The Cradle and Future of Rare Earth Elements

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The world is experiencing rapid geopolitical, financial, and technological shifts, alongside a fast-tracked transition to green technologies. Rare earth elements (REE), especially Nd, Dy, Tb, and Pr, are central to this transition due to their role in Strategic technology production. Permanent magnets, accounting for ~45% of REE use in 2023, are critical for energy, defence, and digital competitiveness.

In the 1980s, the U.S. was the largest REE supplier. In 2024, global Rare Earth Oxide (REO) production reached ~390K t, with reserves estimated at ~90 Mt. The Indo-Pacific dominates the REE sector, producing ~85% of global output and holding ~65% of reserves. However, only two major producers, Northern Rare Earth (China) and Lynas Rare Earths (Australia), were profitable in 2024, with REE prices declining since 2022. This volatility has created uncertainty, prompting the development of new supply chains and advancements in REE science from exploration to processing. The Indo-Pacific's REE backbone includes carbonatite deposits in China and Australia, clay-hosted REE in Myanmar and China, and mineral sands in India and Australia. Vietnam's hydrothermal deposits, with ~3.5 Mt of reserves, produced ~300 t of REE in 2024, showcasing future development potential. Myanmar exported ~45K t of REE to China in 2024, representing ~11.5% of global production.

Carbonatites account for ~80% of global REE production, while heavy mineral sands (~35% in garnet-zircon-monazite content) contribute ~40% of global reserves, mainly mined in India and Australia. Ionadsorption clay deposits in Brazil and South China, including Caldeira (~410 Mt @ 2,625 ppm) and Rocha da Rocha (510 Mt @ 1,513 ppm), offer new opportunities. This presentation contextualises key variables in the REE ecosystem, from exploration to processing, supply chain architecture, and geopolitical dynamics in the new multi-polar financial system, to enable informed, low-risk assessments.