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COMMENTARY

Australia's 2030 Target Gap and the Role of LULUCF: An IPAT Analysis

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Under the 2016 Paris Agreement, Australia committed to reducing emissions to 43% below 2005 levels by 2030 and aims to be net zero (including LULUCF) by 2050. This commitment is part of the global effort to limit warming to below 2°C (Department of Climate Change, Energy, the Environment and Water, 2025). This short commentary applies the IPAT model to assess how population, affluence, and carbon intensity drive GHG impacts.

Australia celebrated 26 years of uninterrupted economic growth from 1991 to 2017 (Leal et al., 2019), reflected in rising affluence. However, it is a country with extensive non-renewable resources such as coal, oil, and natural gas (Leal et al., 2019). The electricity sector is the largest emitter, with coal accounting for roughly two-thirds of all electricity generation, resulting in Australia having the highest CO_2 emissions per capita in 2019 (OECD, 2019). Additionally, Australian CO_2 emissions account for 1.33% of total global emissions, with 0.97% originating from the electricity sector (Ahmed et al., 2021). As the largest emitter, the electricity sector significantly drives overall GHG growth.

Historical trends presented in Table 1 from 1970–2023 show a 1.12% average annual growth (AAG) in total GHG emissions, a 1.43% AAG in population, a 1.57% AAG in GDP per capita, and a –1.87% AAG in Carbon intensity. A negative carbon intensity growth rate means

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GDP is growing faster than emissions. When examining observed trends since signing the Paris Agreement in 2015, total GHG emissions have been falling at an average annual rate of 0.64% and carbon intensity has decreased at an average annual rate of 3.08%.

Reducing emissions to 43% below 2005 levels will require a significant reduction in total GHG emissions. Based on the calculations shown in Table 1, to meet the 2030 target beginning in 2015, total GHG emissions should have decreased at an annual rate of 3.75% per year, and the annual carbon intensity rate should have been –6.74%. Since the observed rates missed this target, Australia must cut GHG emissions by 7.87%, and carbon intensity must fall by 10.875% per year from 2024–2030 to make up the difference.

Table 1: *Trends and Projections using the IPAT Model (1970-2030)*

Trends	Period	Total GHG Emissions (CO2e)2 Growth Rate[1]	Population Growth Rate[2]	GDP per capita growth rate[3]	Carbon Intensity Growth Rate
Historical[4]	1970-2023	1.12	1.43	1.57	-1.87
Target for 2030, starting in 2015	2015-2030	-3.75	1.43	1.57	-6.74
Observed within Target Period	2015-2023	-0.64	1.41	1.03	-3.08
To hit Target in 2030 from 2023	2024-2030	-7.87	1.43	1.57	-10.87

Note. The Population growth and GDP per capita growth are assumed to grow at the historical rate.

[1] Data is obtained from the World Bank using indicator name Total greenhouse gas emissions excluding LULUCF (MtCO2e) and code EN.GHG.ALL.MT.CE.AR5
[2] Data is obtained from the World Bank using indicator name Population, total and code SP.POP.TOTL
[3] Data is obtained from the World Bank using indicator name GDP per capita (constant LCU) and code NY.GDP.PCAP.KN
[4] Data from 2020 and 2021 has been excluded to remove inconsistencies due to the COVID-19 pandemic

The data presented in Table 1 analyze total GHG emission growth rates in Australia excluding Land Use, Land-Use Change, and Forestry (LULUCF). The Government of Australia projects that emissions including LULUCF will fall to 42.6% below 2005 levels by 2030 (Climate Action Tracker, 2025). When LULUCF emissions are taken into consideration, total emissions would need to decrease at an annual rate of 4.7% and carbon intensity would need to fall by 7.5% annually.

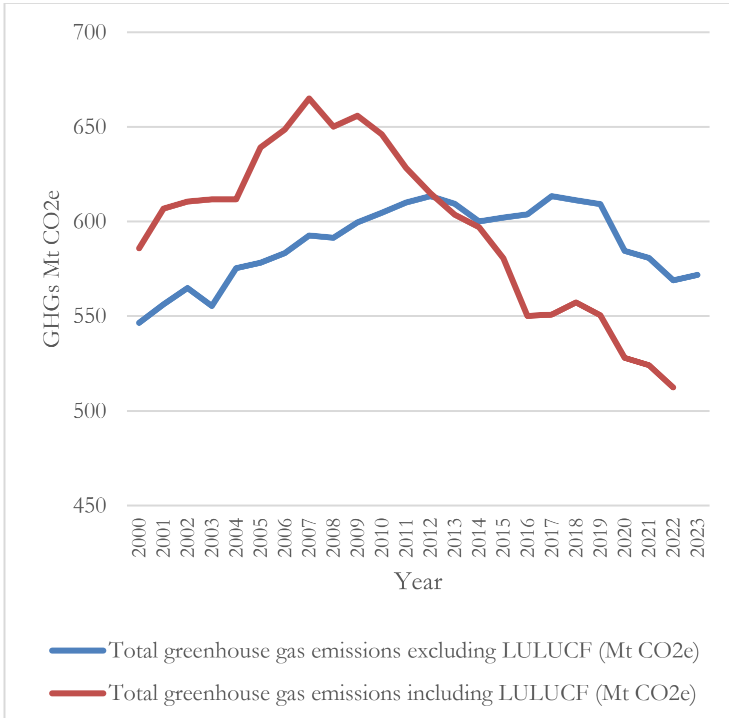

Figure 1. *Emissions Excluding LULUCF Compared to Emissions Including LULUCF in Australia*

Figure 1 depicts how emissions including LULUCF are lower than emissions excluding LULUCFs, meaning LULUCF has acted as a carbon sink since 2010. Although LULUCF is a carbon sink, fire-related forest loss has accounted for 41% of total global forest loss over the past two decades, weakening the global land carbon sink (Huang et al., 2025). The largest source of global carbon emissions (excluding fossil fuels) is fires, and despite strategic forest maintenance, Australia experienced massive fires in 2019–2020 that emitted significant amounts of CO_2 into the atmosphere (Shiraishi & Hirata, 2021). Reliance on LULUCF to reduce emissions and provide a carbon sink could cause problems in the future, with more frequent droughts and extreme heat becoming increasingly more prominent (Shiraishi & Hirata, 2021).

Concluding Remarks

Given the evidence presented in this perspective, Australia will not be able to meet its 2030 emissions target. Reductions of GHG emissions including LULUCF at over 4% per year are not possible with the current energy sources and infrastructure of the economic systems. Although reliance on coal has dropped (International Energy Agency, n.d.) and an investment of $3.27 billion (AUD) has been made on low-carbon liquid fuels, solar installations, and emissions reductions (Department of Climate Change, Energy, the Environment and Water, 2025), additional reductions would be costly and could drive the economy into a deep recession. Australia should focus on its 2050 target to be net zero starting immediately. Significant reductions will require strong policy and investment to sustain historic affluence and population growth. The policies currently in place are generally aligned with the 2050 target but will require consistent funding (Department of Climate Change, Energy, the Environment and Water, 2025; Leandro, 2024).

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Media Attribution

- **Figure 1.** Emissions Excluding LULUCF Compared to Emissions Including LULUCF in Australia was created by Holly Siebenmorgen (2025) and is subject to the CC license on the Future Earth journal.

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Holly Siebenmorgen is a graduate student pursuing her Master of Science in Environmental Economics and Management at Thompson Rivers University. During her time at TRU, she has focused on the intersection of ecological preservation, sustainable development, and the economic valuation of ecosystem services. A lifelong traveller and outdoor enthusiast, she has explored national parks and natural landscapes across the globe—experiences that have deepened her appreciation for biodiversity and strengthened her commitment to conservation. Her academic work centers on integrating environmental well-being into economic decision-making, with particular interest in valuing ecosystem services, climate resilience, and sustainable community development. She hopes to apply the knowledge and analytical tools gained through her graduate studies to build a career that fosters a more sustainable and environmentally conscious future.