OBSERVARE
Universidade Autónoma de Lisboa

e-ISSN: 1647-7251
Vol. 15, Nº. 1 (May 2024 – October 2024)

JANUS.NET
e-journal of International Relations

# RARE EARTH GEOPOLITICS: GLOBAL DYNAMICS AND STRATEGIC BALANCE OF POWER

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## Abstract

This article examines the multifaceted landscape of Rare Earth Elements (REEs), crucial components in traditional industries like glass and metallurgy, as well as pivotal in the growing green and digital economies. The transition toward a greener economy heavily relies on REEs for batteries, wind turbines, and solar panels. The global REE supply chain, dominated by China with nearly 95% of the world's reserves, introduces complexities and geopolitical considerations, and prompting nations like the United States and countries in the European Union to seek alternatives and reduce dependence on China's dominant control. The United States, once a key player in rare earth mining, now heavily relies on Chinese imports, posing national security concerns. This article examines the challenges and opportunities in the global rare earth elements market, addressing environmental controversies, geopolitical tensions, and the race for a secure supply chain. As nations handle the complexities of this critical industry, the pursuit of sustainable and geopolitically secure rare earth supplies emerges as a vital global concern.

## Keywords

Rare Earth Elements (REEs); Geopolitics; Environmental Sustainability; Global Supply Chain; US-China Trade War.

## Resumo

Este artigo analisa a paisagem multifacetada dos Elementos Terras Raras (ETRs), componentes cruciais em indústrias tradicionais como vidro e metalurgia, bem como essenciais na crescente economia verde e digital. A transição para uma economia mais verde depende fortemente dos ETRs para baterias, turbinas eólicas e painéis solares. A cadeia de abastecimento global de ETRs, dominada pela China com quase 95% das reservas mundiais, introduz complexidades e considerações geopolíticas, levando nações como os Estados Unidos e países da União Europeia a buscar alternativas e reduzir a dependência do domínio da China sobre este mercado. Os Estados Unidos, outrora uma potência chave na mineração de terras raras, agora dependem fortemente de importações chinesas, levantando preocupações com a segurança nacional. Este artigo examina os desafios e oportunidades no mercado global de elementos terras raras, abordando controvérsias ambientais, tensões geopolíticas e a corrida por uma cadeia de abastecimento segura. À medida que as nações lidam com as complexidades desta indústria crítica, a busca por materiais de terras raras sustentáveis e geopoliticamente seguros emerge como uma preocupação global vital.

**Palavras-chave**

Elementos de Terras Raras (ETR); Geopolítica; Sustentabilidade Ambiental; Cadeias de Logística Globais; Guerras Comerciais EUA-China.

**How to cite this article**
Martins, Tiago Tecelão (2024). Rare Earth Geopolitics: Global Dynamics and Strategic Balance of Power. *Janus.net, e-journal of international relations*. VOL 15, Nº.1, May-October, pp. 249-265. DOI https://doi.org/10.26619/1647-7251.15.1.14

**Article received on December 3, 2023, and accepted for publication on March 13, 2024.**

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## Introduction

Rare Earth Elements (REEs) are a group of 17 (15 with commercial properties) soft heavy-metals, that include such important elements like Thulium and Cerium. Those are vital components in a wide range of modern technologies, and are found in everyday items like cell phones, computer processors, medical tools, industrial products such as MRI contrast agents and even high-powered magnets used in windmill generators (Van Gosen et al, 2014). They also play a significant role in the glass industry, where they are used for polishing and "providing color and special optical properties" (Chapman, 2017, p. 52). Lanthanum, one specific REE, makes up nearly 50% of digital camera lenses, including those in cell phones (Chapman, 2017). CD-ROM and DVD drives are other crucial applications for these metals. While the label "rare" suggests scarcity, these elements and the minerals housing them are plentiful in the Earth's crust, but the discovery of deposits sizable enough for economic exploitation remains an uncommon geological event.

Extraction and purification of rare earth metals play a pivotal role in achieving a Zero Carbon transition by facilitating the advancement of battery technology, windmill efficiency, and solar panel production (Serpell, Chu and Paren, 2021). It's no coincidence that Bill Gates, a major player in the green transition, is investing around $1 billion in AI mining of rare earth metals, made through KoBold Metals, a mining company based in Berkeley (Sheikh, 2023).

Also, the transition from traditional vehicles to electric ones seem to be dependent on the future of mining of rare earth metals. In reality, the President of Defense Metals Corporation, actually told the press that: "Our way of life depends on advanced materials — from the car we drive to the buildings that house us" (Silverstein, 2022). General Motors is rapidly moving from sourcing their rare earth materials, especially neodymium, from China, to an increase in mining their own rare earth metals domestically .

Nevertheless, this process poses environmental struggles, like in In Inner Mongolia, a key Chinese hub for rare earth ore extraction, that has been accused of detrimental practices such as injecting acid into the ground and using various chemicals having occasioned significant environmental repercussions. This has resulted in the release of toxic gases, the creation of acidic wastewater, and the generation of radioactive waste,

with the impact on surrounding farms and villages being devastating, prompting thousands of people to relocate (Penke, 2021 and Bontron, 2012).

Rare Earths were not widely recognized by scholars or policymakers until China established a virtual monopoly across all stages of the Rare Earth Elements value chains. This shift from simple industrial components to materials with strategic and economic significance, acquired worldwide attention, leading to a reevaluation of their importance in discussions about economic direction and resource competition. The increasing demand for REE raw materials outside China, has raised concerns about the near-monopolistic supply situation (Andersson, Zeuthen and Kalvig, 2018), and as a result both the European Union and the United States have designated REEs as Critical Raw Materials, highlighting their strategic importance (Andersson, Zeuthen and Kalvig, 2018, p. 5). Despite efforts in the EU and other Western countries to develop alternative REE supplies, these political strategies have faced challenges and proven (in general) unsuccessful, and this is changing the western strategy. In fact, U.S. Department of Interior, even identifies "35 critical minerals essential for national and economic security" (Cohen and Grant, 2021).

## From Commerce to Conflict: REE's and the China-US Power Play Initial Landscape: from United States Monopoly to Beijing's Ascent

Situated in a remote part of the California desert, approximately 85 kilometers southwest of Las Vegas, Mountain Pass operates as an open pit mine crucial for the extraction and production of Rare Earth Elements, and was discovered in 1949, coming under the ownership of the Molybdenum Corporation of America, initiating small-scale production in 1952 (Burron, 2023). Recognized as a historic source, Mountain Pass once held the distinction of being the predominant global supplier of REEs and it was one more evidence of American power on a global scale at the time. It reached its peak period of production "between the mid-1960s through the 1980s" (Chapman, 2017, p. 74). Even though the United States was the undefeated dominant position as the world's primary rare earths producer until the 1980s (Seaman, 2019, p. 13), the 1970's were already giving hints of a gradual decline with the rise of environmental protection movements and regulations, especially in the United States, resulting in a significant increase in "regulatory and pricing pressure on producers" (Seaman, 2019, p. 13), especially in western countries. This situation led some companies operating in this "environmentally hazardous industries to seek alternative resource supplies" (Seaman, 2019, p. 13) or contemplating the relocation of production.

Contrastingly, while the United States experienced a rapid growth in the production of rare earth elements during the 1950s and 60s, establishing control over most of the supply chain through the discovery of Mountain Pass, the state of China underwent a comparatively slower process. The first developments of processing Rare Earth minerals in China were done during the late 1950's, but "it was not until the mid-1970s that China became able to make quality RE products and emerged as a very important producer, consumer, and exporter" (Shen, Moomy and Eggert, 2020, p. 130). This was actually coincidental with the emergence of environmental movements in the United States, which, in turn, resulted in the relocation of production, as stated above. Also, in 1975,

the Chinese central government-initiated regulation of the rare earth industry by establishing the National Rare Earth Development and Application Leading Group (Shen, Moomy and Eggert, 2020, p. 130).

The "liberalization of global trade and investment", along with China's own economic openness, allowed international companies to set up operations in China, and gave Chinese firms some technological know-how in the rare earth sector from overseas (Seaman, 2019, p. 13). Furthermore, under the guidance of the Ministry of Land Resources and Planning, China expanded its mining operations between 1978 and 1989 (Pelaudeix, 2015, p. 135). The liberalization and the resource-based strategy of the Chinese government was bearing fruits during the 1980's, with Japan and the USA increasing the import of Rare Earth products from China. Japan alone doubled its import of primary RE chlorides and oxides from 1000 to 2000 tons, and by the year of 1985, it is reported that China's "capacity for producing mixed RE chlorides and oxides was approximately 10,000 tons" (Shen, Moomy and Eggert, 2020, p. 130).

This economic move is seen by some analysts and experts in the field as a failed strategy from the USA, and Ryan Castilloux, founder of Adamas Intelligence's, an organization for the research of strategic metals and minerals, acknowledged that "China (…) in the '80s, flooded the market with low-priced rare earths elements and led to the going out of business of all the other mines globally" (Seligman, 2022). Castilloux continued saying that Beijing's low costs were driven by "government subsidies, low worker wages and poor environmental standards" (Seligman, 2022) that outsmarted the US Rare Earth industry. Thus, it is possible to see how the 1980s ignited the start of the competition between both superpowers that continue until today in this field.

## Deng Xiaoping's Vision and China's Rise to Rare Earth Supremacy in the 1990s

In the 1980s, competition intensified due to liberalization and China's strategic moves. However, the 1990s marked China's strong emergence as a major player in rare earth production, making the Yellow Dragon a leading force during that decade and "producing around 85-95% of the world's supply" (Lavengood, 2022, p. 95). During the last three decades, China employed its abundant rare earth resources to drive "technological innovation and economic development, in a wide range of sectors, from space, defense, and energy" (Seaman, 2019, p. 13). The leadership of Deng Xiaoping and his economic and political plan outlined in 1992 came to be crucial for the REE industry of China, when he stated that his government goal would be to achieve world leadership in the REE industry, and affirmed in 1992 that the "Middle East has oil, China has rare earth" (Pelaudeix, 2015, p. 135). After this direction of policy was stated by the Chinese government, the late 90's confirmed and illustrated this new guideline, when for example, General Motors' magnet-producing subsidiary, Magnequench, was acquired by Chinese State-Owned Enterprises (Mancheri and Marukawa, 201, p. 93), causing some attention from the United States, with Chinese companies securing around 62 percent majority stake at the company (Mancheri and Marukawa, 2018, p. 93). Mr. Zhang Hong, the son-in-law of Deng Xiaoping assumed leadership roles in Magnequench (Mancheri and Marukawa, 2018, p. 95) and the relocation of Magnequench to China in the early 2000s,

following the acquisition, marked a pivotal moment in Sino-U.S. economic relations on REEs issues.

Simultaneously, Japan closed numerous rare-earth processing facilities, transferring both plants and technology to China, and making it more dependent on "Chinese rare earth processors for mischmetal or RE oxides to use as metal hydrides in energy storage" over the years (Mancheri and Marukawa, 2018, p. 113). Therefore, it is possible to understand that China's dominance of the rare-earths market is a relatively new phenomenon, and its dominance over the supply chains allied with environmental issues (a toxic waste spill) led to the cessation of production in the USA's Mountain Pass in 2002 (Chapman, 2017, p. 74), and to the subsequent downfall of the US rare earth production. It is true that under new ownership in 2008, Molycorp resumed production, but these owners have experienced repeated financial problems since then.

## Rare Earths Diplomacy: China's Export Restrictions and Global Response

Before 2010, scholars paid little attention to the concentration of China's rare earth production. However, in that mentioned year, China's dominance, accounting for "95% of the world's rare earth oxides" (Seaman, 2019, p. 7), led Beijing to enforce strict measures that included the imposition of export quotas, taxes (ranging from 10% to 25%), and price controls, causing significant repercussions across global industries like information and communication technology, energy, and defense (Seaman, 2019, p. 7-14). In July 2010, China's Ministry of Commerce announced a dramatic "725% reduction in Rare Earth Oxide (REE) exports for the second half of the year" (Chapman, 2017, p. 61) and in December 2010, Beijing declared an additional cut, setting REE export quotas for the first half of 2011 at 14,508 tons, reflecting an 11% reduction (Chapman, 2017, p. 61).

In September 2010, a notable incident unfolded, marked by a clash between a Chinese fisherman and the Japanese Coast Guard (Seaman, 2019, p. 23). Reports emerged of China halting rare earth shipments to Japan, creating an effective embargo, and increasing concerns about China potentially leveraging its rare earth supply as a diplomatic tool. Faced with this uncertainty, "consumers of rare earths frantically sought solutions and (…) began exploring some of the most far-flung corners of the globe - from the depths of the Pacific Ocean to the jungles of the Amazon, to war-torn Afghanistan" (Seaman, 2019: 7), in order to explore alternatives to the Chinese supply chain. Nevertheless, upon closer examination, these disruptions emerged, not influenced by Beijing's central authorities, but by the hands of local government officials, and port workers, responsible for halting rare earth shipments to Japan, in order to sell for a higher price due to the tendencies in prices. Seaman (2019, p. 23-24) even highlights the potential influence of the black market in this incident, emphasizing its significant power within China's Rare Earth Industry. In reality, officials at different levels of the Chinese central government, including the Ministry of Commerce and the Prime Minister, firmly refuted any suggestion of implementing an embargo on Japan.

Following this rare earths crisis between China and Japan, there was a significant surge in the prices of these elements in 2011 and 2012. Primarily driven by speculative activities, prices rose by up to 500 percent (Seaman, 2019, p. 3), marking the beginning

of heightened awareness in the West regarding Chinese dominance in this field, leading to the initiation of over 200 new projects outside of China in the subsequent years. The surge in prices served as a catalyst for a new moment in the "collaboration between the EU, the US, and Japan to find ways in which to innovate" (Kalantzakos, 2020, p. 4), addressing their substantial dependence on these elements, and resulting in the most significant increase in non-Chinese rare earth minerals, rising from 16.5 million in 2010 to 87.3 million in 2015 (Seaman, 2019, p. 16). Production started in mines (sometimes re-started) in Australia, Vietnam, Brazil and even the United States, and the focus was to diversify, innovate and recycle in order to end dependence on Chinese rare earth minerals. In fact, during 2012, the United States reactivated Mountain Pass after a few years of dormancy, even though initially, this reactivation was gradual and slow. Currently, this mine in California accounts for 15 percent of the world's production of rare earths and is used to supply magnets for "America's most advanced commercial and military technology, from electric vehicles to Virginia-class attack submarines" (Seligman, 2022). The new company that owns Mountain Pass, MP Materials, despite some ups and downs in terms of stock closures, has recently been on Zacks.com's list of the most searched stocks (Zacks Equity Research, 2023) and has been instrumental in the efforts of the public and private sectors to increase the production of Rare Earth Elements from its mine. In November 2022, MP Materials announced the second phase of its production with the construction of a new facility in Fort Worth, Texas. The goal of this new facility is to "convert the refined minerals from Mountain Pass into metals, alloys, and magnets" (Seligman, 2022). The company's Chairman, James Litinsky, himself mentions that "there has to be an American champion in this space" (Seligman, 2022), sending a message to China that the competition cannot come to a halt.

In 2009, China tried to acquire a majority stake (51 percent) in Lynas, Australia's primary rare earth mining corporation (Kalantzakos, 2020, p. 4). However, the Australian government rejected the proposal, stressing the importance of keeping non-Chinese-controlled rare earth resources accessible, and in 2011, this strategy was taken further, when Japan stepped in to support Lynas, providing "a total of USD 250 million in loans and equity in order to receive 8,500 tons of rare earth products over a period of ten years" (Kalantzakos, 2020, p. 5). In 2012, "EU, Japan, and the US collectively filed complaints with the World Trade Organisation (WTO)" (Kalantzakos, 2020, p. 4), regarding Chinese export restrictions on rare earths and other elements like tungsten, and in June of that year, the "U.S. formally requested the establishment of a Dispute Settlement Board (DSB) process" (Chapman, 2017, p. 62). This meant that WTO was called to solve this trade dispute between the Chinese export quotas and restrictions, and the other several countries (lead by the US) complaining that this was China's way of leveraging and weaponizing international negotiations in its own favor. For America, this was detrimental to "American workers and manufacturers across established and emerging industrial sectors" (Chapman, 2017, p. 62), and something had to be done.

After two years of negotiations and processes, the final decision was that Chinese practices "were inconsistent with its WTO accession commitments", and that they violated article 11 "of the General Agreement on Tariffs and Trade (GATT), which prohibits trade restrictions besides duties, taxes, and other charges" (Chapman, 2017, p. 62). The rare earths dispute between China and Japan underscored the potential weaponization of these resources, intensifying global competition for them. Since then,

scholars, international organizations and policymakers have shown a growing interest in these disputes. A Google Scholar search for "Rare Earth Geopolitics" reveals a notable increase in results over specific time periods: from 2010-2012, there are 9,230 results; during the dispute from 2012-2014, this number rises to 11,600 results. Subsequently, in the aftermath of the crisis from 2014-2016, the number further increases to 13,800 results, indicating the escalating relevance and attention to this critical geopolitical issue.

As a consequence of this decision by the WTO, China took the measure in 2015 of abolishing export duties on Rare Earth Elements, and the China's Ministry of Finance and State Administration of Taxation introduced a resources tax in their place. Nonetheless, the disputes between various "Western" countries and China, concerning the embargo and export duties, marked the emergence of another industry where Sino-American relations were being forged amid a foundation of mutual mistrust. In fact, this competition is giving way to new pathways and geographies involved in this conflict. The rise of China's investment in the Arctic is not confined to oil, gas and shipping, but also encompasses the production of rare earths, and in January 2018 the publication of China's Arctic Strategy (State Council Information Office of the People's Republic of China, 2018) paved the way for China's increasing importance in the region.

With Greenland trying to maneuver their way into a more independent position towards Denmark's control, their strategy has been one of flirting with both China and the West in terms of deals for the prospection and export of their resources. China has directed substantial investment towards Greenland, and has ambitious plans to construct or expand airports in the region, like Nuuk, Ilulissat, and Qaqortoq (Kuo, 2019). This has been very important for Greenland's strategy of replacing Danish subsidies and diversify its economy. Another two projects where collaboration between China and Greenland is prospering, is at the Citronen Fjord zinc project in Northern Greenland and the Kvanefjeld Rare Earth Elements (REE) and uranium project. Greenland Minerals Ltd. (GML) owns the Kvanefjeld project, with a significant shareholder base from Western countries and an 11% investment from China's Shenghe Resources Holding (Andersson, Zeuthen, and Kalvig, 2018).

## Beyond Party Politics: The 'Rare' Harmony of Rare Earths Policy during Trump and Biden Administrations

Recognizing the potential pitfalls of excessive dependence on Chinese REEs, former President Donald Trump took action by issuing Executive Orders 13817 and 13953 (Executive Office of the President, 2020). These directives emphasized the need to prioritize domestic extraction of minerals, refining processes, and the assurance of secure supply chains. Donald Trump stated:

> *Our dependence on one country, the People's Republic of China (China), for multiple critical minerals is particularly concerning. The United States now imports 80 percent of its rare earth elements directly from China, with portions of the remainder indirectly sourced from China through other countries. In the 1980s, the United States produced more of these elements than any other country in the world, but China used aggressive economic practices to strategically flood the global market for rare earth elements and*

> *displace its competitors. Since gaining this advantage, China has exploited its position in the rare earth elements market by coercing industries that rely on these elements to locate their facilities, intellectual property, and technology in China. For instance, multiple companies were forced to add factory capacity in China after it suspended exports of processed rare earth elements to Japan in 2010, threatening that country's industrial and defense sectors and disrupting rare earth elements prices worldwide - Executive Office of the President, 2020.*

Donald Trump's statements resonate with the rhetoric put forth by prominent industry analysts, as well as by members of the Pentagon and other American security agencies who increasingly raise concerns about the need to act regarding the Chinese monopoly in the production and acquisition of rare earths. The fact that the "United States had not mined any rare earths domestically in 2017" (Kalantzakos, 2020, p. 4), relying instead on importing 80 percent of REEs from China was a big cause of concern during the Trump Administration. In reality, from 2017 to 2018, the estimated value of rare-earth compounds and metals imported by the United States increased from 137 million dollars to 160 million dollars (Kalantzakos, 2020, p. 5).

With this in mind, as part of the increasingly higher trade war between China and USA, especially during Trump's years, his administration listed REEs in the "summer 2018 list of products" from China that might face tariffs. However, this decision was rapidly overturned. First and foremost, the American dependence on Chinese rare earths could lead to an economic and diplomatic catastrophe from which the U.S. would have difficulty recovering, and the significance of these elements in the everyday economic aspects of the U.S. prevented this trade war from progressing much beyond the initial threats. Secondly, having already observed that Donald Trump was aware of the incident between China and Japan in 2010, it would be expected that he also would not want to face the same consequences from the WTO if China retaliated with similar complaints to the organization in the event of the U.S. proceeding with restrictions on Chinese rare earths.

However, the year 2019 brought to light the same disputes as those in 2018, when "Donald Trump announced he was increasing tariffs on $200bn of Chinese goods from 10% to 25%" (Makortoff, 2019). Chinese retaliation was fast, with tariffs imposed on about $60 billion worth of a wide range of products imported from the U.S. One of the editors of the state-owned newspaper "Global Times," Hu Xijin, tweeted: "Based on what I know, China is seriously considering restricting rare-earth exports to the US. China may also take other countermeasures in the future" (Makortoff, 2019). Near the end of 2019, the United States signed a formal agreement with Australia on critical minerals production as a way of delivering "opportunity and security to both nations" (U.S. Department of the Interior, 2019), in an obvious move to counter Chinese rare earth monopoly, and reinforce the diplomatic network known as QUAD in another critical industry.

The U.S. Department of Defense allocated $30 million to Lynas, the above mentioned Australian rare earth company, in July 2020, supporting the establishment of rare earth refinement facilities in Texas in collaboration with Blue Line Corp. aiming to process imported rare earths domestically (Cohen and Grant, 2021). Also, Canada plays a crucial

role in supplying 13 critical minerals to the U.S., with joint efforts to enhance production discussed in confidential meetings in March 2021, already with the Biden Administration. Both countries, as members of the Energy Resource Governance Initiative (ERGI), are likely to continue collaborating on critical mineral sourcing. And the U.S. is also expanding its critical mineral sources in Mexico, in mining projects led by companies like Southern Copper and Asarco (Cohen and Grant, 2021).

The Biden administration is actively pursuing efforts to strengthen the U.S. rare-earth sector, evident in their commitment to invest in rare-earth separation processes, and in 16 billion dollars awarded for "putting hundreds of thousands [of people] to work in union jobs plugging oil and gas wells and restoring and reclaiming abandoned mines" (Swasey, 2021) under the newly approved $2 trillion infrastructure plan. President Biden's Executive Order 14017 kickstarted a 100-day review of critical mineral supply chains, and in order to combat the climate crisis, "announced an investment in the expansion of the largest rare earth element mining and processing company outside of China" (White House, 2021). The US Government strategy to counter Chinese power and domination over the REEs market is based on deregulation and investment in public and private partnership in order to achieve a stable domestic supply.

Additionally, it is also necessary to look at projects not directly related to Washington but that demonstrate a willingness from its allies to create an alternative to Beijing. For American allies, being a source of production and export of critical materials is a priority, and for Americans, it is necessary to diversify, that is, import their sources of rare earths from allies, reducing dependence on Beijing. As such, the UK launched a mega-project in Angola in 2021, in collaboration with the company Pensana, in order to "build the world's first sustainable rare earth separation facility" (Mining Technology, 2021) with an investment of around 125 million dollars. The goal is to produce approximately 12,500 annualized tons of rare earth oxides and to represent about 5% of the world demand for rare earths in the future.

In September 2022, another episode highlighted significant American concerns about Chinese dominance in this industrial field. The delivery of an F-35 jet was halted for a month following orders from the Pentagon due to issues related to the lack of notification that its rare materials were sourced from China. Some military contracts now include clauses requiring materials from China to undergo thorough inspection and scrutiny (Hudson, 2022). In fact, the majority of F-35s contain materials from China, but the goal is to reduce that number. Ms. Halimah Najieb-Locke, the Deputy Assistant Secretary of Defense for Industrial Base Resilience at the U.S. Department of Defense, stated that "there are choke points that we can't control. If we don't prioritize onshoring this, then we are going to have weak points that don't enable us to really defend ourselves" (Hudson, 2022). Ms. Halimah Najieb-Locke's statement, emphasizing the need to prioritize onshoring, reinforces the broader objective of strengthening domestic capabilities. This commitment aligns with the broader narrative of Washington's efforts to foster self-reliance and minimize vulnerabilities associated with relying on China for crucial resources. General Motors, for example, trying to lead the Electric Vehicle's market have made a deal with Mountain Pass, in order to "to produce enough magnets for up to 500,000 electric motors annually" (Eisenstein, 2021).

And if in 2018 China made their way into Greenland and Arctic Rare Earth Elements, the US approved during this year (2023), a resolution to begin a preliminary process for a potential investment of US$3 million to US$5 million in Ucore Rare Metals Inc.'s rare earths separation facility in Alaska (O'Rourke, 2021). The Alaska Strategic Metals Complex is designed to process mixed rare earth concentrates from U.S.-allied suppliers into high-purity REE oxides, in order to get to the full potential of the Arctic in terms of mineral resources, since it is still underexplored (O'Rourke, 2021).

Indeed, both the Trump and Biden administrations have pursued a strikingly similar course of action in revitalizing the American rare earths industry, driven by shared motivations. While the Trump administration opted for more drastic measures, including tariff hikes on Chinese products, the Biden administration has been cautious to avoid potential economic and diplomatic repercussions with China, a significant economic power in this domain. Nevertheless, the bipartisan political determination to reduce dependence on the Chinese market transcends party lines and is a consistent theme across two seemingly ideologically divergent administrations. It is possible to affirm it as a "rare" bipartisan harmony in a "rare" earth environment.

## Challenges and Opportunities: Balancing Environmental Responsibility and Industrial Demand in a Divided World

Although the rare and critical materials industry represents a small portion of the economy when evaluated individually (valued at roughly 9 billion dollars), it fuels various industries, and its importance is crucial for the global economy (Seaman, 2019, p. 9). Currently, China completely dominates the production of these materials, especially in the case of heavy rare earths like dysprosium. These materials contribute to essentially two categories: firstly, they are essential for traditional heavy industries such as glass, metallurgy, and catalysts. On the other hand, about 40 percent of their contribution goes directly to the emerging industries of the digital revolution and the green energy transition. Currently, 23 percent of today's wind turbines utilize rare earth magnets, but this figure is expected to increase to 72 percent by 2030 (Wind Europe, 2018).

Despite this, there are already pressures to replace rare earths with other components, as expressed by billionaire Elon Musk, who is pushing for a total substitution of rare earth dependence for the green economy and is actively seeking alternatives (Orf, 2023). However, caution is necessary, as the European Commission, in its "Substitution Index" of critical raw materials in 2017, revealed the extreme difficulty of replacing these rare earths with other components. In fact, "heavy rare earths scored 0.96 on a scale of 0 to 1, with 1 being the least substitutable" (Seaman, 2019, p. 21).

It is important, however, to understand the challenges of the Rare Earth Elements industry and not fall into the trap of oversimplifying the phenomenon. Even after several regulatory measures, unlike major industries like oil and gas, China's rare earth industry historically lacked centralization (Seaman, 2019, p. 25-26). Despite the strategic importance of this industry for China, the latest image acquired from this scenario in China shows that an estimated 25,000-50,000 tons of rare earth oxides were illegally produced, with 60 percent involving "heavy" rare earths (Seaman, 2019, p. 25-26). This challenges the notion of a highly bureaucratized state where crime would be difficult to

take place. Additionally, there are practical obstacles to the exploitation of these resources due to their high prices, which hinder the financing of these industries.

With this scenario in mind, China is making increasing efforts to centralize and enhance the planning of rare earth production. In this regard, China developed the China's National Plan for Mineral Resources (2016-2020) with the goal of "protecting national economic security, defense security, and strategic emerging industries" (State Council, 2016, p. 14, as cited in Andersson, Zeuthen, and Kalvig, 2018). This plan includes five-year plans for both Zinc and Rare Earth Elements, encouraging the six major companies, referred to as the "Big Six," to consolidate their positions and engage in overseas activities, promoting collaboration with countries possessing advanced mining industries. Despite encouraging international engagement to demonstrate advanced technologies, the plan paradoxically recognizes the necessity for enhancing China's Rare Earth Element sector to attain world-class status. This seeming contradiction notes the sector's diversity, with smaller producers either ceasing operations or amalgamating into larger entities referred to as the "Big Six" (Andersson, Zeuthen, and Kalvig, 2018). Furthermore, the plan promotes the establishment of REE separation plants in resource-rich countries, indicating a transition towards global leadership instead of relying solely on dominance through processing within China. In other words, China is trying to go global.

China is the predominant force in the rare earths sector, accounting for 62% of raw material production in 2019. In contrast, the United States contributed 12.2% to global production (Cohen and Grant, 2021). Additionally, China holds a substantial majority of global reserves, boasting 36.7%, while the United States has a significantly smaller share at 1.1% (Cohen and Grant, 2021). Therefore, Kazakhstan, Tajikistan, Kyrgyzstan, and Mongolia prioritize increasing mining production, with a primary focus on exporting to China and Russia. Despite this existing connection, the United States has sougth investments and strategic partnerships with Kazakhstan. Kazakhstan stands out not only as one of the world's major uranium producers (Cohen and Grant, 2021) but also due to its escalating emphasis on rare earths production. This is exemplified by a significant agreement signed in June 2023, totaling around $1.7 billion with Germany (Kazakh Invest, 2023), and a major aspect of this agreement involves the collaboration between Kazenergopower LLP and Siemens AG to manufacture medium-voltage distribution devices for Kazakhstan's energy sector using Siemens technology. This collaboration includes the establishment of a Siemens equipment production base in Kazakhstan, with an associated project cost of approximately $22 million (Kazakh Invest, 2023).

When this scenario is examined, it becomes evident that the United States appears to have undergone a kind of Schumpeterian creative destruction from the 1990s until the Trump Administration took office. Despite external influences, such as pressure from low prices and Chinese overproduction of rare materials, the push by environmentalists to close the mine in California would have been highly unlikely to succeed in China. Although the Chinese also faced significant environmental disasters and issues with the toxicity of extracting these resources from their mines (Standaert, 2019 & Liu and McGregor, 2016), the Chinese national ethos, characterized by greater collectivism and unity around a common goal (Jiashan, 2019 & Bai, 2022), as opposed to Western liberalism, leads to a more calculated assessment of risks and benefits in their policies.

Thus, it is possible to observe how the growing social and political division in the United States also leads to a collapse of its industries and internal deindustrialization. The deindustrialization of the United States and the West, in general, is a macroeconomic phenomenon more prominently expressed in the relocation of Western industries to countries considered part of the Global South. What Giovanni Arrighi considers the second phase of capital overaccumulation cycles, resulting from the greater emphasis by the hegemonic power (in this case, the United States) on the financial and speculative sector (Arrighi, 2006). This translates into the abandonment of industry and the so-called physical economy.

However, the influence of environmental movements in the American heavy industry, while having less impact than deindustrialization due to the financialization of the economy, demonstrates how the growing division in American society has also been a key element in its significant loss in the resource race against China. In fact, for China to consider environmental factors, it is most of the times necessary some external pressures and the intervention of non-governmental organizations. In the West, this concern is more ingrained in the daily lives of its citizens, leading society itself to call for environmental justice and giving rise to tensions between responsible economic growth and the effects of heavy industry on the environment.

In this scenario, it is evident that the United States needs to expedite the production process and international agreements to remedy the damage done to the industry during years of mining closures on its territory. Therefore, it is crucial to pay close attention to Mountain Pass, which, after a long hiatus for the reasons mentioned above, has become operational again with significant American investment. It is currently the crucial bet for the United States in the rare earths sector, and much hope has been placed in its reopening by the leading experts in the sector.

## Conclusions

In conclusion, the global dynamics of Rare Earth Elements exemplify a complex interplay between environmental concerns, geopolitical rivalries, and economic shifts. China's historic dominance, holding nearly 95% of the world's reserves and a significant share of production, underscores its strategic position. The evolving landscape, from Washington-based production to a Beijing monopoly, highlights the consequences on global supply chains and the construction of mines worldwide.

The importance of REEs extends beyond traditional industries to crucial sectors like the digital revolution and green energy transition. However, concerns about the environmental impact of extraction processes and China's quasi-monopolistic control have prompted a quest for alternatives. Efforts to replace REEs face challenges due to their irreplaceability, especially heavy rare earths.

China's approach, despite environmental challenges and illegal production, reflects a strategic shift towards centralization and planning. The "Big Six" companies and international collaborations signal China's ambition for global leadership in the REE sector. In contrast, the United States, once a dominant player, faces the repercussions

of deindustrialization and a fragmented approach. The revival of Mountain Pass in California becomes a focal point, symbolizing American efforts to regain prominence.

The historical rivalry between the U.S. and China, marked by strategic moves in the 1980s, continues to shape the REE landscape. China's market strategies, driven by subsidies, low wages, and lax environmental standards, outpaced the U.S., contributing to the latter's decline in the industry. The current scenario emphasizes the urgency for the U.S. to expedite production processes, form strategic partnerships, and secure a stable supply chain, represented by the pivotal role of Mountain Pass. The global quest for sustainable and geopolitically secure REE supplies remains a pressing concern, influencing economic strategies, international collaborations, and the balance of power in this critical industry.

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