

Modelling the Future of Copper Production in Queensland's NW Minerals Province: A New Foundation for Policy Development and Infrastructure Planning

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The closure of the Mount Isa Copper Mine in 2025 highlights the importance of future copper production in the region. We have developed an economic model of Queensland's NW Minerals Province copper supply chain that forecasts this critical metal's production through to 2050. This will be used to estimate the impact of market variables and government interventions on the future productivity of the region.

We have compiled data on all significant copper producers and near-term projects in the province, including mining and processing capacity, copper, by-product and waste production, power and water consumption, capital and labour costs, and transport infrastructure utilisation. The pathway from in-ground resource to saleable copper is mapped out for each producer using a structural economic model that features a rich internal organisation of production and a detailed transport, power and water infrastructure network. This model defines the functions that characterise the processes and cost structures of each production stage, while integrating the infrastructure network that supports it. The model allows for a diverse range of variables to be incorporated at each node of production (mine, concentrator, smelter) and connector in the supply chain (highway, rail, port). Each network segment, consisting of multiple nodes and connectors can be assessed for its financial viability, allowing the model to be used to investigate which variables are the principal drivers of productivity, or conversely, represent the most risk to the supply chain.

The model presented here is a preliminary base-case study; however, this framework allows us to construct counterfactual scenarios for analysing the organization of the copper supply chain and its adaptation to future demand. Quantitative modelling of this complex system is a useful tool for assessing the effectiveness of government intervention in resources supply chains, and assessing the vulnerabilities and emergent opportunities arising due to changes in external variables.