

A Quantitative Strategic Framework for Critical Minerals Value Capture in the Philippines

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Project Highlights:

- Focuses on value capture strategies for critical minerals in the Philippines, considering a shift from raw ore exports to domestic midstream and downstream processing.
- Interdisciplinary by design, the project integrates geological modelling, material flow analysis, and environmental considerations to assess socioeconomic and environmental value.
- Delivers a strategic national framework that identifies specific policy levers to ensure sustainable management and maximise long-term local prosperity.

Overview:

The global energy transition is driving unprecedented demand for critical minerals, positioning resource-rich nations like the Philippines at a pivotal economic juncture. While the Philippines possesses vast mineral wealth, it predominantly exports ores, limiting midstream and downstream value capture. This undervaluation, combined with processing challenges and supply chain vulnerabilities, hinders the country's potential to fully benefit from the emerging low-carbon economy.

This interdisciplinary PhD project investigates how robust quantitative assessments of mineral resources can be systematically integrated into a national strategic framework to rectify this imbalance. Bridging the gap between geoscience, environmental economics, and policy, the research will develop models for comprehensive resource valuation. The methodology integrates quantitative geological reserve modelling, material flow analysis (MFA), and environmental impact assessments to evaluate not just gross tonnage, but the socioeconomic and environmental value of specific critical mineral supply chains within the Philippines. By mapping quantitative insights against current regulatory structures, the research will identify the specific policy levers required to incentivise domestic mineral processing, optimise extraction rates, and accurately price environmental externalities.

Aligning directly with NERC TARGET CDT objectives, this research will deliver a data-driven strategic framework. The aim is to develop a strategy that contributes to securing fairer global supply chains, ensuring the sustainable management of critical minerals while maximising equitable, long-term local prosperity.

Methodology:

This project will employ a three-phase interdisciplinary approach:

1. Geological Modelling: Using spatial data analysis and quantitative geological reserve modelling to evaluate the scale, grade, and distribution of key critical mineral deposits in the Philippines.
2. Systems Analysis and Valuation: Applying Material Flow Analysis (MFA) combined with environmental impact assessments to track minerals from extraction to export. This phase quantifies current supply chain inefficiencies, ecological externalities, and the socioeconomic opportunity cost of lost midstream/downstream processing.
3. Policy Integration: Using economic modelling to simulate alternative domestic processing and valuation scenarios. These quantitative outputs will be mapped against current regulatory structures to identify specific, data-driven policy levers. The result will be a strategic framework designed to optimise local value capture and ensure sustainable resource management.

Possible Timeline

Year 1: Build quantitative geological reserve models using spatial data to establish the scale, grade, and distribution of the Philippines' critical mineral deposits.

Year 2: Apply Material Flow Analysis and environmental assessments to track supply chains, quantifying ecological costs and the socioeconomic impacts of raw exports.

Year 3: Simulate domestic processing scenarios against current regulations to identify policy levers, and develop final data-driven strategic framework.

Training and skills:

TARGET researchers will participate in a minimum of 40 days training over the 3.5 years of study composed of:

- an annual one-week workshop dedicated to their year group, and tailored to that cohort's needs in terms of skills development – *for the first three years of their study*;
- an annual all-TARGET workshop with cross-year interactions, advanced training and opportunities to specialise in particular areas – *all years of study*;
- a number of one-day workshops;
- additional online events and in-person workshops attached to relevant conferences.

Partners and collaboration (including CASE):

The student will be co-supervised by academics from Imperial College and the Natural History Museum. This supervisory team has a strong track record of successful collaboration on multidisciplinary projects in sustainable mining. The student will engage with the Philippines Mines and Geosciences Bureau and the UK Critical Minerals Intelligence Centre.

Further reading:

Mines and Geosciences Bureau - Central Database (<http://databaseportal.mgb.gov.ph/>)

Ryter, J., Nassar, N., Estimating the probability of export restrictions to inform mineral criticality (2026). Resources, Conservation and Recycling, (226), 108629.

Josso, P., Kadochnikova, A., Bishop, C., Watkins, I., Halkes, R., Elliott, H.A.L., Shaw, R., Singh, N. Bide, T., Kirk, K., Graham, R., Luce, A. (2026) Methodological advances in UK criticality assessment. Nottingham, UK, British Geological Survey, 116pp. (OR/26/011) (<https://nora.nerc.ac.uk/id/eprint/541596>)

Further details:

Please get in contact with Dr Pablo Brito-Parada (p.brito-parada@imperial.ac.uk) to discuss a potential application.

Please visit <https://target.le.ac.uk/> for additional details on how to apply.