Tracking 2 Degrees. Quarterly Report December 2021. Q2/FY2022

March 2022

1.1 Introduction

Under the Paris Agreement, the Australian Government has legally committed to reducing our emissions by 26-28% below 2005 levels by 2030. However, to ensure global warming remains under 2 degrees Celsius, the independent body Climate Change Authority (CCA) has proposed that Australia set a national Science Based Target (SBT). This is a target calculated from Australia's share of emissions for a 2°C global outcome. Ndevr Environmental has used this target to model a quarterly emissions budget for Australia.

This report tracks Australia's performance against the Paris target and the CCA's carbon budget based on the latest available data, trends, and industry movements for the months of October, November, and December (Q2/FY2022). Our results are presented in tonnes of carbon dioxide equivalents (t CO_2-e). 1 t CO_2-e is roughly equal to the emissions of a standard 5-seat passenger vehicle driving approximately 5,400 km.

1.2 Headline results

- Year-to-December 2021 total emissions are projected to be 498.6 Mt CO_2-e, a 1.1% decrease on the previous year. This reduction is largely attributable to increased renewable electricity generation in the electricity sector. Penetration of renewable energy for the year-to-December 2021, exceeded the 30% milestone.
- Emissions for Q2/FY2022 are projected to be 121.96 Mt CO_2-e, this is a decrease of 4.3 Mt CO_2-e and 0.70 Mt OC_2-e on the previous quarter and on the same quarter the year prior, respectively.
- The easing of lockdown restrictions in around the country, along with a gradual reactivation of air travel during the Q2/FY2022, is expected to result in a 12% increase in the total transport emissions for the quarter, when compared to the previous quarter (Q1/FY2022).
- Annual results for transport energy (year-to-December 2021) show signs of recovery with an upward trajectory for the sector. A 2.1% increase on the same period the year prior is expected.
- Despite quarterly projected results showing a declining trend in emissions from stationary energy, year-to-December 2021 show subtle signs of the sector realigning to its historical upward trajectory. Q2/FY2022 stationary energy emissions are projected to be 24.7 Mt CO_2-e, 2.0% up on the same quarter the year prior (Q2/FY2021).
- Electricity generation from natural gas in Q2/FY2022 dropped by 28% compared to the same period in FY2021. Natural gas share in the NEM continues in a downwards trend since 2010.
- The geopolitical landscape is expected to play a major role in the sector recovery during the second half of FY2022. Industrial and mining related emissions, including stationary energy

and fugitive emissions are expected to bounce back to a pre-COVID growth trend as international demand increases for coal and LNG.

- 47% of Australia's CO_2-e budget for 2013 – 2050 (below 2°C), recommended by the CCA in 2014, has been spent in nine years. Australian annual emissions overshoot the allowed annual budget by almost double.
- A recent study commissioned by the WWF-Australia, concludes The Australian Government 2030 emission reduction target of 26-28% on 2005 levels, doubles Australia's 'fair-share' in the global carbon budget (below 1.5°C).
- For Q2/FY2022, Australia's emissions are 12.0 Mt CO_2-e higher than recommended safe Science-Based Targets (SBTs).

Figure 1: Australia's Quarterly Emissions Projections to a 2-Degree Target, 2005-2050

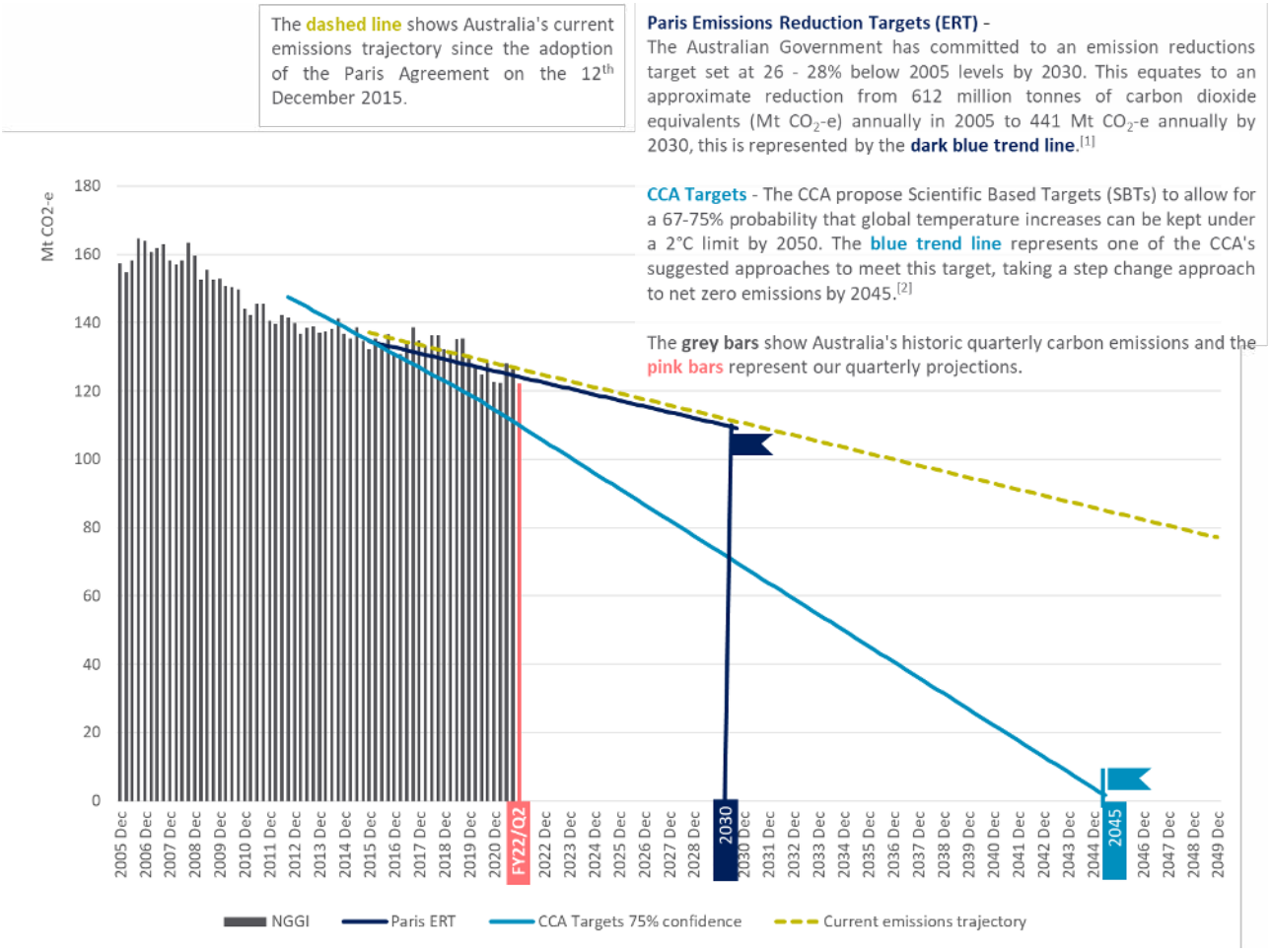
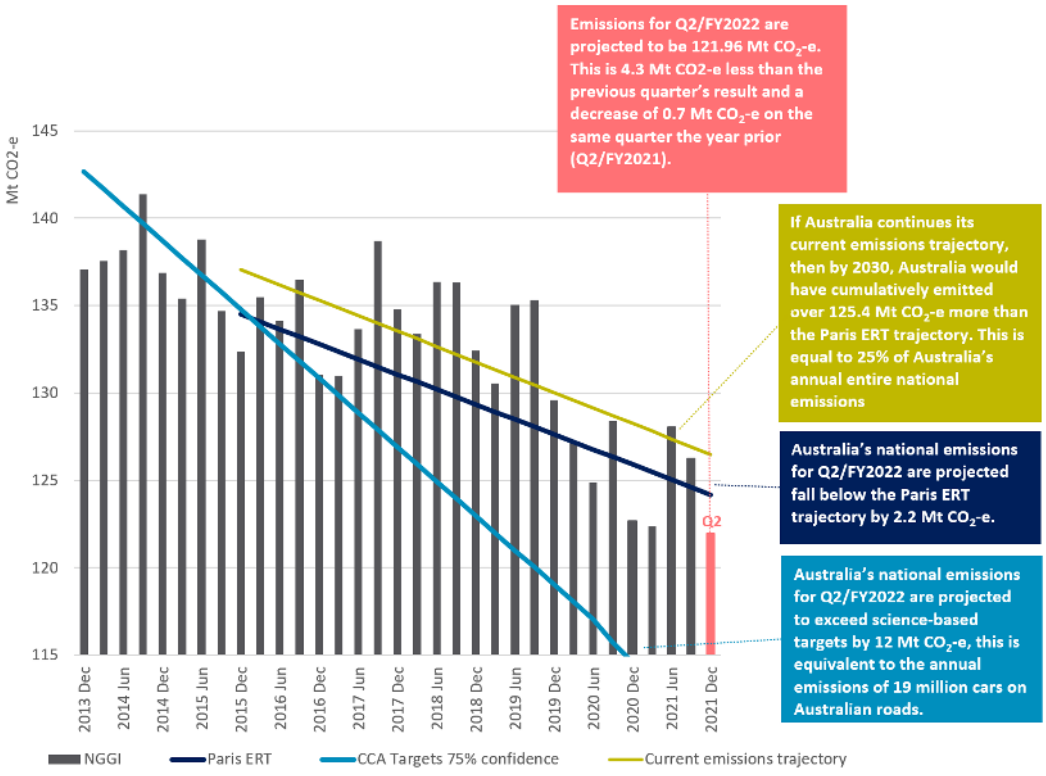


Figure 2: Australia's Quarterly Emissions Projections to a 2-Degree Target, 2013-2021 – Zoomed in view



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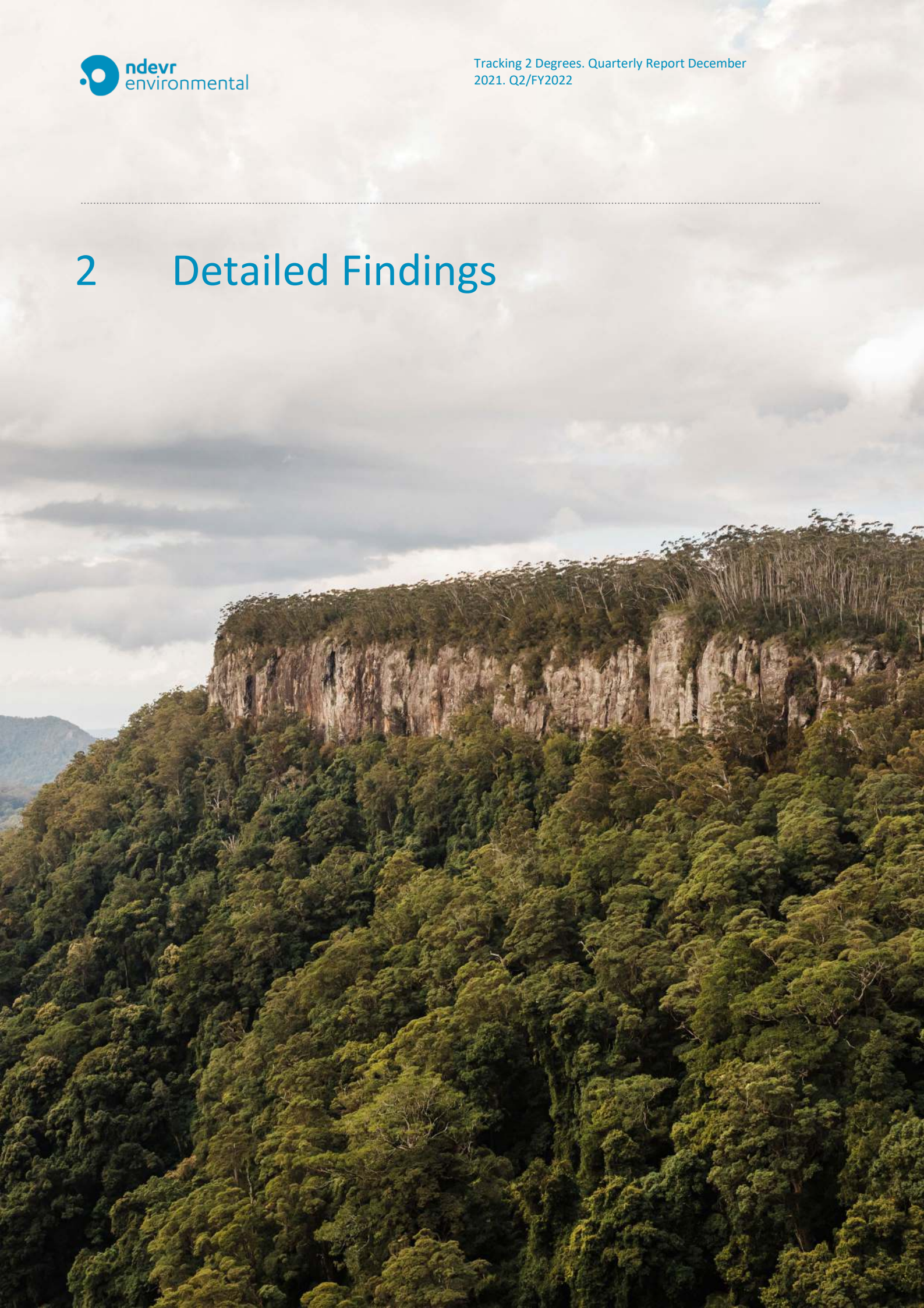
"Global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO2 and other greenhouse gas emissions occur in the coming decades."

— IPCC Sixth Assessment Report, 2021.

2 Detailed Findings



2.1 Detailed Findings

2.1.1 Renewable Energy Transition: The Real Driver of Current Emissions Reduction

When excluding Land Use, Land Use Change & Forestry (LULUCF) emissions, the annual emissions for the year-to-December 2021 results in 523.03 Mt CO_2-e. This is the lowest total since the year-to-December 2005, when 521.4 Mt CO_2-e were recorded.

Including LULUCF, the expected emissions for the quarter are 498.6 Mt CO_2-e, 1.1% decrease on the previous year.

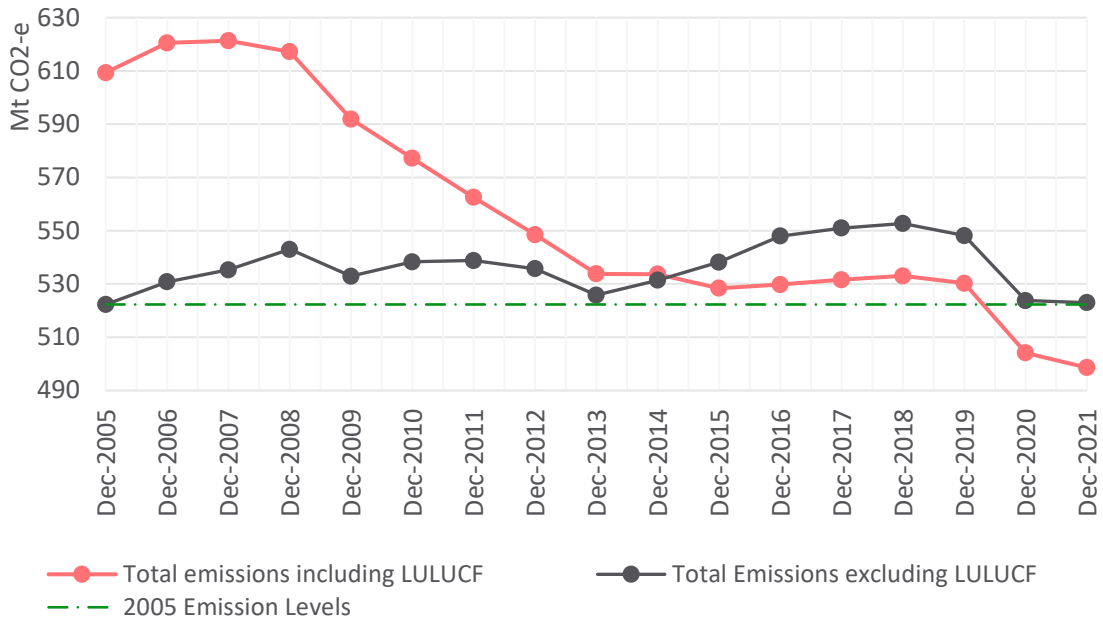
Australia's cumulative emissions up to Q2/FY2022 are 47% of the 2013-2050 CO_2 budget, recommended in 2014 by the Climate Change Authority (CCA) to stay within a 2°C warming. In this scenario, Australia has spent the budget for a 17-year period in 9 years.

Based on this CCA budget, the Climate Targets Panel[1] has calculated the remaining fair share budget for the period 2021 to 2050 under the 1.5°C scenario. Further analysis by the Climate Resource[2], commissioned by WWF-Australia, revealed that the Federal Government's emission reduction targets of 26-28% reduction by 2030 on 2005 levels, falls short by more than half the required target to stay below 1.5°C (50% chance).

[1] Climate Targets Panel. 2021. Australia's Paris Agreement Pathways: Updating the Climate Change Authority's 2014 Emissions Reduction Targets. Available online: climatecollege/unimelbourne

[2] Climate Resource. 2022. Comparison between Australia's 2030 and 2050 emission reduction targets and 1.5°C pathways. Available online: wwf.org.au/news

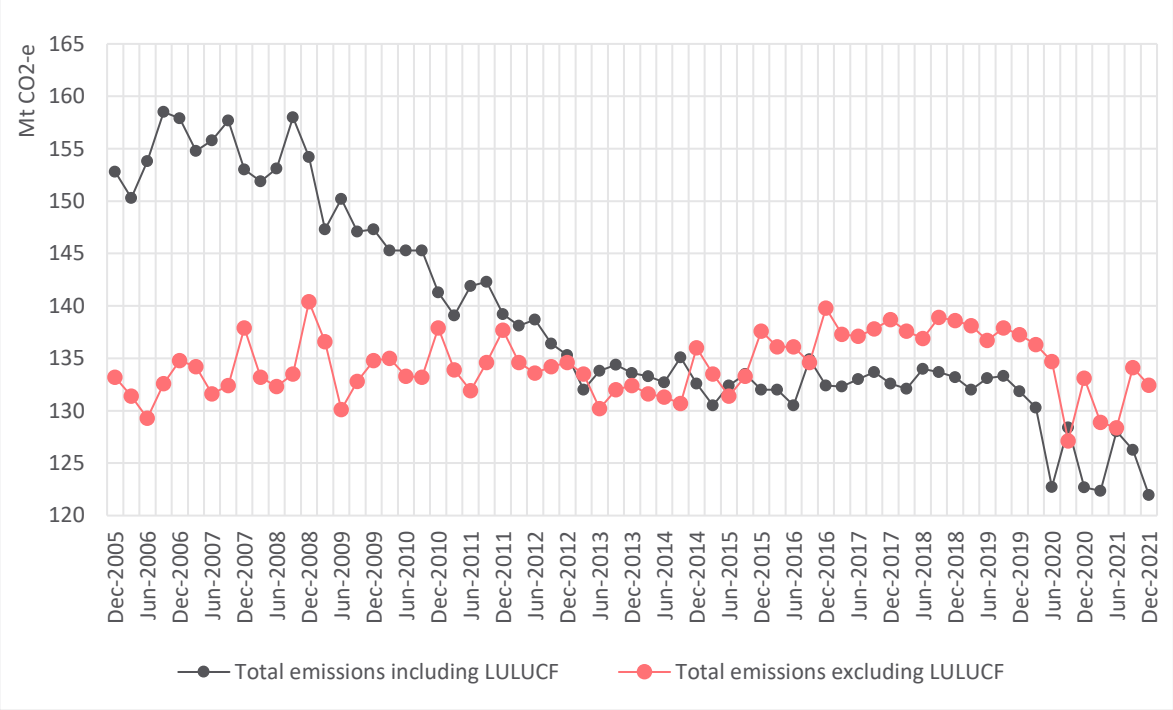
Figure 3: Total annual emissions, year-to-December 2005-2021



Total National emissions for the October 2021 quarter (Q2/FY2022), estimated at 121.96 Mt CO_2-e, are expected to decrease 3.4% or 4.3 Mt CO_2-e on the previous quarter. This represents a reduction of approximately 0.6% or 0.70 Mt CO_2-e on the corresponding quarter the year prior (Q2/FY2021).

Effects of COVID-19 are seen in the historical graph below. Since Jun 2020 quarterly emissions have experienced significant fluctuations compared to the previous five years. Effects of lockdowns on mobility are still lagging for Q2/FY2022 but it is expected to recover in the second half of the year following interstate and international borders reopening.

Figure 4: Total emissions by quarter, Dec 2005 to Dec 2021



2.1.2 The Renewable Energy Transition Continues with Record-breaking Speed

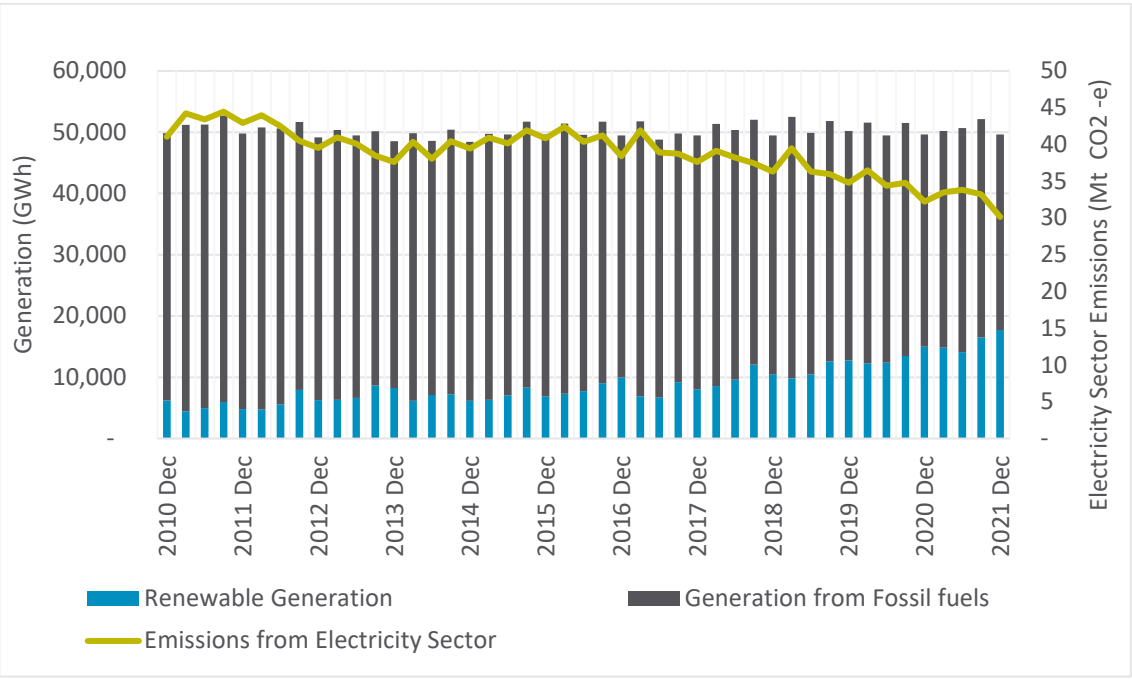
Emissions from the electricity sector continue to decline. For Q2/FY2022 Australia's electricity emissions were calculated at 37.1 tCO_2-e[3], a decrease of 9.1% compared to Q1/FY2022 and a 3.5% decrease compared to Q2/FY2021. With market, social and regulatory forces in its favour plus support from state governments, the renewable energy sector (both small and large) forges ahead.

The sector keeps breaking records with more than a third of the electricity generation during Q2/FY2022 coming from renewable sources in both the NEM and SWIS. Quarterly results for the NEM showed a renewable energy market share of 35.7% for Q2/FY2022 (including pump-hydro and rooftop solar), this is an increase of 4.0% on Q1/FY2022, exceeding the quarter the year prior (Q2/FY2021) by 5.4%.

[3] Actual emissions for the December quarter 2021. Quarterly Update of Australia's National Greenhouse Gas Inventory.

Large scale generation along with rooftop solar have been shaping the future of the energy mix in Australia. This trend shows no sign of slowing down as two of the largest coal-fired power stations prepare to close in the next three years: Liddell (2,000 MW) to close in 2023 and Eraring (2,800 MW) by 2025.

Figure 5: Increasing renewable generation and reducing electricity emissions in the NEM



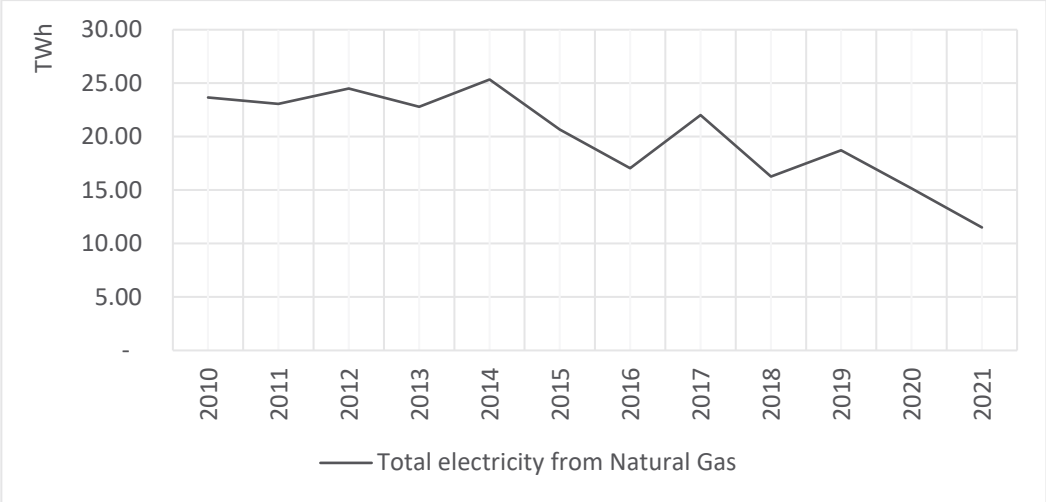
An overview of NEM and WEM performance

- In the NEM states (NSW, VIC, QLD, ACT, TAS and SA), renewables contributed 35.7% of total electricity generation in Q2/FY2022. This is a 4% average increase from Q1/FY2022.
- Renewable energy share in the NEM for the year-to-December 2021 was 31.2%.
- 39.1% for the WEM (WA) through the Southwest Interconnected System (SWIS), representing an increase of 10% on Q1/FY2022.

- Compared to same quarter from the previous year:
  - Black and brown coal generation in the NEM decreased by 6% and 4%, respectively.
  - Generation from natural gas in the NEM experienced a 28% drop.
  - Total aggregated generation from fossil fuel sources decreased by 5.4% in the NEM.

Year-to-December data from 2010 to 2021 show a downwards trend in electricity generation from natural.

Figure 6: Reduction in the electricity generation in the NEM from natural gas (2010-2021)



For Q2/FY2022, results for the NEM states are as follows:

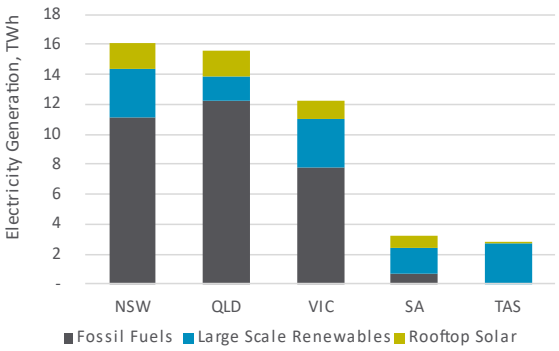
- **NSW** generated 16.04 TWh of electricity with 68.3% from black coal, 1.3% from gas and 30.4% from renewable sources including wind, hydro, utility scale solar and rooftop solar.

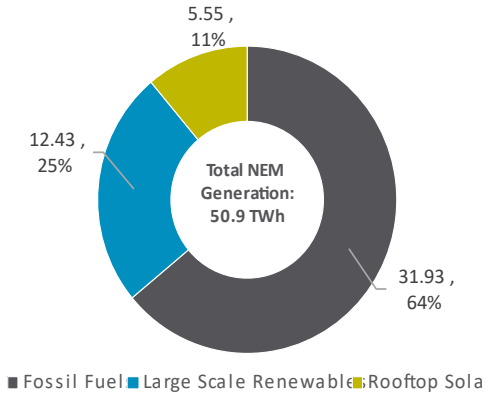
- **QLD** generated 15.61 TWh of electricity with 71.5% from black coal, 6.9% from gas and 21.6% from renewable sources including utility-scale solar, rooftop solar, wind and a small portion of hydro energy. QLD's electricity generation from Black Coal has decreased by 1.9% compared to the Q1/FY2022.

- **VIC** generated 12.28 TWh of electricity with 62.9% from brown coal, 0.5% from gas and 36.6% from renewable sources including wind, hydro, rooftop solar and utility-scale solar. Renewable energy share for Q2/FY22 is the highest on record.

- **SA** generated 3.2 TWh of electricity with 23.0% from gas and 77.0% from renewable sources such as wind, rooftop solar, utility scale solar and battery (discharge). SA's renewable energy penetration has increased 14.9% on last quarter. Solar rooftop penetration in SA has achieved a significant milestone with a quarter of its grid-mix share coming from rooftop solar.

Figure 7: Electricity market generation in the NEM Q2/FY2022





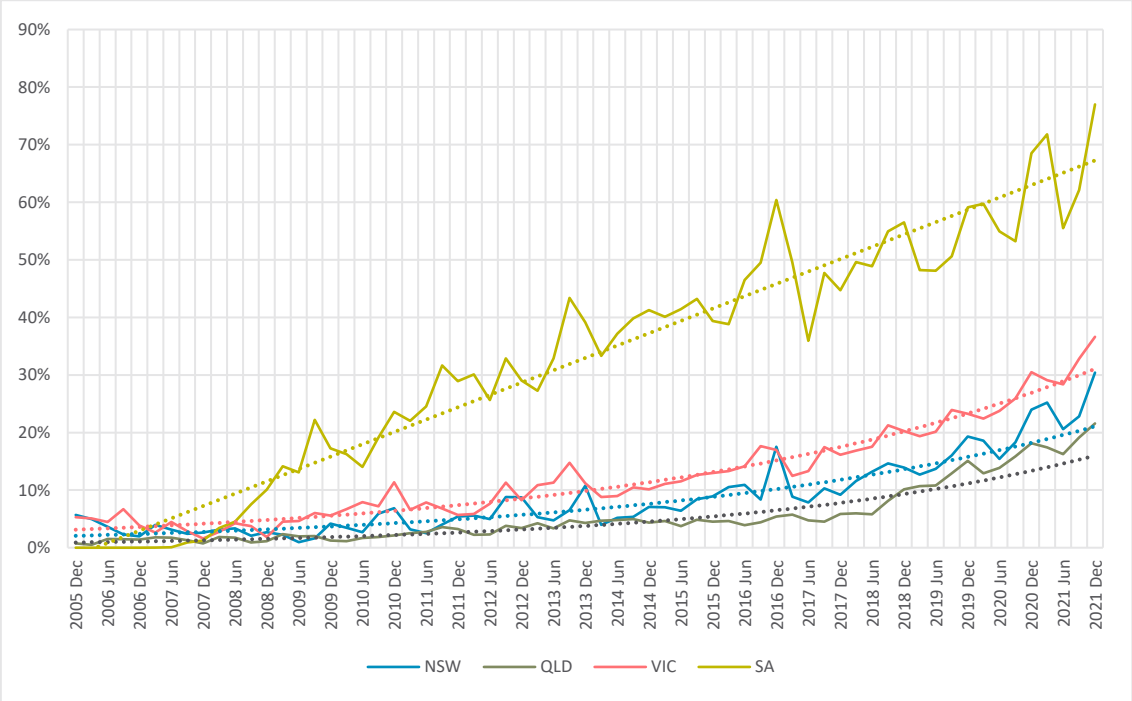
- **TAS** generated 3.54 TWh of electricity with 100% of generation from renewable sources.

The increasing expansion of renewable energy in the grid is also noted across the Wholesale Electricity Market (WEM) through the Southwest Interconnected System (SWIS).

- **WA** generated 4.97 TWh of electricity during Q2/FY2022 with 39.1% from renewable sources such as solar (including rooftop), wind and biogas. Rooftop solar accounts for an impressive 18% of the energy source for this quarter.

The rapid transition in the electricity sector and therefore, the decline in scope 2 emissions has been strongly supported by States and Territories. Tasmania became the first state to generate 100% of its electricity from renewable sources. SA is rapidly trending towards the same goal with a sharp upwards trend in the renewable energy share, while NSW and Victoria are on an upward trajectory surpassing the 30% mark for Q2/FY2022.

Figure 8. Quarterly penetration of renewable energy in the NEM by state. Dec 2005 to Dec 2021



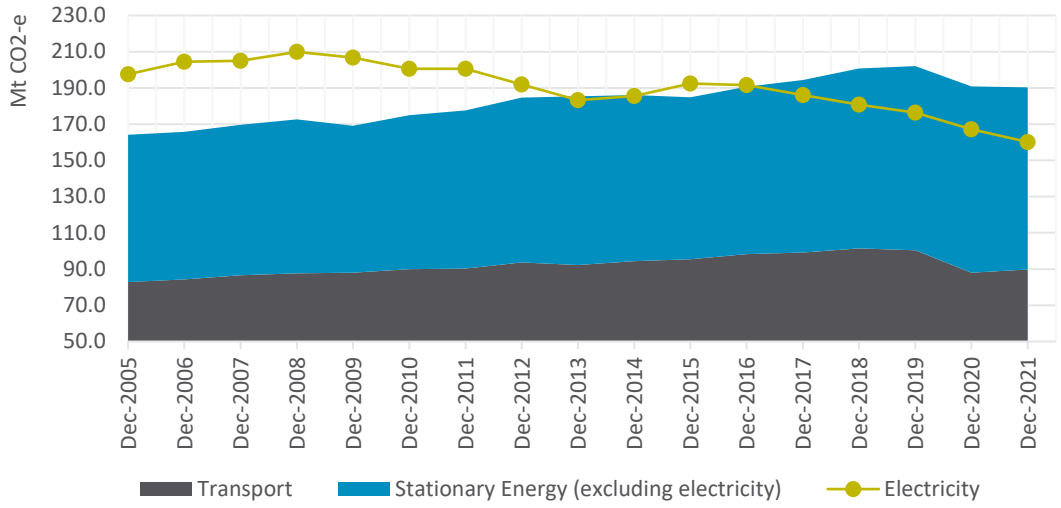
2.1.3 Stationary and Transport Energy Emissions are ones to Watch

Since 2016, stationary and transport energy combined have surpassed the emissions from the electricity sector, accounting for over a third of Australia's quarterly emissions. Arguably, more emission reduction strategies and policies need to start happening across these two sectors.

Although international market prices for coal and LNG and the COVID-19 pandemic have had a significant effect in these sectors, the year-to-December 2021 data shows signs of a gradual recovery of their historical upward trend (Figure 8)

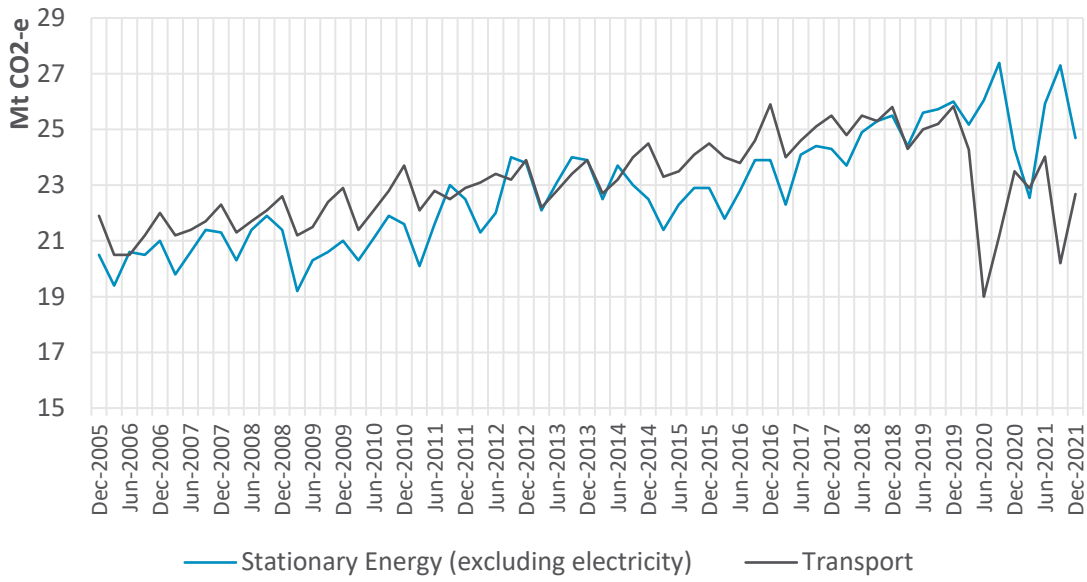
Quarterly projections of stationary energy resulted in 24.7 Mt CO_2-e for Q2/FY2022. This is 9.5% below the previous quarter (Q1/FY2022) but 2% more than the same quarter the year prior (Q2/FY2021). Quarterly emissions from transport (fuels in transportation by road, rail, and domestic aviation and shipping) for Q2/FY2022, are expected to be 22.7 Mt CO_2-e. This is 3.5% less than Q2/FY2021 but 12.3% more than Q1/FY2022.

Figure 9: Annual electricity vs stationary and transport emissions, Dec 2005 to Dec 2021



Compared to the year-to-December 2020, annual transport emissions have started to bounce back to a growth trend over the year-to-December 2021 with an expected increase of 2.1%. A major impact on the total emissions from this sector is expected in Q3/FY2022 when COVID-19 restrictions are likely lifted from all states and territories and the state and international borders are fully opened.

Figure 10: Stationary and transport emissions by quarter, Dec 2005 to Dec 2021



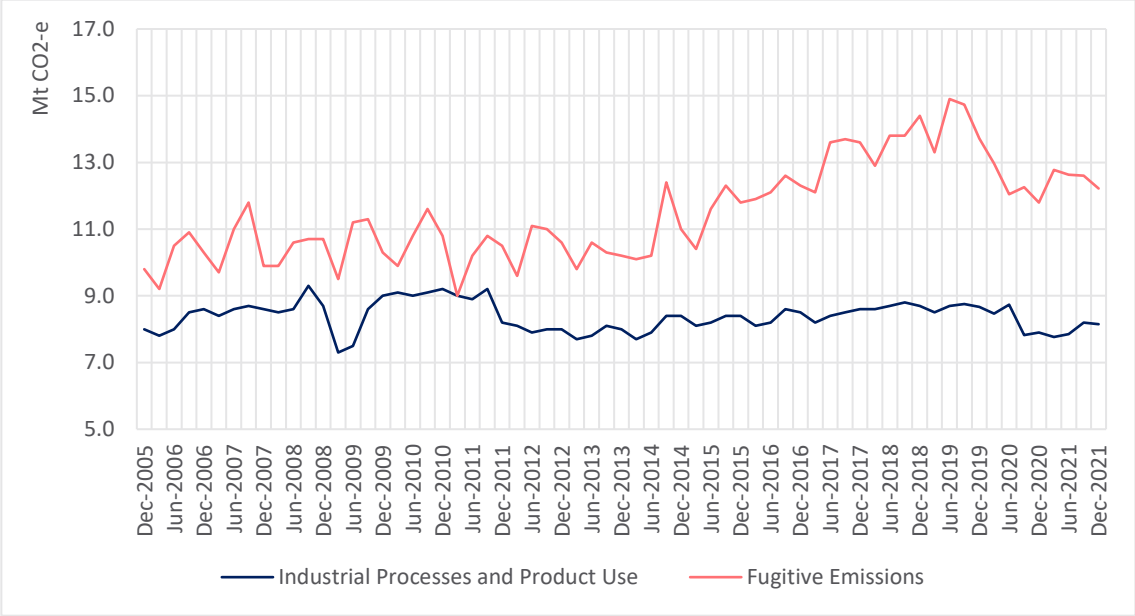
2.1.4 Commodity Demand Drives up Industrial and Fugitive Emissions

For the December 2021 quarter, projected emissions from Industrial processes, including fugitive emissions, show a slight decrease compared to Q1/FY2022. It is projected that fugitive emissions for Q2/FY2022 will drop to 12.2Mt CO_2-e mark while emissions from industrial processes will sit at 8.1Mt CO_2-e. This is a 3.0% and 0.7% decrease on Q1/FY2022, respectively.

Q2/FY2022 fugitive and industrial emissions are expected to exceed Q2/FY2021 by 3.6% and 3.1%, respectively. Annual fugitive emissions are projected to increase by 2.3% over the year-to-December 2021. The recovery for the annual value is influenced by LNG production which was higher by 4.1% compared to the same period in 2020.

The current geopolitical instability in Europe could result in an increase of Australia's LNG production and exports, concurrently increasing the national fugitive emissions in the second half of FY2022.

Figure 11: Emissions from fugitive and industrial processes by quarter, Dec 2005 to Dec 2021



2.1.5 Agricultural Emissions Determined by Extreme Weather

The agriculture sector has been highly affected by extreme weather conditions. The droughts experienced in recent years slowed the sector, significantly reducing its emissions. Quarterly results indicate a reactivation in the sector during Q2/FY2022, where emissions are expected to reach 19.8 $MtCO_2$-e, this is 5.2% more than the same period the year prior (Q2/FY2021). Annual results (year-to-December 2021), show a steady increase in agriculture emissions, expecting them to be 8.0% larger than the year-to-December 2020 and 15% more than the same period in 2019.

Significant impacts on emissions from agriculture are expected for the second half of FY2022 as the sector faces another weather challenge with extreme rain events on the east coast of Australia.

Figure 12: Emissions from agriculture by quarter, Dec 2005 to Dec 2021

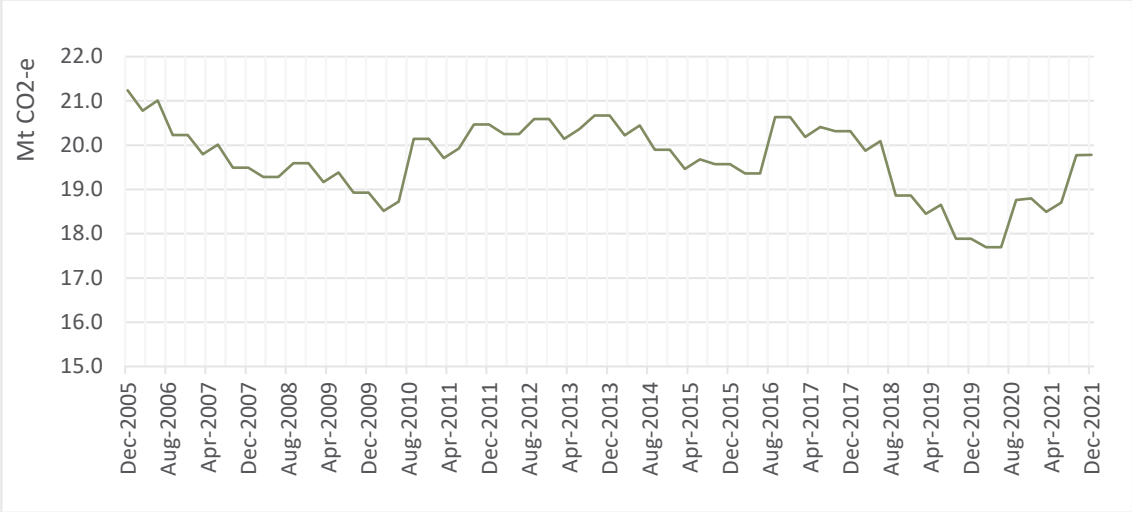


Figure 13: Australia's annual emissions by sector, year to December 2021

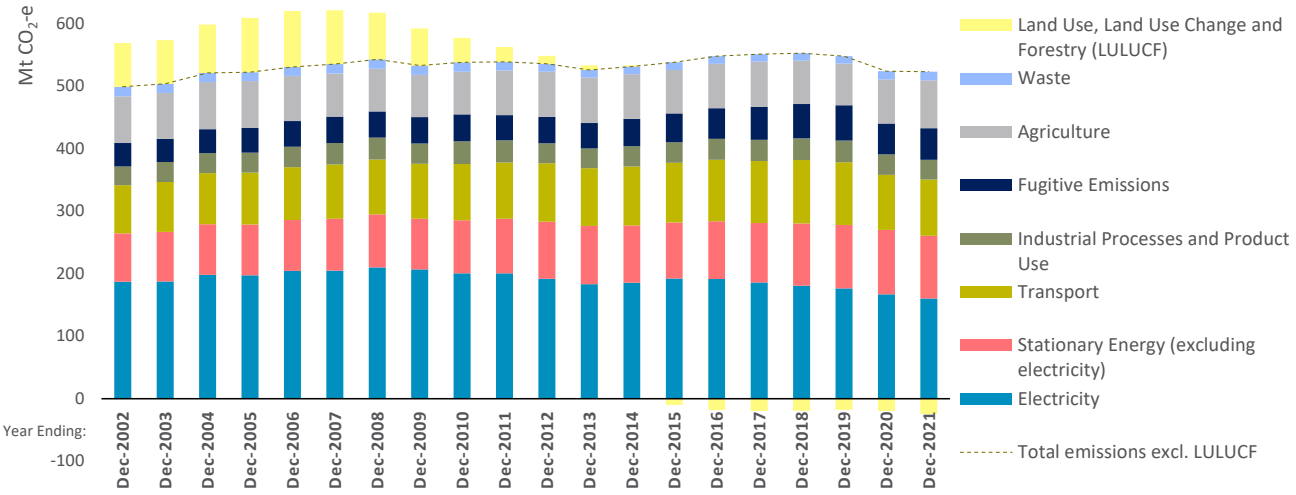
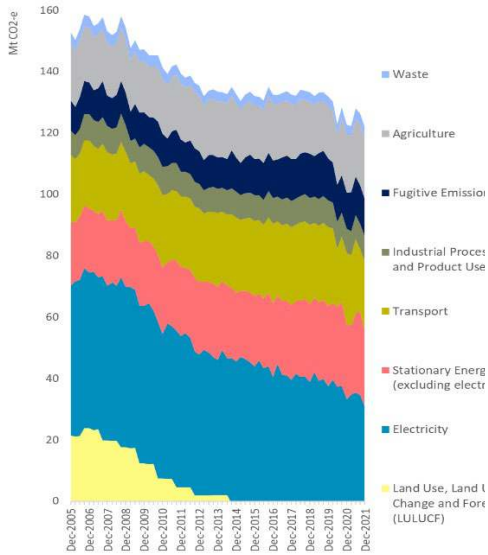
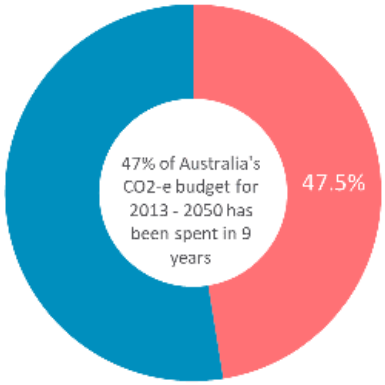


Figure 14: Australia's quarterly emissions by sector*



**Negative LULUCF sector emissions cannot be seen on the above chart*

Figure 15: Degree budget expenditure to date



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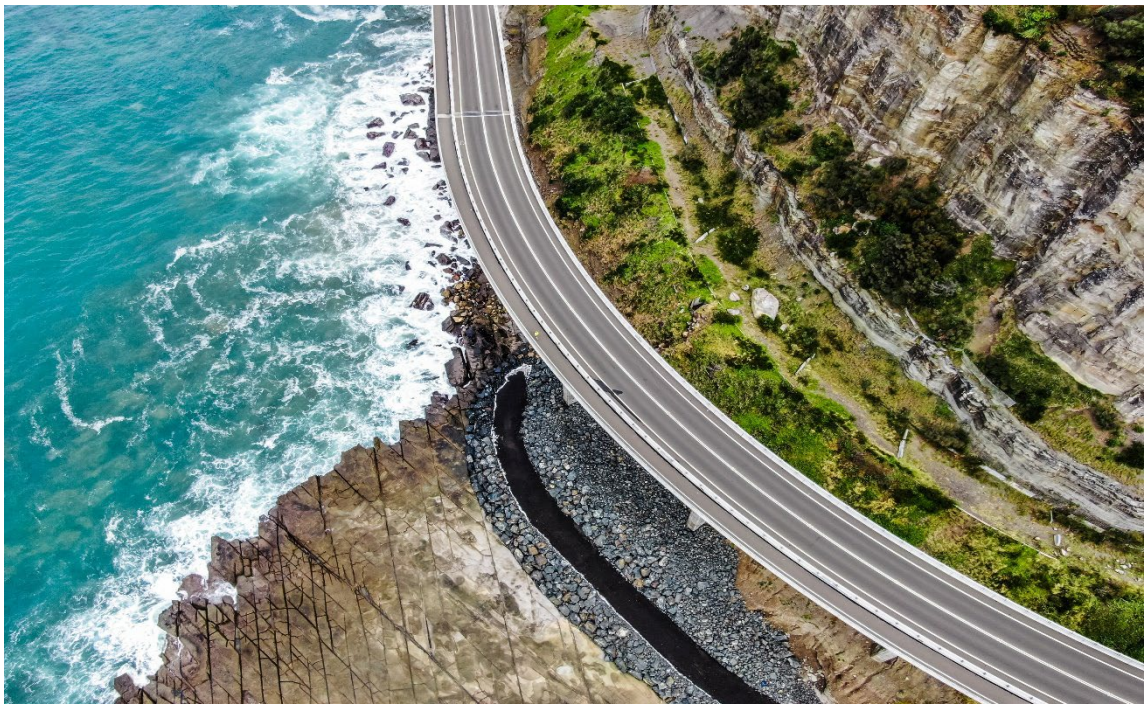

This report has been compiled by Ndevr Environmental Pty Ltd, using the latest information available from: AEMO, Office of the Chief Economist, Australian Petroleum Statistics, Australia Resources and Energy quarterly and historical reports and the Department of the Environment and Energy's National Greenhouse Gas Inventory (NGGI) reports. Detailed electricity generation data for the National Energy Market (NEM) and South West Interconnected System (SWIS) are sourced from Open NEM.

GDP trends are sourced from Trading Economics, information about Australian car use is sourced from the National Transport Commission, 2020 and the Australian Bureau of Statistics. Emission factors are sourced from National Greenhouse and Energy Reporting (Measurement) Determination 2008.

Government and CCA target information is available at the following sources:
[1] - Australian Government (2015), Australia's 2030 Climate change target, Commonwealth of Australia
[2] - CCA (2014), Reducing Australia's Greenhouse Gas Emissions – Targets and Progress Review, Final Report (page 9)

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