

A multisectoral bio-physical Stock-Flow-Consistent input-output macroeconomic modelling analysis for Australian transition to low-emission energy

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Abstract: Australia's transition to a low-emissions energy future requires coordinated investment, structural innovation, and long-term planning under resource and ecological constraints. This study presents a novel dynamic Stock-Flow-Consistent Input-Output (SFC-IO) macroeconomic model to assess how government fiscal policy and adaptive monetary tools can facilitate Australia's renewable energy transition while preserving macroeconomic and price stability. Drawing on ecological macroeconomics and heterodox traditions, the model integrates sectoral financial balances, energy system dynamics, environmental constraints, and inter-industry production flows within a unified accounting-consistent framework.

The model is calibrated using national datasets—including ABS National Accounts, Input-Output tables, DCCEE Energy Balances, RBA statistics, and emissions inventories—to reflect Australia's economic-energy structure. Key industrial sectors, such as mining, manufacturing, energy-intensive exports (e.g., coal, LNG, iron ore), and critical mineral supply chains are modelled explicitly. The framework includes financial sector interactions through credit dynamics, interest rates, and capital allocation, alongside biophysical limits via Energy Return on Investment (EROI) metrics and emissions constraints. This enables endogenous simulations of labour markets, balance sheets, and productivity. Departing from equilibrium models, it captures heterogeneous agents, structural bottlenecks, and macro-financial-energy interactions critical to Australia's renewable transition and inflation risk analysis.

A suite of scenarios—ranging from business-as-usual to net-zero, just transition, and global disruption—reveal that Australia's energy transition, while capital-intensive, is economically manageable and socially beneficial when policy coordination is in place. Our early findings support the argument that inflationary pressures from decarbonisation are not inevitable, but can be mitigated through strategic investment, supply-side expansion, and inclusive labour market policies. The government's proactive role—as investor, employer, and coordinator—is critical in navigating the complex trade-offs between climate action, financial stability, and equitable growth.

This SFC-IO model represents a novel contribution to Australia's macroeconomic toolkit, offering a data-calibrated, policy-relevant platform for scenario design and strategic planning. It provides empirical grounding to support decisions on fiscal expansion, monetary policy alignment, and sectoral transformation in pursuit of a just and stable low-emission economy.

Keywords: *Stock-Flow-Consistent Input-Output macroeconomic model, Fiscal and Monetary Policy, Energy Return On Investment, Heterodox traditions*