Balancing Economic Growth and Environmental Sustainability: Policy Synergies and Trade-offs in Lithium Extraction in Europe

Context:	The EU Critical Raw Materials Act (CRMA) offers a recent opportunity for research on secure and sustainable supply chains for critical raw materials like lithium, cobalt, and rare earths. The CRMA focuses on reducing dependencies, fostering international partnerships, and building domestic production capacity. This provides the starting point for the proposed thesis. EU member states' national raw material strategies often align with the CRMA but may vary based on their industrial needs, geological potential, and strategic goals. For example, Germany prioritizes securing lithium for its automotive industry, while Portugal and Spain focus more on extraction. These differences create rich grounds for exploring how national strategies integrate with or diverge from EU goals, particularly in relation to lithium production, regulation, and innovation.
Proposed research questions:	How do national raw material strategies align with or diverge from the EU's CRMA objectives, and what country-specific approaches are being taken in lithium production and innovation? Potential areas for investigation: ° Analyze the relationship between global value chains and international trade agreements and derive their role in shaping resource extraction. ° Analyze incentive mechanisms across various actors (governments, companies, local communities) and spatial levels (local, regional, national, supranational). ° Identify global and local conflicts of interest surrounding resource extraction and sustainability. ° Develop incentive schemes that address the needs of different stakeholders, aiming to find synergies between national activities and EU goals for lithium extraction. ° Application Example: You could focus on a regional case study (preferably Germany and Portugal; though the Czech Republic, Spain, or Serbia are also of interest) to explore how countries are contributing to the broader goals of the EU CRMA, using lithium as a focal point.
Methods and data:	**Methods:** you may start your journey along the following lines of reasoning: ° Lay out the relationship between the CRMA and a game-theoretic model on policy coordination vs. divergence: A game-theoretic framework can help model the strategic decision-making process of individual countries when choosing between aligning with EU policies or pursuing independent national strategies. Alternatively, you could focus on a public goods and externalities framework. You could start with [1], [2] or [3]. ° Global value chains, international trade agreements and their role in shaping resource extraction. ° Descriptive analyses: Map out the most important global raw material deposits, track trade flows, and assess institutional and economic frameworks at local, national, and supranational levels. ° Network analysis: Identify key players, trade products, and relationships within the CRMA framework to highlight critical connections and dependencies over time. **Data:** ° Policy Documents: National rare earth strategies and the EU CRMA strategy to compare different approaches. ° Trade data: UN Comtrade Database for tracking raw material flows. ° Socioeconomic Data: Penn World Tables, World Bank, and WIPO databases to analyze economic and institutional factors.
Requirements:	Basic understanding of micro economic and macroeconomic approaches on strategic interaction as well as data analysis skills are beneficiary. The thesis can be written in English (preferred) or in German. Data analyses and/or simulations should preferably be realized with R though Python code is also accepted.
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References

[1] Wolfgang Buchholz and Todd Sandler. Global public goods: A survey. *Journal of Economic Literature*, 59(2):488–545, jun 2021.

[2] Scott Barrett. Self-enforcing international envitonmental agreements. *Oxford Economic Papers*, 46:878–894, 1994.

[3] Scott Barrett. *Environment and Statecraft: The Strategy of Environmental Treaty-Making*. Oxford University Press, 2005.