

THE ROLE OF RARE EARTHS IN THE FUTURE SUSTAINABLE ECONOMY

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RESEARCH ARTICLE

Abstract

The elements that make up the rare earths are of overwhelming importance in the top industries of the modern economy, but their extraction and processing have a particular impact on the environment, but also on the international economic relations between states, with great risks regarding the interruption of supply chains and having a particular impact on the gross global product. The future economic development of mankind, but also the protection of the environment, are dependent on the cooperative or conflictual relationship, on the one hand, between the developed Western states and on the other hand China, followed by other states with important reserves of rare earths.

Keywords: rare earths, costs, energy, restrictions, economic war, economic cooperation, sustainable economy, European Union.

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INTRODUCTION

Rare metals, also called rare earths, constitute a group of 17 chemical elements, which are used in today's leading industries, being components of computers, telephones, electric batteries, weapons and energy industries, etc. These rare earths are known in English as "rare earth metals", using the acronym REM. Internationally, the expression "conflict minerals" is also used, due to their major importance in the world economy, trade disputes between states and their location in areas of military conflict.

In the last decade, as a result of the sharp rise of the Chinese economy, the economic struggle between the developed Western countries (USA, European Union countries, Japan, Canada, Australia) and China has intensified for the greatest possible influence on the production of rare metals, in the conditions in which China holds reserves of 44 million tons of rare metals and processes on 90% of the world's rare metals, according to a study published by the U.S. Geological Survey in the year 2023. This economic war has manifested itself through the acquisition of mines in African countries by Chinese

companies, through the attempted acquisition of Western companies that produce rare metals, but also through the prohibition by Western states of the acquisition of chips advanced by China, and China, in turn, banned the export of two rare metals (it produces about 80% of the amount of gallium and about 60% of the amount of germanium on the planet), which are part of these faces.

MATERIAL AND METHODS

The prices of rare earths have risen extremely strongly in the last decade, due to their increasing importance in the modern economy. China has come to dominate the rare earth market, both in terms of the reserves located on Chinese territory and the processing of these rare earths, due to environmental protection measures and due to the very high extraction costs in Western states. Apart from China, other countries that play an important role in the supply of rare earths are Russia and South Africa, which are the main producers of platinum group metals (PGMs), and Brazil, which provides 92% of the world's niobium production.

The formation of rare earth prices (Charalampides G & Co, 2015) is not entirely

transparent like the prices of metals quoted on commodity exchanges. The prices of rare earths are influenced by direct negotiations between sellers and buyers, current stocks, the purity of these earths, transportation costs, storage costs, etc.

The life of people in the 21st century would not be the same without the economic use of rare earths, because the high-tech products, the renewable energy industry could not exist. Many of the elements that make up the rare earth category are concentrated in a few countries. For example, according to the U.S. Geological Survey in 2020, 60% of the world's existing cobalt is extracted from the Democratic Republic of Congo, an area torn by civil wars, and 80% of the amount is processed by China. These aspects create a strategic vulnerability for countries that have high-tech industries.

According to a 2023 OECD study, in recent years more than 10% of the global value of exports of critical raw materials has faced at least one restrictive export measure. Taking into account the aspects presented above, the question arises of the continuation of the economic cooperation between the Western countries and China, which existed until the last years regarding the processing of the elements that make up the rare earths, or will it go on the preponderance of economic wars between the two parties, a fact that will lead to an end to globalization and implicitly to the creation of distinct economic blocs.

RESULTS AND DISCUSSIONS

The European Commission created a working group, called the Community Group for the Supply of Materials, which identified a number of 30 elements as being of overwhelming importance for the development strategy of the European Union.

These rare materials are:

Critical rare materials 2020 antimony, fluorine, magnesium silicon compounds barytine gallium natural graphite, tantalum bauxite germanium natural rubber titanium beryllium hafnium niobium vanadium, bismuth heavy rare earths (HREE) platinum

group metals (PGMs) tungsten indium borate strontium phosphate rock cobalt lithium phosphorus coking coal light rare earths (LREE) scandium Source: Study on the EU's list of Critical Raw Materials (2020).

The countries of the European Union are very dependent on the provision of critical rare materials from countries located outside the EU, not being extracted from the territory of the EU. Thus, 98% of the borate needs of the European economies are provided by Turkey, 85% of niobium by Brazil, 78% of lithium by Chile, 71% of phosphorus by Kazakhstan.

At the level of the European Union, it is considered that rare non-ferrous metals must undergo the recycling process to a greater extent than before. In this context, it is important to reduce the export of waste containing recyclable rare metals outside the European Union. However, the recycling of these materials is not meeting the spectacular increase in demand for rare earths, leading to the creation of stockouts in industries using rare earths.

There are many rare metals that are not found in sufficient quantities on the territory of the European Union. Thus, the problem of finding substitute elements for these rare metals arises.

Within the European Union, regulations have been adopted that aim to identify and avoid producers of raw materials that originate in conflict zones and that contribute to the maintenance and amplification of these conflicts. In the countries of the European Union, even if some quantities of rare earths are found, they are not exploited, due to European environmental protection rules. For example, in the Kavala region of Greece, there is a deposit estimated at 485 million tonnes with an average content of 1.7% rare earths (Charalampides G & Co, 2015), but which is not exploited.

Action priorities have been established at the level of the European Union regarding essential mineral resources for the sustainable functioning of modern society. Entire fields such as the automotive industry, the aerospace industry, construction, the electronics industry, the metallurgical

industry, the chemical industry and energy production are almost totally dependent on access to the elements that make up the rare earths. Taking into account these aspects, Romania, as part of the European Union, carried out a SWOT analysis, included in the project on the Strategy of Romania for Non-Energy Mineral Resources, from which it emerges the fact that, on the territory of Romania, some critical prime materials (Bi, Sb, Ga) which are associated with copper or lead-zinc deposits and which can be exploited simultaneously with them, but that the know-how for research and processing has been lost. However, there is interest from the business environment regarding the application of new technologies and the resumption of mining activity, but more attention is needed regarding the environment.

The member countries of the E.U. are determined to assess the use of rare earths in terms of sustainable resource management, which provides them with information on the environmental impact of a critical raw material over the entire economic cycle, covering all aspects of energy consumption, air pollution, resource depletion and human health.

CONCLUSIONS

Through the discussions carried out by the countries of the world to achieve a global agreement on combating climate change and the desire to achieve zero net CO₂ emissions, the idea of the need to expand production and world trade with more raw materials, from the category of rare earths, is reiterated as of paramount importance to the transformation of the world economy from one dominated by fossil fuels to one driven by renewable energy industries.

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