

Re-establishing the Australian Treasury's climate modeling capability

Australia—Department of the Treasury

Rebecca Cassells and Gerard Hawkins

A contribution to the 'Compendium of Practice from a Global Community of Ministries of Finance and Leading Organizations: Economic analysis and modeling tools to assist Ministries of Finance in driving green and resilient transitions'

Topic: Enhancing analytical capacity in Ministries of Finance: capacity-building case studies

June 2025

Access the full Compendium at www.greenandresilienteconomics.org

This contribution was prepared at the request of, and with guidance from, the Ministry of Finance of Denmark as Lead of the Coalition's Helsinki Principle 4 initiative 'Economic Analysis for Green and Resilient Transitions' and its Steering Group, with input from its Technical Advisory Group. The views, findings, interpretations, and conclusions expressed are those of the authors. While many Coalition members and partners may support the general thrust of the arguments, findings, and recommendations made in this contribution, it does not necessarily reflect the views of the Coalition, its members, or the affiliations of the authors, nor does it represent an endorsement of any of the views expressed herein by any individual member of the Coalition.

© The authors, 2025

Licensed under [CC BY-NC 4.0](https://creativecommons.org/licenses/by-nc/4.0/).

Introduction

The Australian Treasury has recently returned to playing a lead role in modeling the climate risks and opportunities for the Australian economy, coinciding with a step up in the Australian Government's climate change agenda. Central to this agenda are more stringent emissions reduction targets and major policy reforms focusing on some of the largest emitting sectors. These include legislating greenhouse gas emissions reduction targets to reach net zero by 2050 and 43% below 2005 levels by 2030; reforming the Safeguard Mechanism, a "baseline and credit" system for heavy industry; transforming the electricity sector to achieve 82% renewables by 2030; and introducing a New Vehicle Efficiency Standard. Globally, the decarbonization process represents one of the most significant structural changes since the industrial revolution, with significant implications for Australia's economy.

The Treasury's capability uplift

In response to these developments, the Government positioned the Australian Treasury to take a leading role in modeling climate risks and opportunities. Substantial long-term funding was allocated to rebuild the Treasury's modeling capability and expertise, recognizing its critical role in providing an economy-wide perspective on the global climate and energy transition. The evolving policy landscape and increasing demand for a broad range of analytical tools to inform Government decision-making led to the establishment of a dedicated Climate and Industry Modelling team, consisting of around 30 professionals: the first such team within the Treasury since 2011.

The creation of this new team required a comprehensive hiring process to create three integrated units—global, domestic, and industry. Due to the long pause since the last dedicated climate modeling team was active within the Treasury, much of the institutional knowledge had been lost. Apart from in the domestic unit, responsible for developing the Treasury's general equilibrium model of Australia's economy, it was necessary to consolidate expertise and rebuild capabilities from the ground up to meet the unique challenges of climate modeling.

A multi-stage approach was adopted, with phases defined as Build (2023), Refine (2023/24), and Mature (2025+). These phases are aligned with major planned modeling exercises, with the overarching aim to develop a flexible, sustainable, and credible modeling capability. Additionally, this approach involved the Treasury establishing new relationships and acting as the central nexus between various Government Agencies engaged in climate analysis, ensuring cohesive and integrated efforts across the public sector.

Modeling capability to support Government decision-making

To tackle the complex challenges of the climate and energy transition, a suite of sophisticated modeling tools has been developed to provide a practical, fit-for-purpose, and well-integrated analytical framework. The Treasury collaborated closely with leading experts in the field to ensure its new capabilities met the needs of the Australian context.

The analytical framework has been designed to help understand both transition risks and opportunities as well as the physical impacts of climate change on the economy, which are becoming more prevalent than before. The new capability stretches across sectoral, domestic, and global modeling frameworks, working together to form a comprehensive integrated assessment of climate impacts. The Treasury framework includes both general and partial equilibrium models, many requiring bespoke development to address Australia's specific circumstances. Central to the Treasury's modeling capability is understanding the potential transition pathways available to sectors as they decarbonize.

The Treasury's suite of models is designed to provide a comprehensive analysis of the transition to net zero. Models fall into two major categories: general equilibrium models, and bottom-up sector-specific models. Models that have been developed by Treasury staff include the following:

- **Treasury Industry Model (TIM):** A forward-looking, multi-sector dynamic general equilibrium model of the Australian macroeconomy. TIM has been in development by Treasury staff over a number of years, but as part of the establishing the new climate modeling capability the model has been extended to capture the additional detail required to analyze the net zero transition and physical climate impacts.
- **Model of Industrial and Resources Abatement (MIRA):** A partial equilibrium techno-economic model of least-cost abatement for large industrial emitters that are part of the Safeguard Mechanism. This model has been developed by Treasury staff in collaboration with a range of other Government Agencies and stakeholders. The model provides detailed analysis of how industrial emitters can meet emission reductions targets through investment in on-site abatement and the purchase of carbon credits.
- **Australian Lifecycle Energy eXpenditure (ALEX):** A household cameo model that allows the analysis of household energy costs across certain types of consumption (electrify heating, water heating, cooking, and vehicles).

In addition to the models developed in-house, the Treasury also uses a number of models that were initially developed externally:

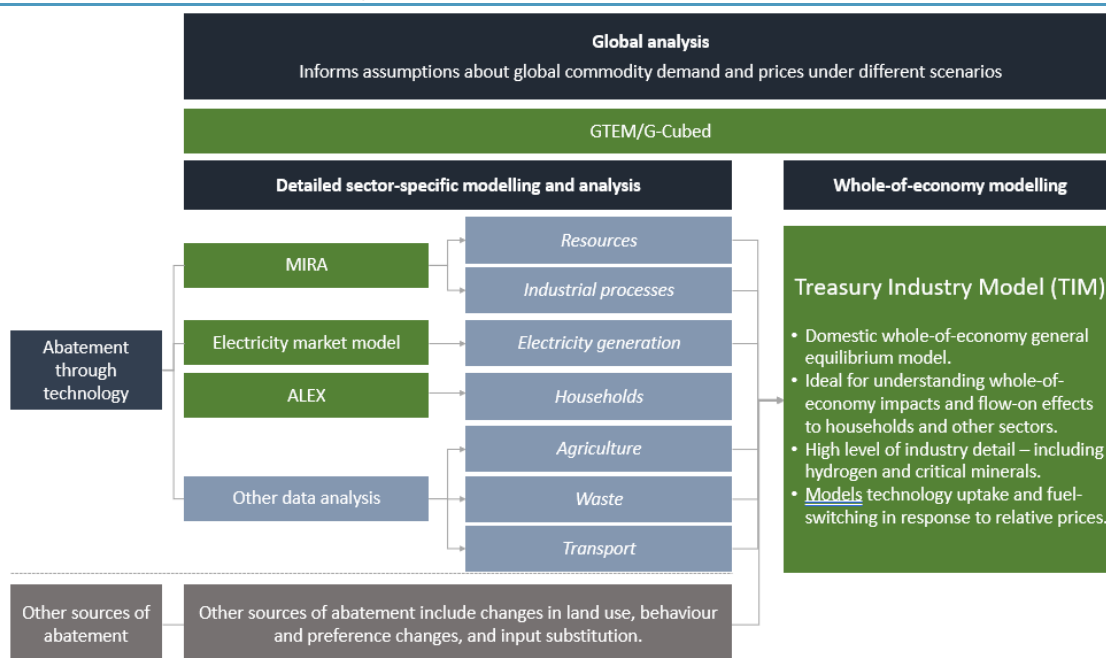
- **Electricity Market Model (EMM):** A partial equilibrium techno-economic model capable of analysis capacity expansion and detailed dispatch for Australia's key electricity grids. The model is a shared resource with Australia's Department of Climate Change, Energy, Environment and Water.
- **Global Trade and Environment Model (GTEM):** A dynamic global computable general equilibrium model with the capability to address the total, sectoral, spatial, and temporal efficiency of resource allocation.
- **G-Cubed:** Professor Warwick McKibbin's intertemporal general equilibrium model of the global economy. The model covers a range of regions/countries and sectors and is based on explicit intertemporal optimization by agents (consumers and firms).

Models are used both individually and together and are complemented by data analysis, consultation, and qualitative assessments. These models give insight into questions such as:

- How will emission reduction policies, changes in technology, and the global outlook impact different sectors and their abatement opportunities over time?
- What impact could a warming planet have on the prevalence and intensity of physical climate risks, and how might this impact the economy and long-term fiscal outlook?
- How might physical climate risks impact productivity among workers and across different sectors?

These insights can help inform Australia's long-term emissions reduction plan, national climate risk assessments, and future assessments of long-term economic and fiscal outlook.

Figure 1. The Australian Treasury's integrated climate modeling suite



The Treasury's modeling capability in practice

In 2023, the Australian Government's Intergenerational Report marked a significant advancement in climate modeling for the Treasury, with the introduction of a dedicated Climate and Energy Transition chapter that explores the potential long-term fiscal and economic impacts of climate change for Australia. For the first time, the report included new insights into the physical impacts of climate change over time using TIM, as well as analysis on how climate change could affect selected Government expenditure and revenue items, and coal and critical minerals exports profiles.

While the Intergenerational Report was a pivotal first step in testing the Treasury's frameworks and models, the uplift in modeling capability has more recently been geared toward supporting the Government's Net Zero Plan. As the Government's lead economic advisor, the Treasury will provide advice on the economy-wide impacts of the Net Zero Plan, including abatement opportunities. This work will include integrating information from the development of six sectoral decarbonization plans across responsible Government Agencies: Transport, Industry, Resources, Agriculture, Energy and Electricity, and the Built Environment. This comprehensive approach will require leveraging key analytical assets to integrate global, economy-wide, and sectoral pathways.

The Treasury has also played a key role in the Australian Government's Carbon Leakage Review, led by Professor Frank Jotzo. The review focuses on an assessment of carbon leakage risk to trade-exposed facilities covered by the Safeguard Mechanism, and an evaluation of the potential options for addressing carbon leakage risk. The modeling brought together the global (GTEM), sectoral (MIRA), and whole-of-economy (TIM) frameworks to assess the potential impacts of an Australian Carbon Border Adjustment Mechanism (CBAM).

Lessons and challenges

Since the inception of the Treasury's new climate modeling capability, the primary challenge has been balancing the development of models and their capability with the need to meet the immediate analytical demands of the Government's climate agenda. This balancing act has required strategic prioritization of the model build and development in tandem with analytical outputs. Additionally, integrating new methodologies, such as integrating bottom-up sectoral insights and ensuring the models remain adaptable to evolving policy landscapes, has presented both a challenge and

opportunity, often requiring more time and resources, but resulting in a more sophisticated and robust outcome. The new function has also had to navigate the complexities of inter-agency and industry collaboration, ensuring data sources and analytical approaches are harmonized to produce coherent and actionable insights. Finally, as with any modeling capability, the long-term sustainability of the function will be an ongoing challenge. Longer lead times are often required to acquire specialist knowledge and expertise in climate and economic modeling, and staff retention and development will remain a priority for the function. Despite these challenges, strong institutional support, combined with an openness to collaboration and continuous learning and development have all been instrumental in rebuilding the Australian Treasury's role in modeling the climate risks and opportunities for the Australian economy.

To maintain the Treasury's new capability and role it will be necessary to continue to refine and expand the analytical framework, to address known limitations and future changes in the structure of the Australian economy, technological change, and the evolving policy environment. Work is underway across the Treasury's suite of models to better capture developments in industries likely to see significant changes to production processes through the global net zero transition. This includes improving the ability to capture both the available technology options and the interlinkages with other sectors of the economy.