharan Africa, with rare earth deposits identified in several countries, including Tanzania, Nigeria, Madagascar, Malawi, the Democratic Republic of Congo, Angola, South Africa, and Uganda. The "supercycle" of rising commodity prices up to 2014 resulted in increased growth and public revenues in Africa, which held promise for sustainable development. However, since 2014, periods of falling or sharply fluctuating prices have led to the continent's heavy reliance on the extractive sector, not only resulting in greater economic volatility but also exacerbating fiscal and external imbalances, generating a higher risk of debt distress. In the medium and long term, the “negative externalities” and economic and political distortions generated by the extractive sector have, depending on the country, complicated the implementation of a fair sharing of extractive rents, limited the economic spillover effects of a sector that is essentially “enclosed,” exacerbated inequalities, and delayed the achievement of the Sustainable Development Goals (SDGs, on the United Nations’ 2030 agenda). The ongoing energy transition from fossil fuels to renewable energies could have contrasting effects on African economies that depend on the extractive sector. It risks weighing heavily on the economies and finances of oil-producing and exporting countries, but it could also represent a new development opportunity for both the extractive and renewable energy sectors, as Africa has comparative advantages in this area (UNCTAD, 2023). Demand and prices for the "critical metals" essential to the energy transition are indeed expected to grow significantly by 2050. This article aims to describe the opportunities and challenges posed by the development of these metals' extraction in Africa, particularly in comparison to the oil sector. While the critical metals sector, crucial to the energy transition, raises numerous environmental, social, and governance (ESG) issues similar to those of the oil sector, it differs in one important aspect: by ensuring some of the conditions necessary for the development of renewable energies, it could help stimulate a catch-up in the energy sector, provided that the public policies implemented support and realize this new promise. Africa's growing importance in the global production of critical metals for the energy transition. (Gracelin, B. 2022): The analysis focuses on seven critical metals that are among the most important for Africa: cobalt, copper, tin, graphite, lithium, manganese, and titanium. This selection is based on the list of 27 critical metals identified by Miller (Miller, H. et al.2023) as playing a key role in the energy transition. For each of these metals, we selected ores that: 1. account for more than 5% of global African production, according to data from the United States Geological Survey (USGS) in 2022; 2. are produced in several African countries; 3. are among the ten critical metals with the highest anticipated demand, according to Miller (Miller, H. et al,2023); 4. have sufficiently accurate USGS data coverage for both production and reserves.

6. RARE EARTHS AND CRITICAL METALS IN SUB-SAHARAN AFRICA

Cobalt, manganese, graphite, copper, and lithium meet all of these criteria. Although excluded from the list of the ten metals with the highest anticipated demand, we extend our analysis to titanium and tin, which are produced at 35% and 7% respectively in Africa, in a large number of countries, and with sufficiently reliable production data. The other metals produced in significant quantities in Africa (vanadium, chromium, tantalum, and hafnium) are either produced in only one African country (South Africa, for chromium and vanadium), are not included in the list of the ten metals with high demand (tantalum and hafnium), or have incomplete USGS reserve data. According to the USGS (2020), resources refer to a naturally occurring concentration of solid, liquid, or gaseous material in a form and quantity such that its extraction is currently or potentially feasible. Proven reserves (referred to as

"reserves" in this article) represent the portion of resources that can be profitably extracted at the valuation date (even if the extraction infrastructure is not yet in place). They can be considered an inventory of mining companies tracking their capacity to supply a mineral that they deem profitable to extract. Africa's share of global reserves and production of these seven metals has, overall, increased significantly over the past decade. Between 2012 and 2022, global manganese reserves increased 2.5 times, lithium reserves doubled, and graphite reserves quadrupled. Copper reserves increased by 30% and cobalt reserves by 10%. Production also grew strongly: by 11% in ten years for graphite, by 25% to 35% for manganese, copper, and tin, and by 85% for cobalt. Africa's lithium reserves have almost quadrupled. Its share of manganese reserves has increased significantly (from 30% to 40%) and graphite reserves (from 0% to approximately 1.5%). Regarding global cobalt and titanium reserves, Africa's share stands at 50% and 10% respectively, but is trending downward. (Ngom, A. 2022)As for production, Africa's share has increased since 2012 for almost all the metals considered, with the exception of lithium (for which African production data is incomplete).Africa thus has a significant number of major producing countries of critical minerals essential to the energy transition, although their distribution is uneven. (Garbarino, Danielle M. 2021): In 2022, South Africa was the world's leading producer of manganese and the third largest producer of titanium, Gabon the second largest producer of manganese, the Democratic Republic of Congo (DRC) the world's leading producer of cobalt, Mozambique the second largest producer of graphite and the third largest producer of copper, and Madagascar the third largest producer of graphite. Three-quarters of the critical metals for the energy transition are located in low-income countries, and developing their exploitation is a sustainable development challenge. Analysis of the distribution of natural resources in Africa (oil, other natural resources, identified critical metals) by income level (low, middle) reveals three distinct challenges (see map below). Fossil fuel producing countries (oil, coal, etc.) have benefited from an increase in per capita income and, with the exception of Chad and South Sudan, are middle-income countries. However, this increase has not necessarily translated into significant progress in economic and human development: in 2015, before the sharp drop in global oil prices, the Human Development Index of oil-exporting countries was lower than that of countries with a similar GDP per capita. Economic diversification into other mineral resources (particularly critical metals) is a major challenge for these countries in order to mitigate the risks associated with the loss of competitiveness of their oil sector (whose operating costs and greenhouse gas emissions are respectively 15 to 50% and 80% higher than the global average), the depletion, or the loss of value of the resource. This is also the case for South Africa, a coal exporter whose foreign trade could suffer from a global energy transition, but which possesses significant resources of various minerals. Furthermore, three-quarters of the countries producing metals critical for the energy transition, and more broadly, countries rich in natural resources (excluding oil), are low-income countries, which poses a strategic challenge for them in reconciling the exploitation of natural resources with the achievement of the SDGs. Finally, East Africa represents a unique case on the African continent since, based on existing data, the region appears to concentrate low-income countries. low income and poor in natural resources. (Raimondi, P, P. 2021)

7. CONCLUSION: CRITICAL METALS – A SOURCE OF SUSTAINABLE DEVELOPMENT

While they can, depending on the circumstances, support economic growth or partially offset the anticipated decline in the hydrocarbon sector, the production dynamics of rare metals under consideration can only contribute to sustainable wealth creation under certain conditions. As with hydrocarbons, the first condition relates to the public policies to be implemented to address the risks of the "resource curse." In addition to the already highlighted risks of political instability and conflicts related to the appropriation of resource rents, the development of critical materials, as with hydrocarbons, can result in lower growth and investment levels, particularly in Africa, the only continent to have experienced a net loss of capital due to the consumption and depreciation of its natural capital, especially minerals (World Bank, 2021). Faced with these risks, an improved business climate, the promotion of stable regulatory frameworks (particularly uniformly applied mining codes), and greater transparency and governance within the mining sector itself, notably through international coordination initiatives (Extractive Industries Transparency Initiative – EITI, Natural Resources Charter), are crucial for increasing the attractiveness of African countries. The quality of public financial management is a key issue for ensuring the optimal allocation of mineral resources for sustainable development. Beyond the objectives of mobilizing tax and parafiscal revenues associated with the sharing of profits during the exploitation phase, the development of critical materials requires, upstream, the implementation of public policies to assess, limit, and internalize in contracts with mining companies the collective public expenditures generated by the exploitation of these materials (increased water stress, pollution, health impacts, loss of arable land), notably through environmental impact assessments and financing conditional on environmental compliance. Government financial policy choices must also take into account the risks of over-anticipating the development of rare metals. (Oladipo H. J., et al. 2023) These can lead to excessive and costly debt, non-concessional rates on euro-denominated bond markets, or to ore-backed debt held by mining and trading

companies. The final condition concerns the capacity of African states to open up the mining sector, for the purposes of inclusive growth, by capturing a larger share of the added value of critical materials in value chains. This is particularly necessary given that the employment content of critical metal mining is declining and capital intensity is increasing with mechanization and digitalization. This opening up implies objectives for the local processing of raw minerals. Thus, in Gabon, the mining law (Article 148) requires extractive companies to process the ores they extract locally, in part or in full. This also involves the local development of renewable energies, the complexity and costs of which undoubtedly necessitate regional cooperation, as in the case of lithium. This nexus between the mining sector and the local development of renewable energies appears crucial for Africa. Africa bears a high cost from the greenhouse gas (GHG) emissions generated by the mining sector, but the associated gains currently benefit primarily developed and emerging countries. In the medium and long term, this joint development also appears essential to limit the anticipated growth of GHG emissions on the continent, resulting from both its population growth and a legitimate rise in the living standards of African populations.

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