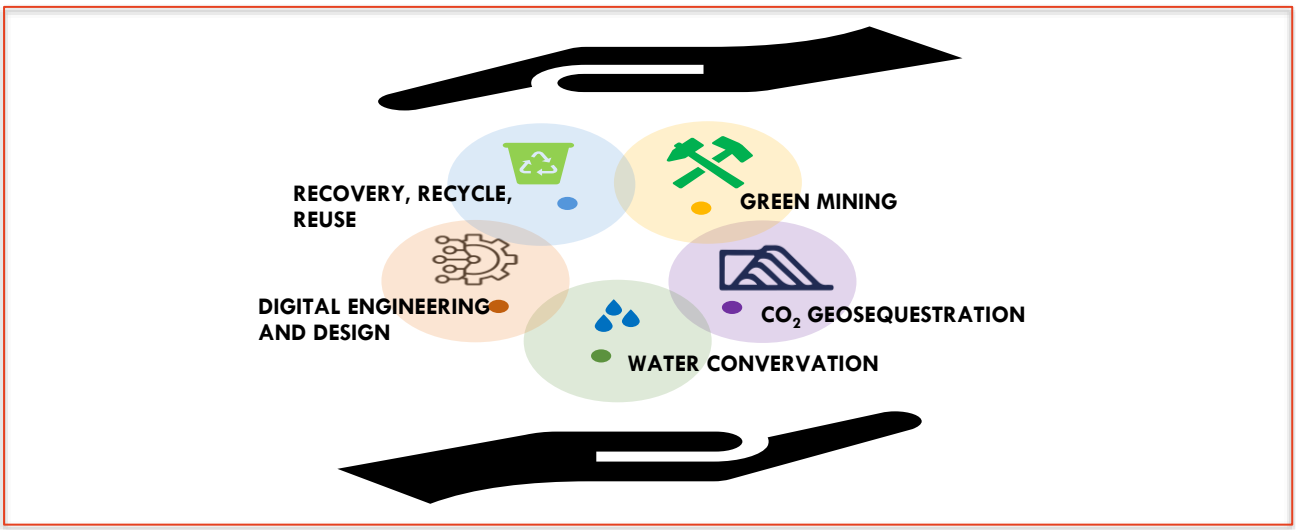
THE UNIVERSITY OF SYDNEY

Net Zero Initiative
Critical Minerals



Our vision and mission

The production of low-carbon renewable energy technologies such as batteries, wind turbines, electric vehicles, nuclear energy, and solar voltaic cells will require enormous amounts of 'energy-critical' metals and minerals, including lithium, copper, cobalt, and rare earth metals. The increasing demand will lead to unprecedented technical, economic, social and regulatory challenges for the mining industry. Decision making will be complex.

Our aim is to develop processing technologies and a decision support system that facilitate sustainable large-scale production of energy-critical metals.

Our approach

We are investigating novel technologies that improve the extraction of metals and minerals, particularly from mining waste. We are also developing a holistic framework to help stakeholders make critical decisions relating to the suitability of feedstock for processing, the selection of processing technology, and the management of mining wastes.

Our research

A key Enabling Research Theme of the Net Zero Initiative (NZI) is 'Emissions Avoidance through Zero Emissions Energy', which is dedicated to facilitating the rise of renewable energy technologies. As part of this, we are investigating ways to ensure the mining industry can meet the accompanying demand for energy-critical resources. Under the pillar 'Critical Minerals', our researchers are pursuing the following activities:

- Developing processing technologies that efficiently recover metallic fractions from minerals and wastes. Example: biomining offers a cost- effective, ecologically sensitive means for mineral extraction;
- Developing technologies to mitigate new climate and environment-related risks in mineral intensification, from extraction to the end use of minerals and metals in low carbon technologies. Example: technologies for re-use and management of mining waste;
- Developing a framework for industry requirements and new product specification to help build sovereign manufacturing and recycling technologies for the Australian energy sector.

Meet our research experts

Our interdisciplinary research team leverages outstanding capabilities and infrastructure. Experts working under this pillar include:

School of Chemical and Biomolecular Engineering

Professor Marjorie Valix, A/Professor Alejandro Montoya, A/Professor John Kavanagh, and Dr. David Wang
Specialise in waste and ore processing, biotechnology, recycling, material science, material characterisation, process design & modelling, membrane technology and techno-economic assessment.

School of Electrical and Information Engineering

Professor Yonghui and Dr. Zihuai Lin
Specialise in AI, machine learning and data analytics.

School of Civil Engineering

Professor Brian Uy, Professor Wije Ariyratne, Professor Anna Paradowska, Professor Gianluca Ranzi, Dr. Ali Hadigheh
Specialise in structural engineering, material science, and additive manufacturing.

School of Aerospace, Mechanical and Mechatronic Engineering

Professor Liyong Tong: Specialises in structural material design, analysis, and modelling.

Director of Core Research Facilities, The University of Sydney

Professor Simon Ringer: Specialises in material science and characterisation.

How your business will benefit

By partnering with us, your business will be able to:

- collaborate with leading academic and industry experts from the University of Sydney to address the challenges faced by your business;
- help shape the next generation of postgraduate students with skills relevant for your business needs;
- host one of our talented PhD students, who will be placed in your business for up to one year; and
- benefit (pending eligibility) for the Australian Government's R&D Tax Incentive Scheme.

Example Projects Underway

Carbon neutral mines:

Microbiome assisted accelerated carbon dioxide sequestration in mine tailings.

Repurposed mining wastes:

Transformation of mining wastes into materials for constructions.

Sustainable processing of minerals:

(i) Exploitation of microbiome in the efficient extraction of metals from ores and metallic wastes; (ii) Sustainable electrochemical processing of valuable metals from ores and electronic waste.

Decision support systems for evaluating sustainability of mining projects:

Integrated assessment of processing that applies to mining projects.

Contact us

For further information or to discuss in greater detail, please contact:

Net Zero Initiative

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