100% renewables

Hunter's Hill Council

NET ZERO IMPLEMENTATION PLAN

Final Report
100% Renewables Pty Ltd

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www.100percentrenewables.com.au

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1.1 Strategic context

Hunter's Hill Council engaged 100% Renewables to develop a Net Zero Implementation Plan (NZIP) that aims to set realistic targets for both Council and community greenhouse gas (GHG) emissions, and identify emissions reduction opportunities for Council to undertake for meeting both targets. Actions developed for Council in this plan are drawn from stakeholder engagement, data analysis, carbon footprint development, and assessments via walk-through energy audits at Council sites.

Hunter's Hill, like communities across Australia, faces a critical moment in the transition to net zero emissions. The way that Council uses energy, manages waste, and plans for the future will shape the liveability and affordability of the local area. While climate action is a shared responsibility, Council has an important role to play—both in cutting its own emissions and in enabling households and businesses to make meaningful, cost-effective changes.

This Net Zero Implementation Plan (NZIP) provides a practical roadmap for achieving deep emissions reductions across both Council operations and the wider community. It prioritises actions with measurable impact, balancing early wins—such as fleet electrification and renewable energy procurement—with longer-term strategies that set the foundation for future reductions. Importantly, this plan recognises that Council emissions are a small fraction of the total LGA footprint. However, Council's actions are not just about reducing its own emissions—they serve a demonstration role, reinforcing a clear strategic direction, and providing practical examples of solutions that businesses and households can adopt or adapt.

1.2 Project scope

To identify key issues and feasible solutions, the project followed a structured, multi-step approach that integrated data analysis, technical expertise, stakeholder engagement, and careful consideration of Council's operational context.

- **Progress review and update:** With a principal focus on emissions reduction and the 100% renewable energy target (RET), Council's progress against measures outlined in the 2022 Sustainability Action Plan (SAP) are assessed, and a completion status of each action is documented and summarised.

- **Emissions analysis:** Both organisational and community-wide greenhouse gas emissions in the financial year (FY 2023) are estimated. Particularly for Council's organisational (i.e. corporate) inventory, data were collected for the following listed emission sources, where it is available:
    - Electricity use for Council facilities and public lighting;
    - Reticulated gas consumption at Council sites;
    - Fuel usage for Council fleet;
    - Waste generated from Council operations;
    - Water usage at Council facilities.

- **Site visits and opportunity identification:** Primarily to identify opportunities for energy efficiency and emissions reduction, visits to selected Council sites were conducted and involved discussions with Council staff, identification of major energy-consuming areas, assessment of equipment condition, and evaluation of potential renewable energy (e.g. solar PV) installations. Opportunities were documented, categorised into short and long-term timelines, and submitted to Council for review.

- **Pathways to Net Zero:** Informed by the identified opportunities, abatement pathways are modelled to illustrate emissions reduction over time for each emission source.

1.3 Key findings and strategic implications

The key findings of the project of relevance to Council's net zero strategy going forward are summarised below.

1.3.1 Council's role in community emissions

Council's emissions (97.3 tonnes CO_2-e) are only 0.07% of the LGA's total (126,679 tonnes CO_2-e). While Council's emissions have been declining rapidly, community emissions are projected to plateau by 2033 at ~80,000 tonnes under a business-as-usual scenario. Consultation with the community revealed a general desire for Council to take a stronger leadership role in reducing community emissions.

Council can lead the way by continuing to reduce its reliance on fossil fuels, improving energy efficiency, and embedding sustainability into its procurement decisions. This sends a clear signal that net zero is both achievable and cost-effective. The installation of solar panels, fleet electrification, and energy efficiency upgrades are not just about Council's footprint; they show what's possible, provide real-world data on performance and savings, and help normalise these solutions for the wider community.

However, resource constraints mean that Council must focus on efficiency and effectiveness in delivering these actions. Securing additional funding and advocating for broader financial support will be an important means to ensuring the plan's success. Regular reviews of the strategy will help adapt to changes in costs, resource availability, and Council's capacity to implement the most impactful actions over time.

1.3.2 Electrification and the future of energy

As the world moves towards net zero, electrification is a key lever in reducing emissions. The shift from gas to electricity represents a crucial step in transitioning to a cleaner energy future. By focusing on electrification, including wider adoption of battery storage, Hunter's Hill can tap into renewable energy sources that can be easily scaled and integrated into homes and businesses. Battery storage, in particular, allows residents and businesses to store excess renewable energy, reducing reliance on grid electricity and further driving down emissions and energy bills. Council should not only lead by example in electrifying its own operations but also advocate for, as well as fund and facilitate, the wider adoption of these technologies, ensuring residents and businesses can participate in the benefits and opportunities of making this shift.

1.3.3 Community engagement and awareness

A key barrier to reducing emissions across the LGA is a lack of information and awareness within the community. To overcome this, Council should prioritise timely, accessible, and engaging awareness-raising initiatives. Information campaigns need to focus on the practical benefits of emissions reduction, such as cost savings, improved comfort, and local resilience to climate impacts. Information and links to relevant programs, how to access grants and renewable energy and battery schemes, and guidance/clarification with regards to technical and equipment installation issues, would all be well received.

1.3.4 Council's planning function

Consultation for this project highlighted that Hunters Hill residents see Council's planning functions as a key opportunity to support net-zero outcomes. A major concern raised was the prevalence of heritage-listed homes, which creates barriers to solar PV installations. Clear policy guidance is needed to resolve conflicts between heritage protections and the transition to sustainable energy.

There was also strong support for strengthening local environmental planning policies. Residents called for the upcoming Local Environmental Plan (LEP) to protect green space, tree cover, and soft landscaping while limiting excessive demolitions, large-scale new builds, and deep excavations. Consultation emphasised the role of trees in reducing urban heat and lowering energy demand for cooling. There was also support for Council to use its planning influence to improve cycleways and other low carbon transport options.

1.3.5 Waste management

While not directly owning or operating a landfill, Council also has a role in leading by example on waste management. Residents expect clear action to reduce landfilling, improve recycling rates, and support implementation of food and organics measures. Community views also reflected circular economy principles and waste avoidance (including encouraging adaptive reuse and discouraging demolition).

1.4 Council operational emissions

1.4.1 Carbon footprint overview

Based on the emissions boundary established for the project, Hunter's Hill Council's carbon footprint for its operations for the financial year 2022-23 (FY 2023) was estimated to be **97.3 tonnes of carbon dioxide equivalent (t CO_2-e).** With Council achieving zero emissions from grid-supplied electricity by retiring large-scale generation certificates (LGCs) tied to its renewable energy purchase via a power purchase agreement (PPA), the majority of emissions stem from fuel usage for Council's fleet and outdoor equipment (52%), followed by water and wastewater services (10%) and petrol use for stationary plant (4%). FIGURE 1 and TABLE 1 below summarise Council's operational emissions, categorised into Scope 1 (direct emissions from Council operations), Scope 2 (indirect emissions from consumed grid electricity), and Scope 3 (selected indirect emissions within Council's value chain).

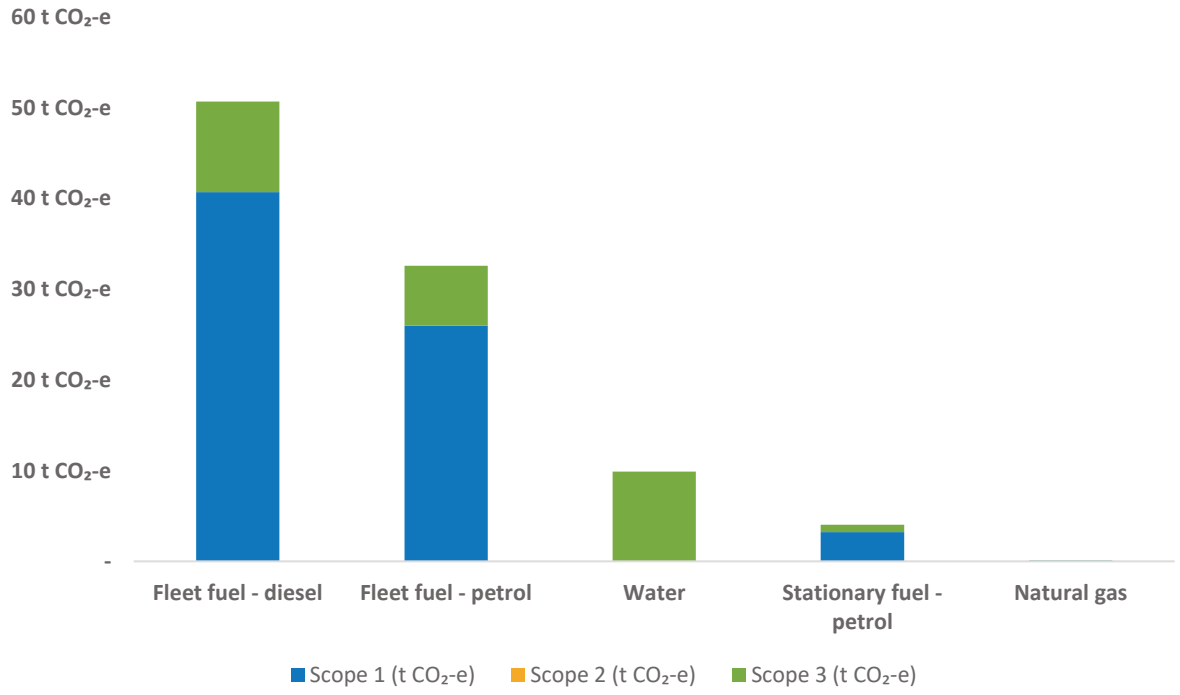


FIGURE 1: HUNTER'S HILL COUNCIL – FY 2023 CARBON FOOTPRINT BY EMISSION SOURCE AND SCOPE

TABLE 1: HUNTER'S HILL COUNCIL – FY 2023 CARBON FOOTPRINT

Emission source		Activity data	Unit	Scope 1 (t CO_2-e)	Scope 2 (t CO_2-e)	Scope 3 (t CO_2-e)	Total	%
	Natural gas	1.72	GJ	0.089		0.023	**0.111 t CO_2-e**	**0.1%**
	Stationary fuel							
	Petrol	1.39	kL	3.22		0.816	**4.03 t CO_2-e**	**4.1%**
	Fleet fuel							
	Diesel	15.0	kL	40.7		10.0	**50.7 t CO_2-e**	**52.1%**
	Petrol	11.2	kL	26.0		6.61	**32.6 t CO_2-e**	**33.5%**
	Electricity	281,387	kWh		-	-	-	-
	Streetlighting	315,923	kWh		-	-	-	-
	Water	10,994	kL			9.88	**9.88 t CO_2-e**	**10.2%**
	Total			**70.0**	**-**	**27.3**	**97.3 t CO_2-e**	**100.0%**

1.4.2 Net zero strategy

Following site assessments, carbon footprint development and technological research, the impact of potential emissions reduction measures across multiple areas of opportunity – buying clean energy, behind-the-meter solar, energy efficiency, gas-to-electric technologies, fleet electrification and sustainable procurement – was evaluated to develop a pathway for Council's operational emissions to FY 2050. Key abatement priorities for Council in the coming years include:

- Ensure the contract for purchasing 100% renewable electricity for Council operations and streetlighting is renewed post-CY 2026 and sustained at this level going forward.
- Install solar PV and battery storage systems or expand existing ones to achieve further reductions in electricity demand and prices at an estimated overall payback period of about six years, providing Council with a positive cash flow that can be directed to a 'revolving energy fund' or similar for cost management while maintaining service delivery levels.
- Undertake further energy efficiency initiatives focused on lighting upgrades, HVAC optimisation and power factor correction across Council sites.
- Replace gas equipment at Gladesville Road Community Centre and Boronia Park Grandstand to electric technologies as the existing equipment reaches the end of its useful life.
- Gradually transition Council's fleet to low or zero-emissions vehicles, starting with replacing the current utility vehicles with plug-in hybrid electric vehicles (PHEVs) at the end of their useful life as a cost-effective solution in the short-to-medium term, leading to full adoption of battery electric vehicles (BEVs) in the long-term.
- To achieve net zero by 2050, Council must focus on reducing emissions throughout its supply chain by embedding sustainable practices into its purchasing decisions. Key actions include developing a comprehensive Scope 3 emissions inventory for understanding the abatement task, adopting a sustainable procurement policy aligned with broader sustainability goals, prioritising low-emission materials and energy-efficient technologies, educating Council staff, updating product and service specifications to focus on low or zero emissions, engaging suppliers with carbon neutrality credentials, and regularly adjusting procurement practices to align with evolving sustainability standards.
- As a lower priority than direct emissions reduction through abatement strategies mentioned above, Council may need to purchase carbon offsets to balance any residual operational emissions, but only as a last resort.

1.4.3 Recommended emissions reduction targets

Based on available abatement opportunities and NSW State Government targets for emissions sources, the following emissions reduction targets are recommended for Council:

- **Renew PPA contract of purchasing 100% renewable electricity beyond 2026.**
- **Align with the NSW State Government's targets of net zero emissions for Scope 1, 2 and 3 emission sources by FY 2050.**

1.4.4 Net zero pathway

Based on the above strategy and goals, a potential net zero pathway is modelled, suggesting that Council could reduce emissions from FY 2023 levels by 84% to 15.7 t CO_2-e before purchasing offsets by FY 2050, with insets also potentially considered to address residual emissions for Council to reach net zero emissions. FIGURE 2 shows the modelled pathway with abatement measures implemented.

While the strategy may see adjustments over time on account of changes in the timing, scope and impact of individual abatement measures, early actions are essential to maximise long-term benefits.

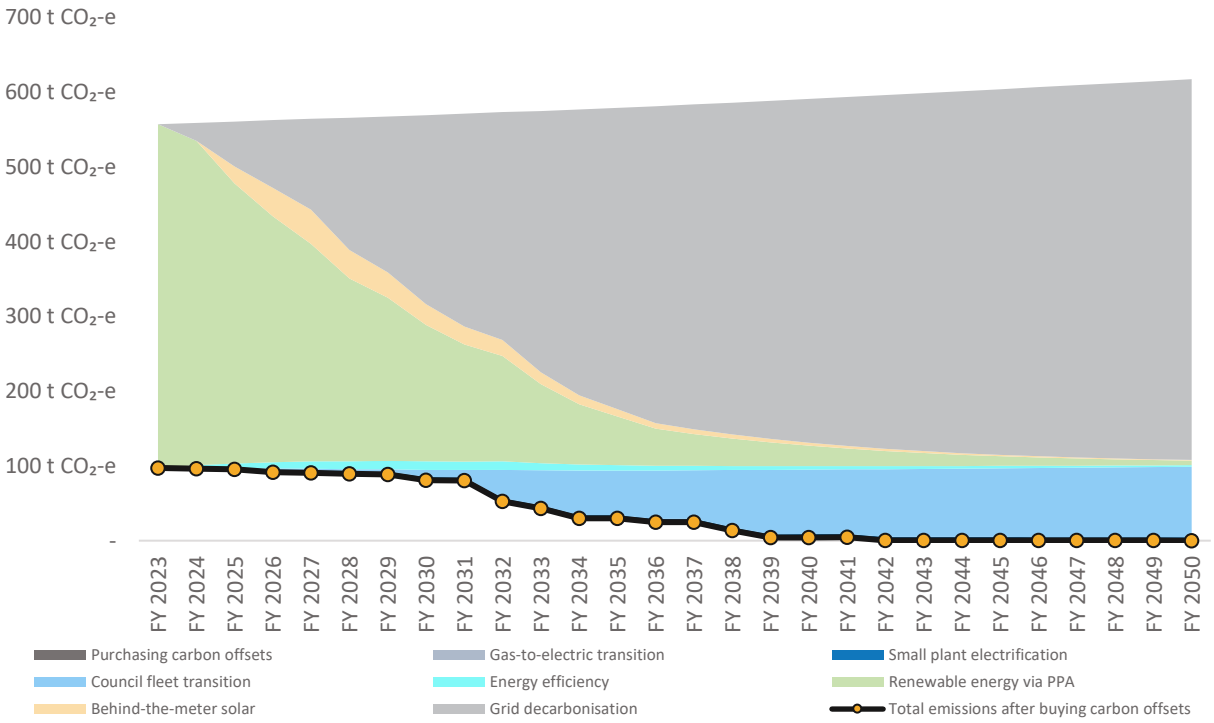


FIGURE 2: HUNTER'S HILL COUNCIL NET ZERO PATHWAY

1.5 Community emissions

1.5.1 Carbon footprint overview

Hunter's Hill LGA's carbon footprint for the financial year 2022-23 (FY 2023) was estimated to be **126,679 tonnes of carbon dioxide-equivalent (t CO_2-e).** Most of the emissions arise from the use of electricity and natural gas at residential and non-residential buildings (48%), followed by vehicle fuel combustion (39%) and waste generated inside the community's boundary and disposed of or treated outside of the boundary (13%). FIGURE 3, TABLE 2 and TABLE 3 below summarise the LGA's emissions, categorised into Scope 1 (i.e. direct emissions from sources within the LGA), Scope 2 (i.e. indirect emissions from consumed grid electricity in the LGA) and Scope 3 (i.e. all other indirect emissions occurring outside of the LGA resulting from activities in-boundary).

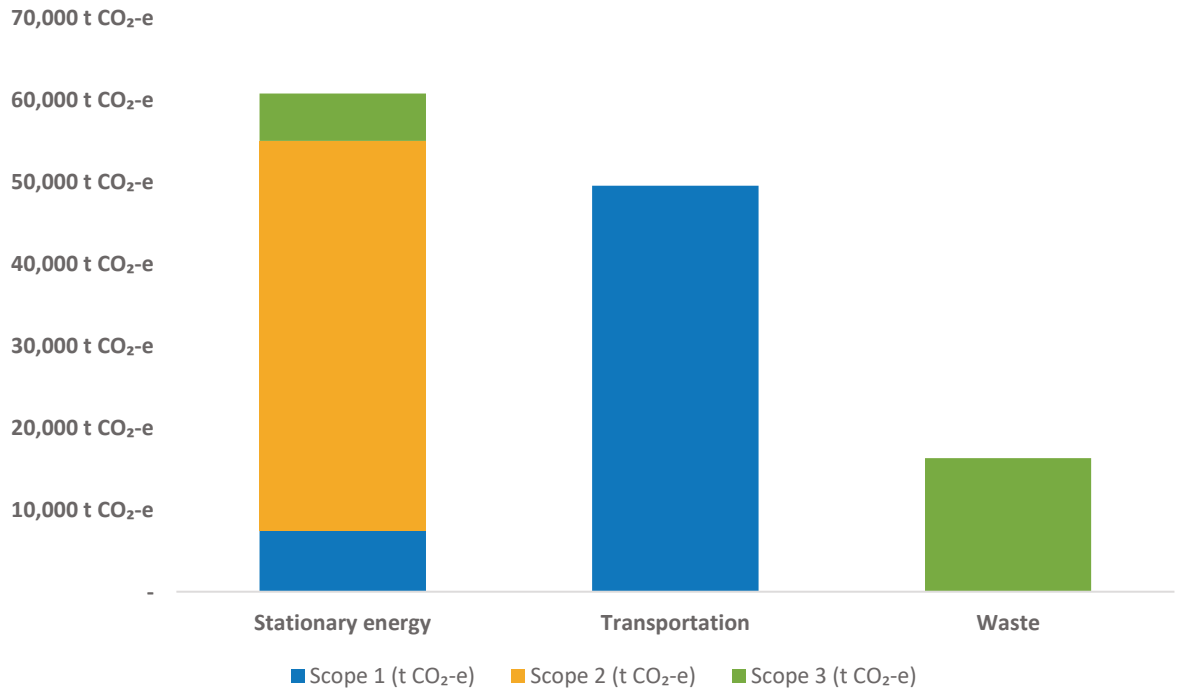


FIGURE 3: HUNTER'S HILL LGA – FY 2023 CARBON FOOTPRINT BY SECTOR AND SCOPE

TABLE 2: HUNTER'S HILL LGA – FY 2023 CARBON INVENTORY

Emission source	Activity data	Unit	Scope 1 (t CO_2-e)	Scope 2 (t CO_2-e)	Scope 3 (t CO_2-e)	Total	%
Stationary energy	60,831	t CO_2-e	7,424	47,607	5,800	**60,831 t CO_2-e**	**48.0%**
Transportation	49,550	t CO_2-e	49,550			**49,550 t CO_2-e**	**39.1%**
Waste	16,298	t CO_2-e			16,298	**16,298 t CO_2-e**	**12.9%**
Total			**56,973**	**47,607**	**22,099**	**126,679 t CO_2-e**	**100.0%**

TABLE 3: HUNTER'S HILL LGA – FY 2023 CARBON INVENTORY (DETAILED)

Emission source	Activity data	Unit	Scope 1 (t CO_2-e)	Scope 2 (t CO_2-e)	Scope 3 (t CO_2-e)	Total	%
Stationary energy	**60,831**	**t CO_2-e**	**7,424**	**47,607**	**5,800**	**60,831**	**48.0%**
Electricity	65,215	MWh		47,607	3,913	51,520	40.7%
Residential	43,713	MWh		31,910	2,623	34,533	27.3%
Non-residential	21,186	MWh		15,466	1,271	16,737	13.2%
Streetlighting	316	MWh		231	19	250	0.2%
Gas	144,069	GJ	7,424		1,887	9,311	7.4%
Residential	111,318	GJ	5,736		1,458	7,194	5.7%
Non-residential	32,751	GJ	1,688		429	2,117	1.7%
Transportation	**49,550**	**t CO_2-e**	**49,550**			**49,550**	**39.1%**
Gasoline	21,383	t CO_2-e	21,383			21,383	16.9%
Diesel	26,016	t CO_2-e	26,016			26,016	20.5%
Ethanol	1.94	t CO_2-e	1.94			1.94	0.0%
LPG	2,148	t CO_2-e	2,148			2,148	1.7%
Waste	**16,298**	**t CO_2-e**			**16,298**	**16,298**	**12.9%**
Solid waste disposal	15,362	t CO_2-e			15,362	15,362	12.1%
Biological treatment of waste	73	t CO_2-e			73	73	0.1%
Incineration and open burning	-	t CO_2-e			-	-	-
Wastewater treatment and discharge	863	t CO_2-e			863	863	0.7%

1.5.2 Net zero strategy

Based on community engagement, development of the carbon footprint and technological research, the impact of potential emissions reduction measures was evaluated to create a pathway for community emissions to FY 2050. Within its influence, Council could consider the following priorities based on key areas of opportunity, such as buying clean energy, regional and community renewables, behind-the-meter solar, energy efficiency, gas-to-electric technologies, fleet transition and waste management:

- Advocate for remote work to lessen commuting, improve walking and cycling infrastructure, and collaborate with public transport providers to adopt low-emission solutions. In the long term, transition Council's fleet to BEVs, and drive the expansion of EV charging infrastructure by partnering with relevant stakeholders, securing government funding, and supporting local business to install chargers.
- Continue to lead by example by ensuring that Council keeps sourcing 100% renewable electricity for its operations and streetlighting past CY 2026. Additionally, inform businesses and residents on available options for buying renewable electricity through their suppliers.
- Explore the feasibility of a community battery project by first engaging with energy providers to assess local energy use, optimal locations, and financial viability. Seek funding through programs such as the Australian Renewable Energy Agency (ARENA) Community Batteries Round 2, and consider partnering with neighbouring councils for joint grant applications.
- Address barriers to solar PV installations at Council sites, develop solar PV guidelines for heritage properties, support schools through the 'Solar my School' program, and connect residents and businesses to community solar providers. In the long term, promote battery storage (e.g. by securing incentives and bulk-purchase programs), and work with stakeholders to provide solar and battery solutions for low-income households and renters.

- Continue energy efficiency upgrades at Council sites, educate the community on energy-efficient technologies, and collaborate with stakeholders to design tailored initiatives for low-income households. In the long term, build on these efforts and support compliance with evolving housing energy policies.
- Support initiatives in the *Northern Sydney Regional Waste Strategy*, focusing on waste reduction, resource recovery and community engagement, and promote circular economy practices through programs such as community swaps and *The Yarn.* In the long term, assist the community in adopting future waste strategies (e.g. NSW Government's FOGO mandate).
- As with Council's operational emissions, carbon offsets may need to be purchased to balance any residual operational emissions, but only as a last resort.

1.5.3 Net zero pathway

Based on the above strategy, a potential net zero pathway is modelled, suggesting that LGA emissions could reduce from FY 2023 levels by 98% to 3,018 t CO_2-e before purchasing offsets or accounting for insets by FY 2050. FIGURE 4 shows the modelled pathway with abatement measures implemented. The strategy may also see adjustments over time due to changes in the timing, scope and impact of individual abatement measures.

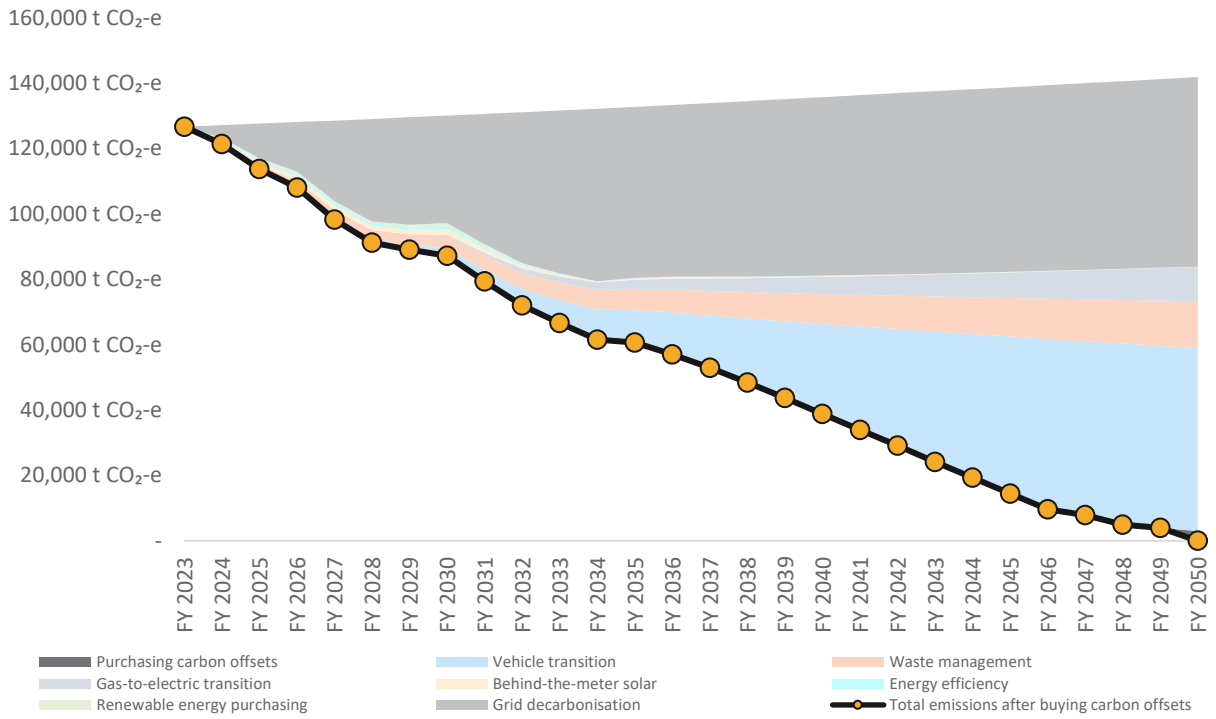


FIGURE 4: HUNTER'S HILL LGA – FY 2023 NET ZERO PATHWAY

2 Introduction

2.1 About Hunters Hill

Hunters Hill, governed by the Hunters Hill Council, is a suburb located approximately 7 kilometres northwest of Sydney's central business district. Situated on a small peninsula, Hunters Hill is bordered by the Lane Cove and Parramatta Rivers. Covering an area of 6 square kilometres, it is recognised as Australia's oldest garden suburb, with 75% of the municipality declared a conservation area. The area encompasses about 5.75 square kilometres, including approximately 650,000 square meters of parks and reserves.

As of the 2023, Hunters Hill Municipality had a usual resident population of 14,036. The median age of residents is 52 years. Approximately 70% of residents were born in Australia, with notable communities from England, China, New Zealand, and Italy.

The area predominantly features detached houses, reflecting its garden suburb heritage. In 2021, there were 5,323 dwellings in the municipality, with an average household size of 2.62 persons. Hunters Hill also hosts a range of businesses that cater to both residents and visitors, including such sites as Garibaldi Village Square and the Business Hub at Gladesville Road.

2.2 Project scope

Council's Net Zero Implementation Plan aims to provide Council with a delivery program of measures to reach its net zero targets for both community and organisational emissions aligned with global, national, and local sustainability frameworks, and informed by engagement with stakeholders and assessments from site visits to ensure that the needs of stakeholder and wider community are met. Main components of the scope of work include:

- **Progress review and update**
  With a principal focus on emissions reduction and the 100% renewable energy target (RET), Council's progress against measures outlined in the 2022 Sustainability Action Plan (SAP) are assessed, and a completion status of each action is documented and summarised.

- **Emissions analysis**
  Both organisational and community-wide greenhouse gas emissions in the financial year (FY 2023) are estimated. Particularly for Council's organisational (i.e. corporate) inventory, data were collected for the following listed emission sources, where it is available:
  - Electricity use for Council facilities and public lighting;
  - Reticulated gas consumption at Council sites;
  - Fuel usage for Council fleet;
  - Waste generated from Council operations;
  - Water usage at Council facilities.

- **Site visits and opportunity identification**
  Primarily to identify opportunities for energy efficiency and emissions reduction, visits to selected Council sites were conducted and involved discussions with Council staff, identification of major energy-consuming areas, assessment of equipment condition, and evaluation of potential renewable energy (e.g. solar PV) installations. Opportunities were documented, categorised into short and long-term timelines, and submitted to Council for review.

- **Pathways to Net Zero**
  Informed by the identified opportunities, abatement pathways are modelled to illustrate emissions reduction over time for each emission source.

2.3 Global and national context

2.3.1 Global context

At a global level, the call to action for countries to act on climate change has been increasing for several years. According to the Intergovernmental Panel on Climate Change (IPCC) report, *Climate Change 2021: the Physical Science Basis* we have emitted over 85% of all emissions we can emit if we are to have a chance of remaining within 1.5°C of warming in the long term. Key agreements and reports that underpin international consensus to act include:

1. Sustainable Development Goals (SDGs)[1]
2. Paris Agreement[2]
3. Special IPCC report on 1.5°C warming (SR15)[3], and
4. IPCC Sixth Assessment Reporting cycle (AR6)[4]

FIGURE 5: GLOBAL CONTEXT FOR ACTION ON CLIMATE

[1] Sourced from https://www.un.org/sustainabledevelopment/development-agenda/
[2] Sourced from https://www.un.org/sustainabledevelopment/climatechange/
[3] Sourced from https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_HR.pdf
[4] Sourced from https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf

2.3.2 National context

In Australia, there is a growing, unified commitment across all levels of government to address climate change, aligned with internal goals: Key targets underpinned by ambitious decarbonisation efforts are:

- The Federal Government legislated an emissions reduction target of 43% by 2030 (from 2005 levels) and is committed to Net Zero by 2050.
- NSW Government's legislated targets of 50% reduction by 2030, 70% reduction by 2035, and net zero by 2050 from 2005 levels.
- Local governments representing over two-thirds of NSW's population are committed to deep emissions cuts.

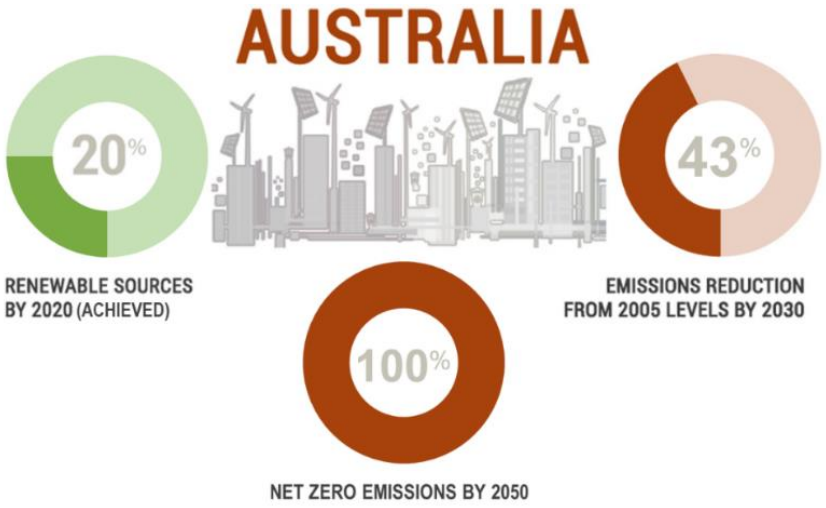


FIGURE 6: AUSTRALIA'S EMISSIONS REDUCTION ACHIEVEMENT AND GOALS AT A NATIONAL LEVEL

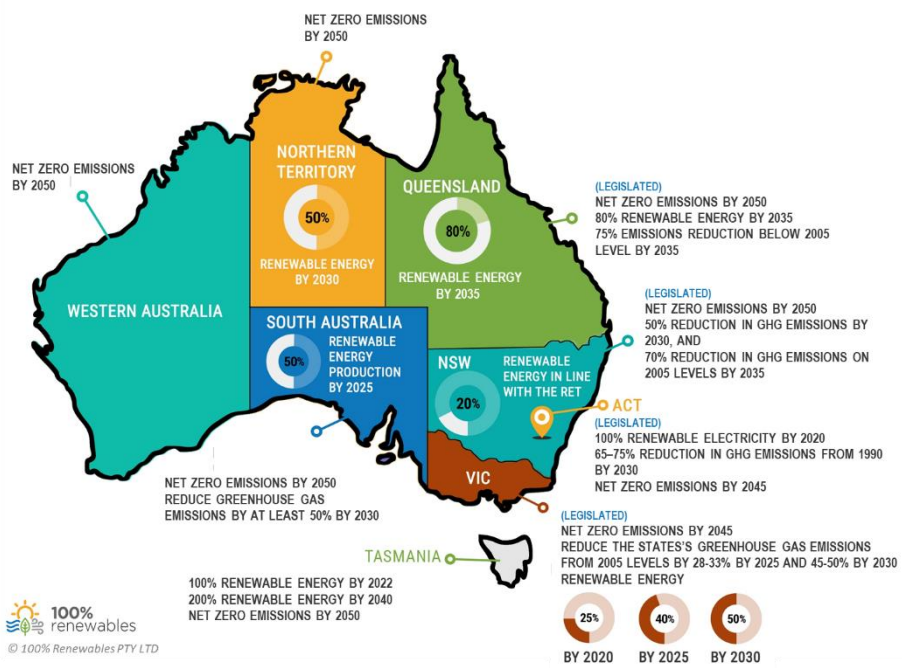


FIGURE 7: AUSTRALIA'S EMISSIONS REDUCTION GOALS AT A STATES LEVEL

2.4 Hunter's Hill Council's sustainability journey

Hunter's Hill Council has exhibited its dedication to preserving and maintaining the area's natural environment and heritage through its actions on climate change:

- **Partnership with *Resilient Sydney***
  Council collaborated with over 30 metropolitan councils in Greater Sydney to develop *A strategy for city resilience 2018*, outlining a detailed plan for enhancing Sydney's resilience against increasing global uncertainty and local shocks and stresses, including urbanisation, transport congestion, chronic illnesses, climate change, and social inequality.

- ***Circular Economy in Action – The Yarn***
  Council has built a community and library space known as *The Yarn* that exemplifies circular economy principles by using repurposed materials (e.g. recycled glass and textiles) in its construction, and providing community services such as tools library and e-waste recycling.

- **Climate emergency declaration**
  In February 2020, Council declared a state of climate emergency, showing Council's acknowledgement of significant threats posed by climate change, and recognition of the urgent need to take decisive action to reduce greenhouse gas emissions, boost sustainability efforts, and adapt to climate change impacts.

- ***Sustainability Action Plan 2022***
  In October 2021, Council endorsed the *Sustainability Action Plan 2022,* aiming to guide Council and community towards reducing greenhouse gas emissions and achieving a 100% Renewable Energy Target (RET) across the organisation by June 30th 2030, highlighting Council's commitment to renewable energy.

- **Partnership on *Northern Sydney Regional Waste Strategy***
  As a response to the NSW Waste and Sustainable Materials Strategy 2041 (WASM Strategy), Council partnered with co-members in Northern Sydney Regional Organisation of Councils (NSROC) to develop an extensive approach focused on regional collaboration, resource optimisation and community engagement to reach the organisation's waste management and resource recovery goals.

Council's *Sustainability Action Plan* sets out a comprehensive approach to reduce emissions and promote sustainability through targeted actions and community involvement, aligns with Council's *2028 Community Strategic Plan,* and responds to the climate emergency declaration the prior year.

Building on Council's progress on outlined actions in the SAP, the aim of the *Net Zero Implementation Plan* is to inform Council's implementation program of measures grouped into short, medium and long-term timelines to reduce emissions across the organisation and wider community, and help Council move towards net zero emissions by 2050.

FIGURE 8: HUNTER'S HILL COUNCIL – PLANS AND STRATEGIES RELATED TO CLIMATE ACTION

2.5 Progress against the Sustainability Action Plan

The SAP outlines an action plan composed of measures that help Council effectively reduce organisational and community emissions. Actions directly targeting Council operations were extracted from the plan, and a summary of each action's completion status is shown in TABLE 4 below:

TABLE 4: PROGRESS ON *SAP 2022* ACTIONS SPECIFIC TO COUNCIL OPERATIONS

Core Goal	No.	Proposed Action	Status
Improving energy efficiency	1.1	LED upgrades to streetlighting across LGA	Completed
	1.2	Energy efficiency upgrades to Town Hall Building	Underway
Switching to renewable energy	2.1	Join Cities Power Partnerships	Completed
	2.3	Evaluate a transition to renewable electricity for utilities and solar for Council-owned buildings	Completed
Supporting low-emissions transport	3.1	Evaluate opportunities for EV vehicles (i.e. 2 x pool cars & 2 x ranger vehicles)	Completed
Driving circular economy and waste minimisation	4.5	Embed sustainable procurement by reviewing Council's policy	Underway
Growing community adaptation and resilience	5.4	Consider initiatives which encourage and support water conservation for Council and community usage on public and private land	Commenced

Council achieved its Council's 100% Renewable Energy Target (RET) by 2030 through its acquisition of a power purchasing agreement (PPA) that sources 100% of its electricity from renewable sources. With electricity emissions largely addressed, the focus has shifted to addressing the next largest emissions source (i.e. fuel use for Council fleet), for which a vehicle transition to EV has the most impact.

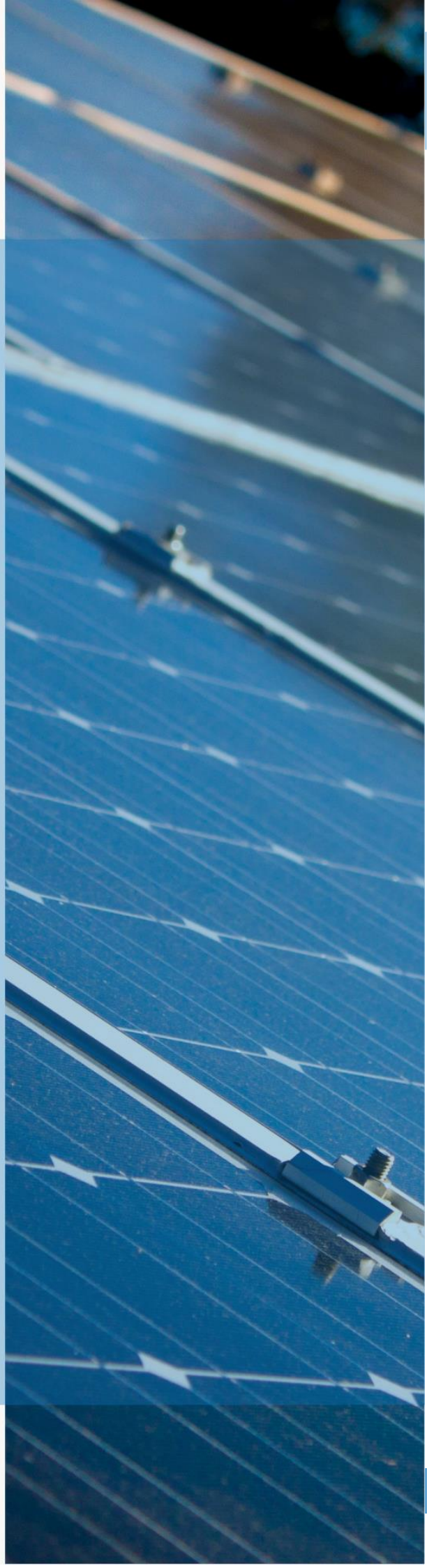
100% renewables

Hunters Hill Carbon footprints:

Council operations

+

Community emissions



3 Hunter's Hill Council and community carbon footprints

3.1 Council's operational carbon footprint

Hunter's Hill Council's carbon footprint was calculated using the methods laid out in the GHG Protocol Corporate Accounting and Reporting Standard.

To help differentiate between different greenhouse gas emission sources, emissions are classified into the following scopes according to the GHG Protocol – Corporate Standard[5]:

- **Scope 1 emissions** are direct emissions generated at Council operations through fuel combustion, gas consumption, and fugitive emissions from refrigerant gases in air-conditioning equipment.
- **Scope 2 emissions** are indirect emissions caused by consuming electricity. Such emissions are generated outside the organisation (i.e. fossil fuel power plants), but Council is indirectly responsible for them.
- **Scope 3 emissions,** known as value chain emissions, are also indirect emissions and happen upstream and downstream of Council's operations. Typical examples include staff commute, outsourced professional services and waste-to-landfill.

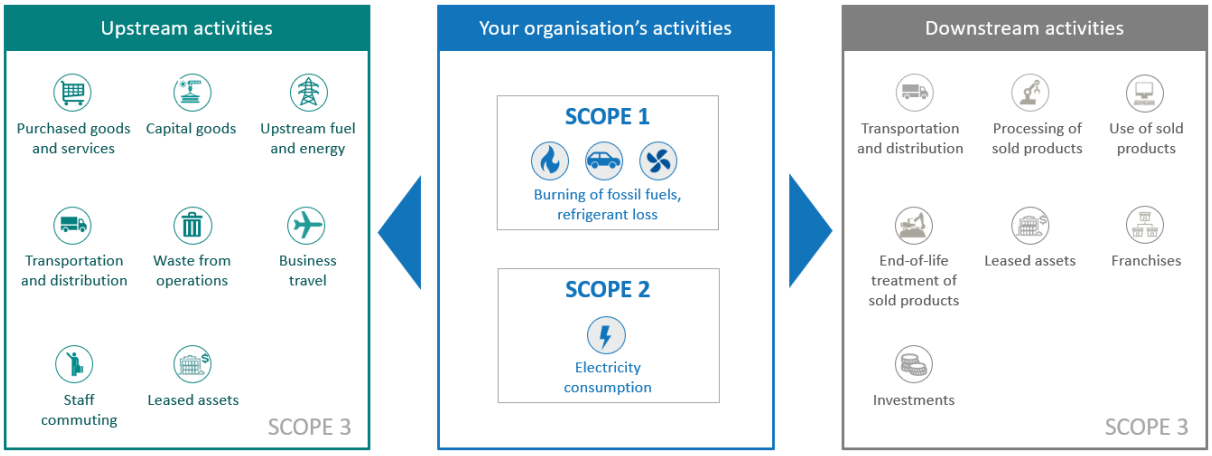


FIGURE 9: SCOPE 1, SCOPE 2 AND SCOPE 3 EMISSIONS

[5] Sourced from https://ghgprotocol.org/

3.1.1 Scope of emissions assessed for Council operations

Hunter's Hill Council's carbon footprint consists of Scope 1, Scope 2 and limited Scope 3 emissions, following the emissions boundary recommended in the project brief and illustrated in FIGURE 10.

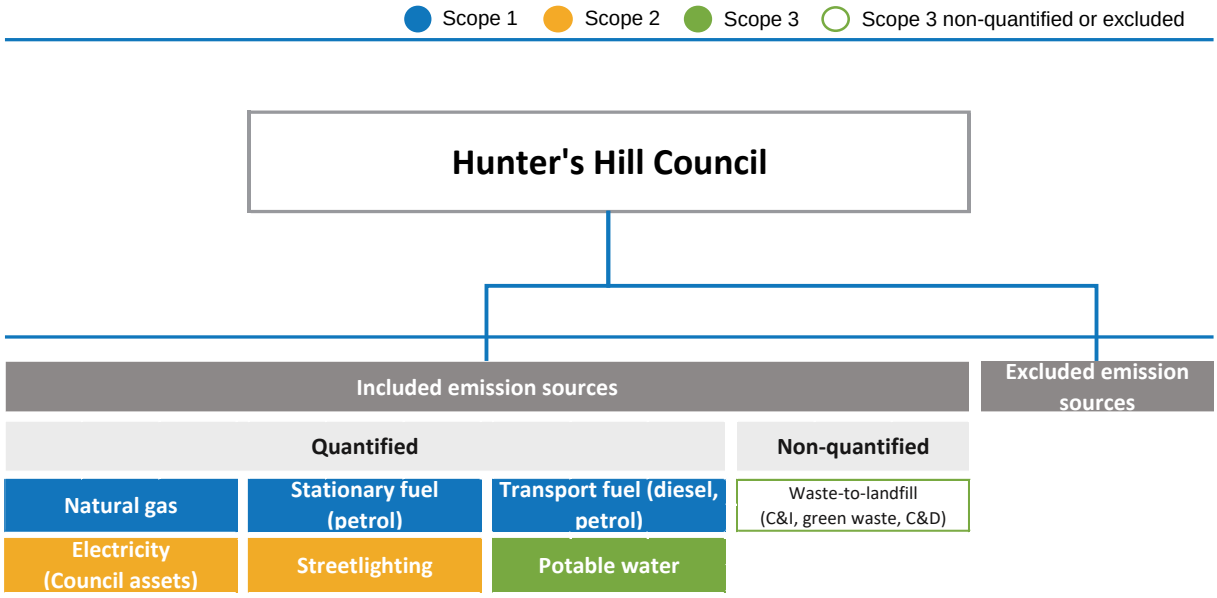


FIGURE 10: EMISSIONS BOUNDARY FOR HUNTER'S HILL COUNCIL'S FY 2023 OPERATIONAL CARBON FOOTPRINT

For this project, there was insufficient data to accurately quantify emissions from waste-to-landfill, however, a high-level estimate has been provided based on data from other councils. In the future, accurate quantification of waste-to-landfill could be pursued, and Council's emissions boundary could expand to incorporate a wide range of Scope 3 emissions by conducting a 'relevance test' with key internal stakeholders. The test identifies additional relevant emission sources such as:

- Business travel and accommodation (e.g. flights)
- Taxi and hire car expenses
- Embodied emissions in building, road, and bridge construction or alternation projects
- Food and catering expenses
- Office equipment, supplies and furniture expenses
- Telecommunications equipment and services
- Postal and courier services
- Extensive list of availed professional services (e.g. accounting, education, insurance)

Such emissions coverage would align with the Australian Government's Climate Active standard, which offers guidance on measuring, reducing, offsetting, validating and reporting emissions. Further insights into the Climate Active standard and relevance test are available in APPENDIX C.

Detailed Scope 3 analyses are typically conducted when pursuing carbon neutrality, or to better understand 'hot-spot' emission sources in the value chain and explore ways to collaborate with suppliers to reduce their emissions.

3.1.2 Council's FY 2023 emissions inventory

Hunter's Hill Council's carbon footprint for its operation for the financial year 2022-23 (FY 2023) was estimated to be **97.3 tonnes of carbon dioxide equivalent (t CO_2-e)**. TABLE 5 below lists the emission sources, with corresponding emissions in t CO_2-e, and percentage contributions to the carbon footprint:

TABLE 5: HUNTER'S HILL COUNCIL – FY 2023 CARBON INVENTORY

Emission source		Activity data	Unit	Scope 1 (t CO_2-e)	Scope 2 (t CO_2-e)	Scope 3 (t CO_2-e)	Total	%
	Natural gas	1.72	GJ	0.089		0.023	**0.111 t CO_2-e**	**0.1%**
	Stationary fuel							
	Petrol	1.39	kL	3.22		0.816	**4.03 t CO_2-e**	**4.1%**
	Fleet fuel							
	Diesel	15.0	kL	40.7		10.0	**50.7 t CO_2-e**	**52.1%**
	Petrol	11.2	kL	26.0		6.61	**32.6 t CO_2-e**	**33.5%**
	Electricity	281,387	kWh		-	-	-	-
	Streetlighting	315,923	kWh		-	-	-	-
	Water	10,994	kL			9.88	**9.88 t CO_2-e**	**10.2%**
	Waste (*estimate*)	15	t CO_2-e			15.0	**15.0 t CO_2-e**	
	Total (without estimated waste emissions)			**70.0**	**-**	**27.3**	**97.3 t CO_2-e**	**100.0%**

Council's material sources of emissions in FY 2023 are as follows:

- **Diesel use in fleet:** Council's diesel-operated fleet and outdoor equipment largely contribute to the carbon footprint, accounting for about 52% of the total emissions. This includes diesel usage by Council's backhoe, tractor, five ride-on mowers, three trucks and four utility vehicles.
- **Petrol use in fleet:** A significant portion of Council's fleet runs on petrol, contributing about a third of the total emissions. This includes petrol usage for administrative and field operations by Council's sedan, wagon, two sports utility vehicles (SUVs) and two more utility vehicles.
- **Water consumption:** Water and wastewater services supplied to Council facilities make up about 10% of the total emissions. Such emissions stem from fuel and energy used in the supply and treatment processes employed by the utility to maintain hygiene and sanitation standards.
- **Petrol use in stationary equipment:** Petrol used for Council-owned equipment (e.g. whipper snippers, chainsaws) represents about 4% of the total emissions.

FIGURE 11 and FIGURE 12 below illustrate Council's emissions in FY 2023:

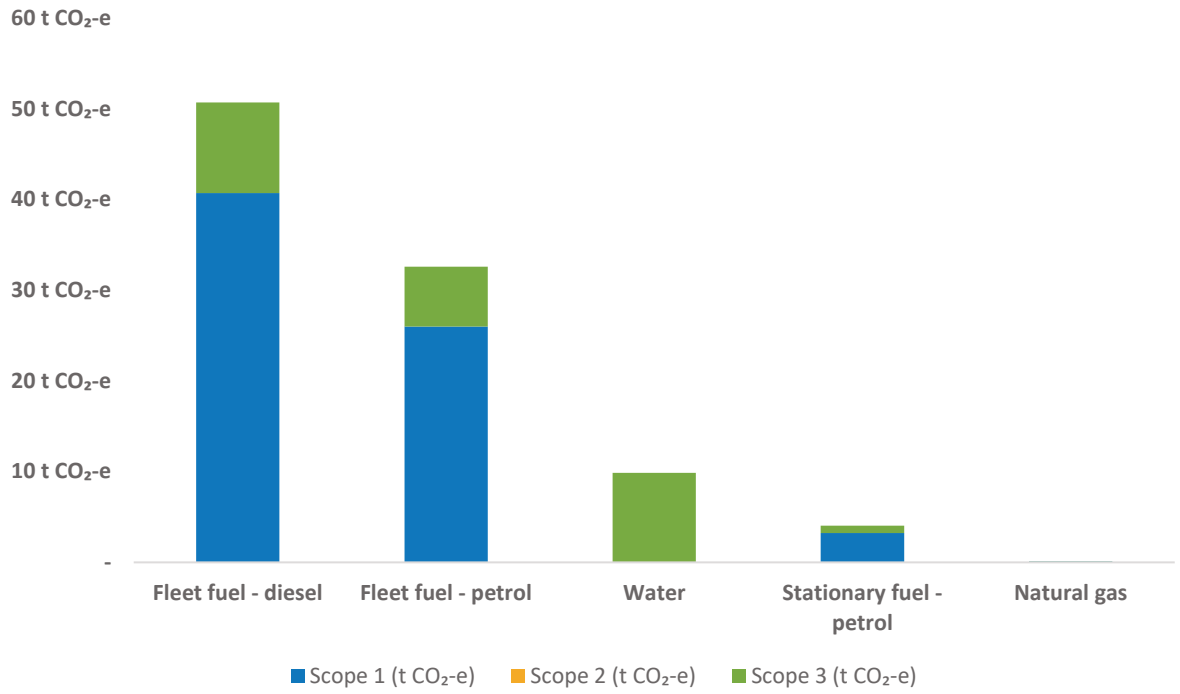


FIGURE 11: HUNTER'S HILL COUNCIL – FY 2023 CARBON FOOTPRINT BY EMISSION SOURCE AND SCOPE

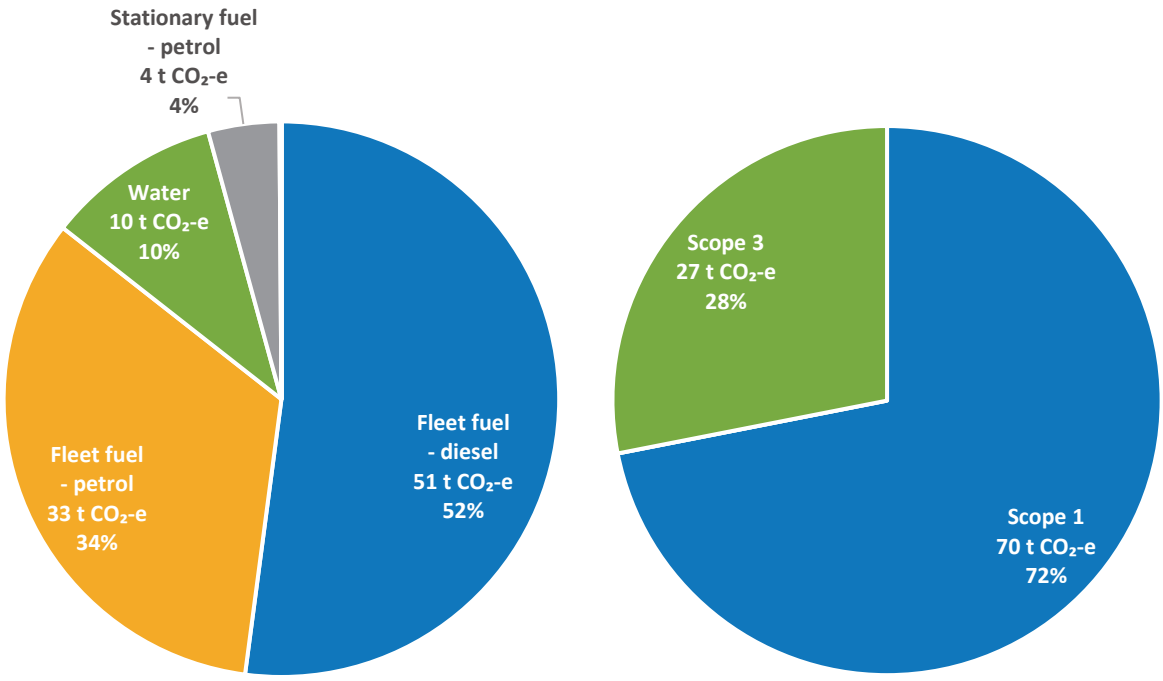


FIGURE 12: HUNTER'S HILL COUNCIL – SPLIT OF FY 2023 CARBON FOOTPRINT BY EMISSION SOURCE AND SCOPE[6,7]

[6] Indirect emissions (Scope 2) from grid electricity use are effectively eliminated in Council's carbon footprint on account of sourcing renewable energy via a PPA.
[7] With an updated emissions boundary for FY 2023, Council's carbon footprint includes a limited range of other indirect emissions (Scope 3) across its value chain.

The graphs highlight the dominant sources of emissions in Hunter's Hill Council's operations for FY 2023. Fleet fuel - diesel is the largest contributor, accounting for the majority of Scope 1 emissions, as it directly powers council-operated vehicles. Fleet fuel - petrol is the second largest source, also primarily contributing to Scope 1 emissions. Together, these sources reflect the significant impact of transportation on the council's operational carbon footprint.

Water-related emissions, although smaller in absolute terms, are notable within Scope 3. These emissions arise from indirect processes such as the supply, treatment, and pumping of water. This highlights an area where the council has less direct control but could explore collaborative solutions with water providers to improve efficiency and reduce emissions.

The pie charts illustrate the overall split of emissions by source and scope. Scope 1 emissions dominate, representing 72% of the total footprint, primarily from fuel combustion. Scope 3 emissions account for 28%, driven by water use and the indirect impacts of fleet fuel. This analysis underscores the importance of targeting transportation and exploring alternative vehicle technologies or fuel sources as a priority for emissions reduction.

As mentioned, waste-to-landfill was not able to be quantified. However, Council's waste-to-landfill emissions is estimated to be in the order of 15 t CO_2-e per annum. This estimate is based on an assessment of waste-to-landfill in nearby councils, adjusted based on relative population of the LGAs as an indicator of the relative size of council operations.

3.2 Hunter's Hill LGA carbon footprint

The carbon footprint for Hunter's Hill LGA was developed following the methodologies from the *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC)*, a globally recognised standard for reporting community and city emissions. Launched in 2014 by the World Resources Institute (WRI), C40 Cities Climate Leadership Group, and ICEI – Local Governments for Sustainability, it is widely used for calculating community carbon footprints. The GPC offers inventory developers guidance on how to account for and report emissions, while providing the flexibility to choose a suitable methodology for the community.

3.2.1 Scope of emissions assessed for activity within the community

The GPC requires communities to report GHG emissions by scope and sector. Emissions can originate both within and outside a city's geographic boundaries. To prevent double-counting, emissions are categorised into three scopes: Scope 1, Scope 2, and Scope 3.

	Scope	Definition	Category	Examples
	Scope 1	Carbon emissions from sources located within the city.	In-boundary	• Natural gas consumption • Fugitive emissions from mining coal • Fuel consumption in vehicles • Wastewater generated in the city • Emissions from livestock
	Scope 2	Use of grid-supplied electricity in the city.	Grid-supplied energy sources	• Electricity use in commercial buildings • Electricity use in residential buildings • Electricity use for streetlighting • Charging electric vehicles • Electricity use for railways
S3	Scope 3	All other carbon emissions that occur outside the boundary of the city as a result of activities within the city.	Out-of-boundary	• Transmission and distribution losses of grid-supplied electricity • Waste disposal and treatment outside the city/LGA boundary • Transboundary transportation

FIGURE 13: GPC EMISSION SCOPES

3.2.2 LGA's FY 2023 emissions inventory

Hunter's Hill LGA's carbon footprint for the financial year 2022-23 (FY 2023) was estimated to be **126,679 tonnes of carbon dioxide-equivalent (t CO_2-e).** TABLE 6 below lists the emissions across the sectors (i.e. stationary energy, transportation, waste and industrial processes and product use) in t CO_2-e with percentage contributions to the carbon footprint, split into the three emissions scopes. TABLE 7 further breaks down the emissions into the different subsectors that make up each sector:

TABLE 6: HUNTER'S HILL LGA – FY 2023 CARBON INVENTORY

Emission source	Activity data	Unit	Scope 1 (t CO_2-e)	Scope 2 (t CO_2-e)	Scope 3 (t CO_2-e)	Total	%
Stationary energy	60,831	t CO_2-e	7,424	47,607	5,800	**60,831 t CO_2-e**	**48.0%**
Transportation	49,550	t CO_2-e	49,550			**49,550 t CO_2-e**	**39.1%**
Waste	16,298	t CO_2-e			16,298	**16,298 t CO_2-e**	**12.9%**
Total			**56,973**	**47,607**	**22,099**	**126,679 t CO_2-e**	**100.0%**

TABLE 7: HUNTER'S HILL LGA – FY 2023 CARBON INVENTORY (DETAILED)

Emission source	Activity data	Unit	Scope 1 (t CO_2-e)	Scope 2 (t CO_2-e)	Scope 3 (t CO_2-e)	Total	%
Stationary energy	**60,831**	**t CO_2-e**	**7,424**	**47,607**	**5,800**	**60,831**	**48.0%**
Electricity	65,215	MWh		47,607	3,913	51,520	40.7%
Residential	43,713	MWh		31,910	2,623	34,533	27.3%
Non-residential	21,186	MWh		15,466	1,271	16,737	13.2%
Streetlighting	316	MWh		231	19	250	0.2%
Gas	**144,069**	**GJ**	**7,424**		**1,887**	**9,311**	**7.4%**
Residential	111,318	GJ	5,736		1,458	7,194	5.7%
Non-residential	32,751	GJ	1,688		429	2,117	1.7%
Transportation	**49,550**	**t CO_2-e**	**49,550**			**49,550**	**39.1%**
Gasoline	21,383	t CO_2-e	21,383			21,383	16.9%
Diesel	26,016	t CO_2-e	26,016			26,016	20.5%
Ethanol	1.94	t CO_2-e	1.94			1.94	0.0%
LPG	2,148	t CO_2-e	2,148			2,148	1.7%
Waste	**16,298**	**t CO_2-e**			**16,298**	**16,298**	**12.9%**
Solid waste disposal	15,362	t CO_2-e			15,362	15,362	12.1%
Biological treatment of waste	73	t CO_2-e			73	73	0.1%
Incineration and open burning	-	t CO_2-e			-	-	-
Wastewater treatment and discharge	863	t CO_2-e			863	863	0.7%

LGA's material sources of emissions in FY 2023 are as follows:

- **Stationary energy:** Electricity and gas usage at residential and non-residential (e.g. commercial, industrial) buildings and facilities account for 48% of the total emissions.
- **Transportation:** Fuel combusted for on-road transport (e.g. cars, taxis, buses) makes up about 39% of the total emissions.
- **Waste:** Emissions from waste generated inside the community's boundary and disposed of or treated outside of the boundary represent roughly 13% of the total emissions.

FIGURE 14 and FIGURE 15 below illustrate the LGA's emissions in FY 2023.

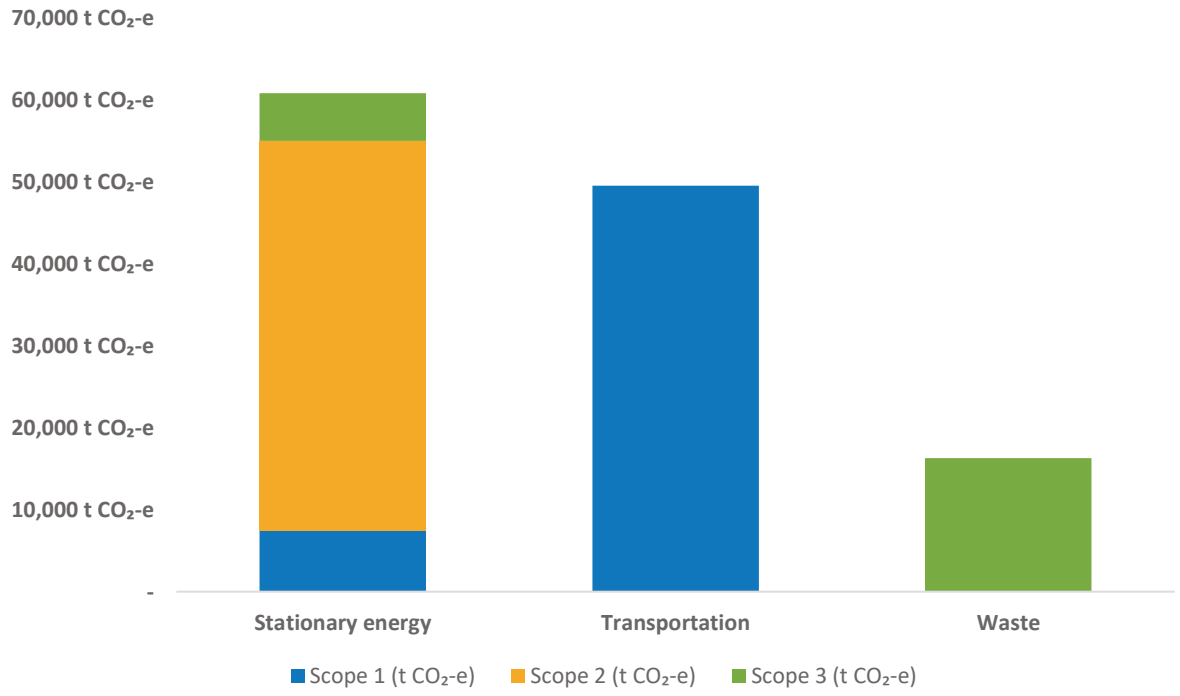


FIGURE 14: HUNTER'S HILL LGA – FY 2023 CARBON FOOTPRINT BY SECTOR AND SCOPE

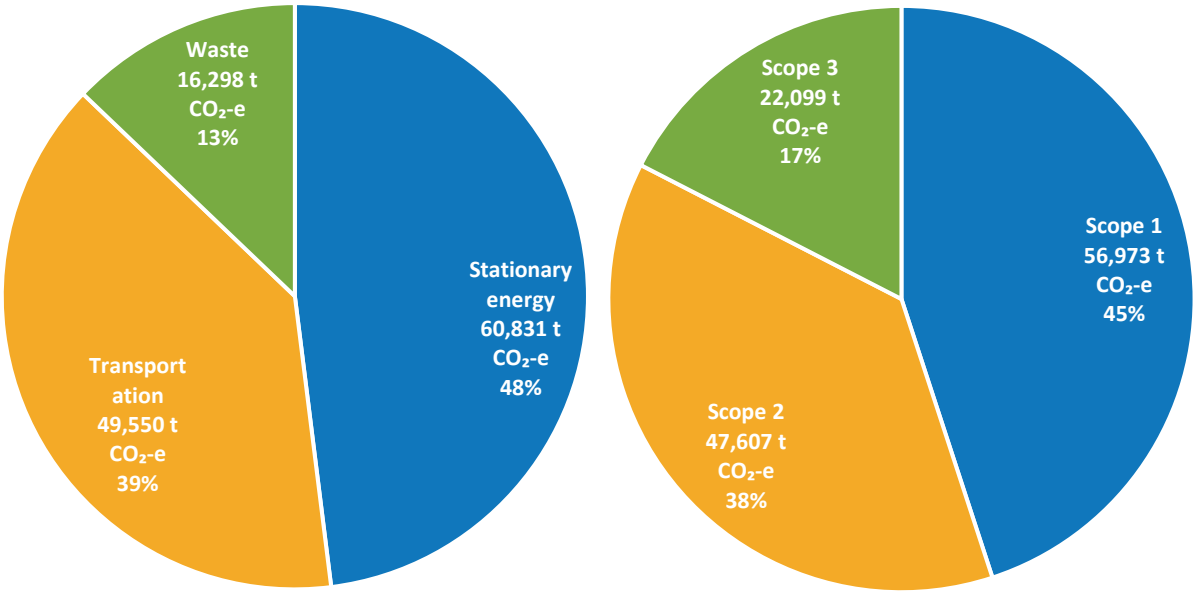


FIGURE 15: HUNTER'S HILL LGA – SPLIT OF FY 2023 CARBON FOOTPRINT BY SECTOR AND SCOPE

The bar graph illustrates the distribution of emissions by sector (stationary energy, transportation, and waste) across the three scopes. Stationary energy is the largest contributor to Scope 1 emissions (direct emissions) and Scope 2 emissions (purchased electricity), while its contribution to Scope 3 emissions (indirect emissions such as supply chain impacts) is smaller. Transportation is another significant source of emissions, particularly in Scope 1, due to the use of fossil fuels in vehicles. Waste emissions are predominantly represented in Scope 3, reflecting the indirect emissions associated with waste management processes, such as landfill decomposition.

The pie charts provide further detail on the breakdown of emissions. By sector, stationary energy accounts for the largest proportion of the carbon footprint (48%), followed by transportation (39%) and waste (13%). By scope, Scope 1 emissions represent 45% of the total footprint, indicating substantial direct emissions that the Council or community can influence. Scope 2 emissions, primarily from purchased electricity, account for 38%, while Scope 3 emissions contribute 17%, highlighting the indirect impact of activities such as waste disposal and supply chain operations.

The split of emissions across scopes highlights varying levels of control and influence. Scope 1 emissions are primarily under the direct control of the Council or community, such as energy use in buildings or fuel consumption in fleets. These emissions can be significantly reduced through operational changes and efficiency measures. Scope 2 emissions, while indirect, are still within the Council's influence, as they result from purchased electricity. This means that strategies like transitioning to renewable energy suppliers can substantially reduce these emissions. Scope 3 emissions are more complex, as they originate from activities indirectly related to the Council's operations, such as waste management and the supply chain. Addressing these emissions often requires collaborative efforts with external stakeholders and systemic changes.

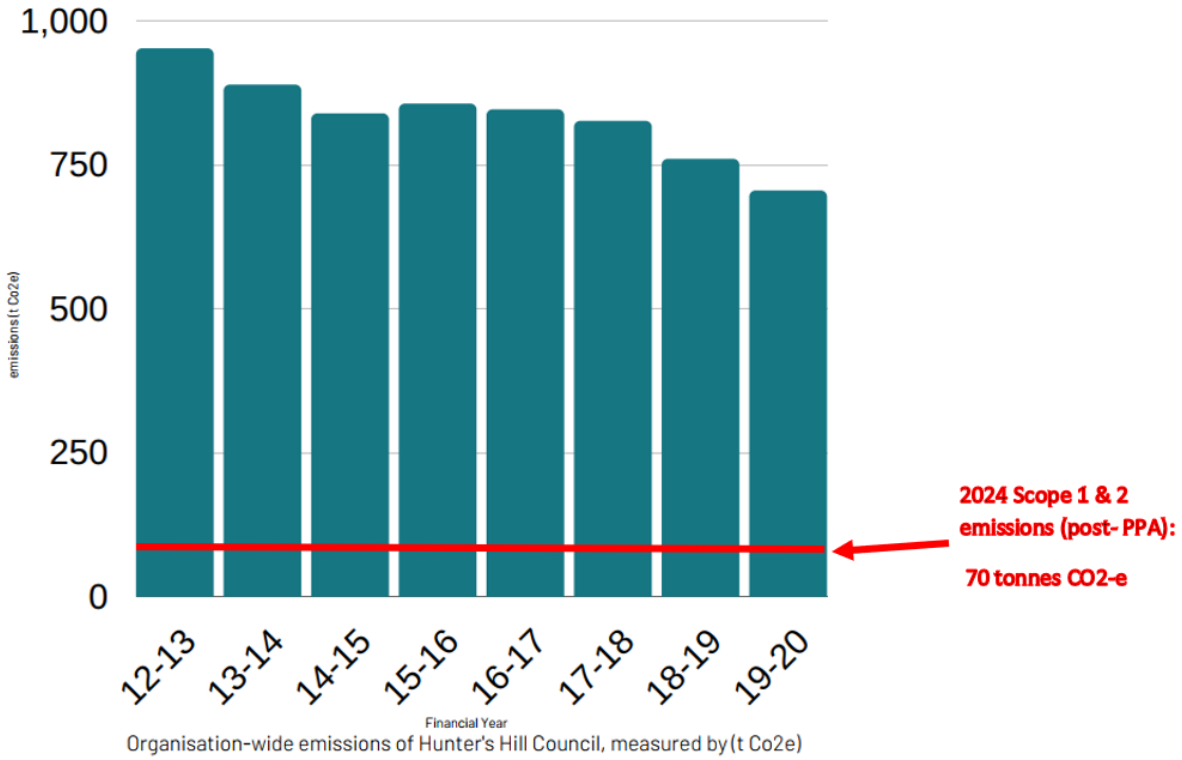
The breakdown of emissions underscores the importance of focusing efforts where the greatest impact can be made, particularly in stationary energy and transportation, which dominate the carbon footprint in the Hunters Hill LGA. Understanding the scope-specific sources of emissions also helps to identify actionable areas for intervention and the need for partnerships to address broader, community-wide challenges.

4 Emissions forecasts

4.1 Council operations

4.1.1 Setting emissions reduction targets for council operations

Over the last few years, Council has made drastic reductions in its Scope 1 and 2 emissions, thanks largely to a recently implemented Power Purchase Agreement (PPA), together with a range of energy upgrade measures. The graph below shows Councils current Scope 1 & 2 emissions compared to its historical emissions. The red line shows the current emissions for Scope 1 and 2, noting that Scope 2 emissions have been effectively eliminated via the PPA.



Organisation-wide emissions of Hunter's Hill Council, measured by (t Co2e) from scope 1 and 2 emissions from 2012-2020

Council has committed to a 100% Renewable Energy Target (RET) across its organisation by 2030. Based on stakeholder engagement, assessment of emission reduction opportunities and alignment with current legislation, it is further recommended that Council consider the following renewable energy and emissions reduction targets as part of a long-term commitment to achieving Net Zero:

- **Renew PPA contract of purchasing 100% renewable electricity beyond 2026:**
  It is recommended that Council extends its PPA contract for its sites past 2026, to continually achieve substantial emissions reductions via renewably sourced purchased electricity.
- **Net Zero for Scope 1, 2 and 3 emissions by FY 2050:**
  It is recommended that Council commits to aligning with the NSW State Government target of Net Zero emissions by FY 2050, or earlier. This would involve a comprehensive, ongoing program of emission reduction works and value chain decarbonisation initiatives, implemented in accordance with the identified optimal timing, thereby minimising final carbon offset liability while maximising overall benefits to Council.

Council may also wish to select an interim target in line with NSW State Government targets. This approach of setting interim targets is in line with the Science based Target Initiative (SBTi) which emphasises the need for a steady downward trajectory. Both these options require establishment of a baseline carbon footprint year for 2005 or later, through modelling or calculation of actual data. Based on Council's *SAP 2022,* with a recorded ~950 t CO_2-e in FY 2013 as the established base year, the following provide indicative estimates of Council's progress:

- **50% emissions reduction in FY 2030:**
  Emissions forecast in 2030 of 90.6 t CO_2-e represents a 90% reduction from 2013 levels, well above the NSW State Government target.
- **70% emissions reduction in FY 2035:**
  Emissions forecast in 2035 of 42.8 t CO_2-e represents a 95% reduction from 2013 levels, again well above the NSW State Government target.

Council may wish to undertake further analysis prior to future reviews of this NZIP, to inform whether and which new targets should be adopted.

4.1.2 Business-as-usual (BAU) forecast emissions for Council

To develop an optimal strategy for achieving net zero emissions by or before 2050, it is important to establish both the current carbon footprint and projected future emissions, accounting for anticipated shifts in Council operations and external circumstances. In developing a high-level estimate of 'business-as-usual' or BAU emissions, the following factors are considered:

- Impact of external factors (e.g. grid decarbonisation) on emissions reduction;
- Forecast population growth and its effect on demand for Council services;
- Additions, divestments, and significant operational changes, considering whether these changes are temporary, periodic or permanent.

Hunter's Hill Council's BAU emissions are projected up to FY 2050 to provide an overview of Council's potential emissions without further actions to reduce emissions.

4.1.2.1 Assumptions used for BAU forecast

The population in Hunter's Hill Local Government Area (LGA) experienced modest growth between 2006 and 2023. Over this period, the population increased from 13,662 people in 2006 to 14,036 – an increase of 374 people, or approximately 2.74%. However, between 2020 and 2021, the population decreased by 673 people, from 14,269 to 13,596, or about 4.7% – an outlier compared to the average annual population growth rate of 0.31% from 2006 to 2020. Excluding this period, the average year-on-year population growth rate from 2006 to 2023 is about 0.45%.

As the population grows, Council's services will likely expand to meet the community's evolving needs, and this rate of change is incorporated in the BAU forecasts.

The following outlines the modelling assumptions used to forecast Council's BAU emissions:

- Emissions not related to electricity increase at 0.45% annually to 2050, in line with population growth and associated increase in service demand;
- Electricity demand for streetlighting and all Council assets rises at 0.45% per annum, but emissions intensity declines at a rate in line with the forecasts from the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and Australian Energy Market Operator (AEMO);
- Council's PPA for purchasing electricity from renewable sources is assumed to remain in effect past the initial expiry on December 31, 2026, entailing continuous surrender of LGCs.
- Existing solar arrays at Council facilities are not expected to expand beyond a capacity of 100 kW, such that any exported energy would not account for eligible emissions through the surrender of LGCs.

4.1.2.2 Summary of BAU forecast

FIGURE 16 and FIGURE 17 illustrate business-as-usual forecasts for Council's energy demand and emissions over the next decades:

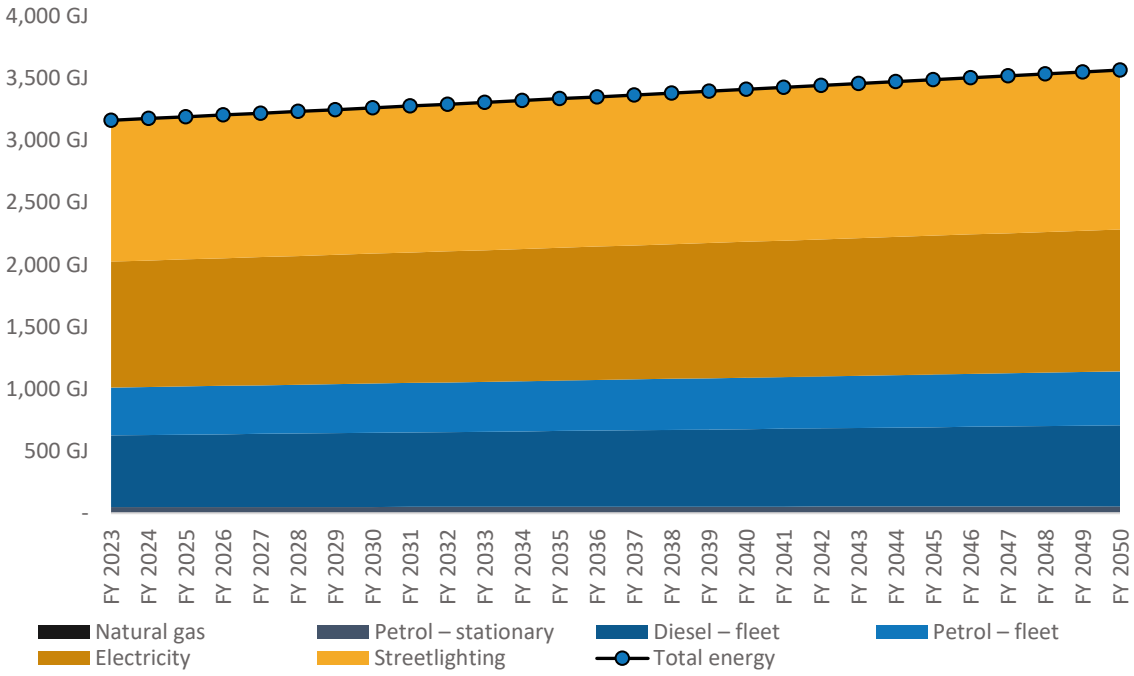


FIGURE 16: HUNTER'S HILL COUNCIL – BUSINESS-AS-USUAL ENERGY DEMAND FORECAST

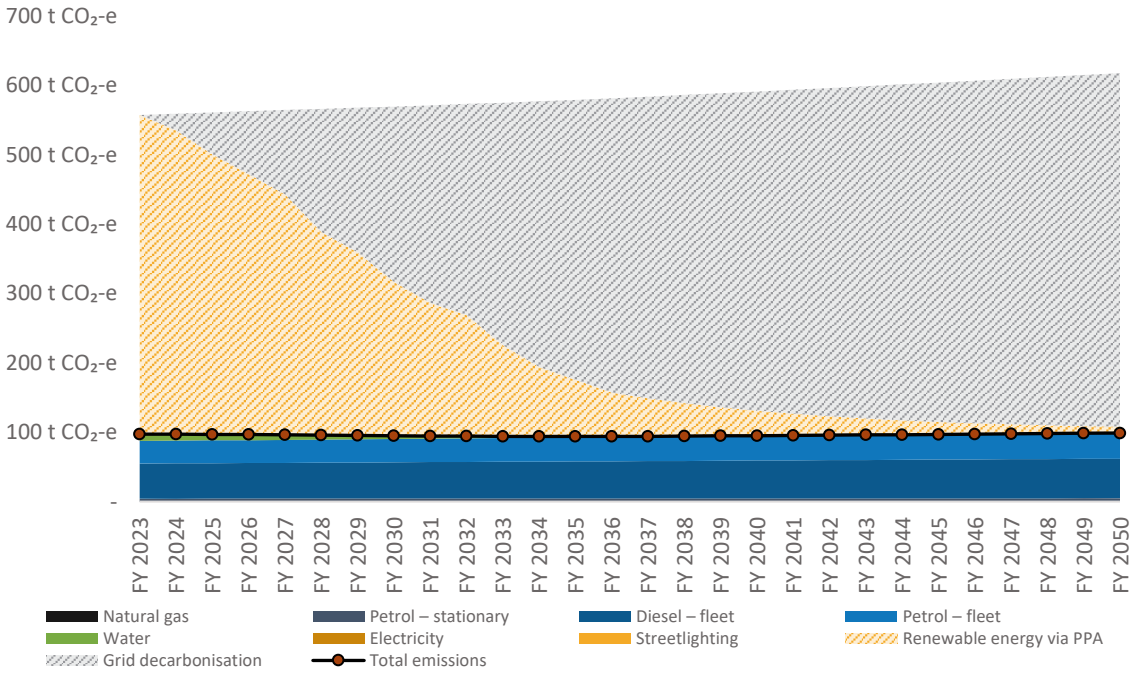


FIGURE 17: HUNTER'S HILL COUNCIL – BUSINESS-AS-USUAL EMISSIONS FORECAST

4.1.3 Net zero pathway to 2050 for Council operations

Following assessment of opportunities from on-site visits, engagement with stakeholders and comprehensive analyses of data provided, a net zero pathway and emissions reduction forecast model was developed.

The pathway is based on the assumed implementation of short- and long-term initiatives specified in CHAPTER 5. The pathway assumptions underpinning the forecast model are detailed in TABLE 8. Implementation timelines and scale of each measure within the pathway may be adjusted in the future as circumstances evolve and further insights are gained.

TABLE 8: HUNTER'S HILL COUNCIL – MODELLED SCENARIOS FOR COUNCIL'S NET ZERO PATHWAY

Emission source	Scenario to reduce emissions	Timing
Natural gas	Fully transition space heating at the Gladesville Road Community Centre and Boronia Park Grandstand from reticulated gas to electric heat pumps from FY 2030.	FY 2030 → FY 2050
Transport fuel	Transition Council's fleet (light & heavy vehicles) and outdoor equipment to hybrid counterparts in the short to medium-term (FY 2025 → 2030) as they reach the end of their useful life, then to all-electric (e.g. battery EVs) in the long-term.	FY 2025 → FY 2030 FY 2031 → FY 2050
Purchased electricity	Extend PPA contracts and continue purchase of 100% renewable electricity beyond CY 2026. It is assumed that Council would continue procuring renewable power even after the initial contract expires, with this need potentially expiring when the grid is wholly or largely renewable.	FY 2023 → FY 2050
Electricity – on-site solar PV	Install new solar PV systems in the short-term to increase onsite solar capacity. Sizes of modelled solar PV systems are as follows: 1. Gladesville Road Community Centre - 15 kW 2. Boronia Park Pavilion & Community Centre - 10 kW 3. Hunter's Hill Council Pre School - 10 kW 4. Riverside Pre School - 10 kW 5. Papilio Early Learning Childcare - 10 kW 6. Henley Community Centre - 5 kW 7. Fairland Hall - 4 kW	FY 2025 → FY 2027
Electricity – energy efficiency	Implement energy efficiency measures to achieve year-on-year electricity demand reduction. It is assumed that undertaking the identified actions to improve energy efficiency across Council assets reduces electricity consumption by 10% reduction by FY 2035, to a further 25% reduction by FY 2050.	FY 2025 → FY 2035 FY 2036 → FY 2050
Purchasing carbon offsets	Council will purchase carbon offsets in 2050 to achieve Net Zero status across Scope 1, Scope 2, and limited Scope 3 emissions (based on developed emissions footprint).	FY 2050

4.1.3.1 Pathway forecast

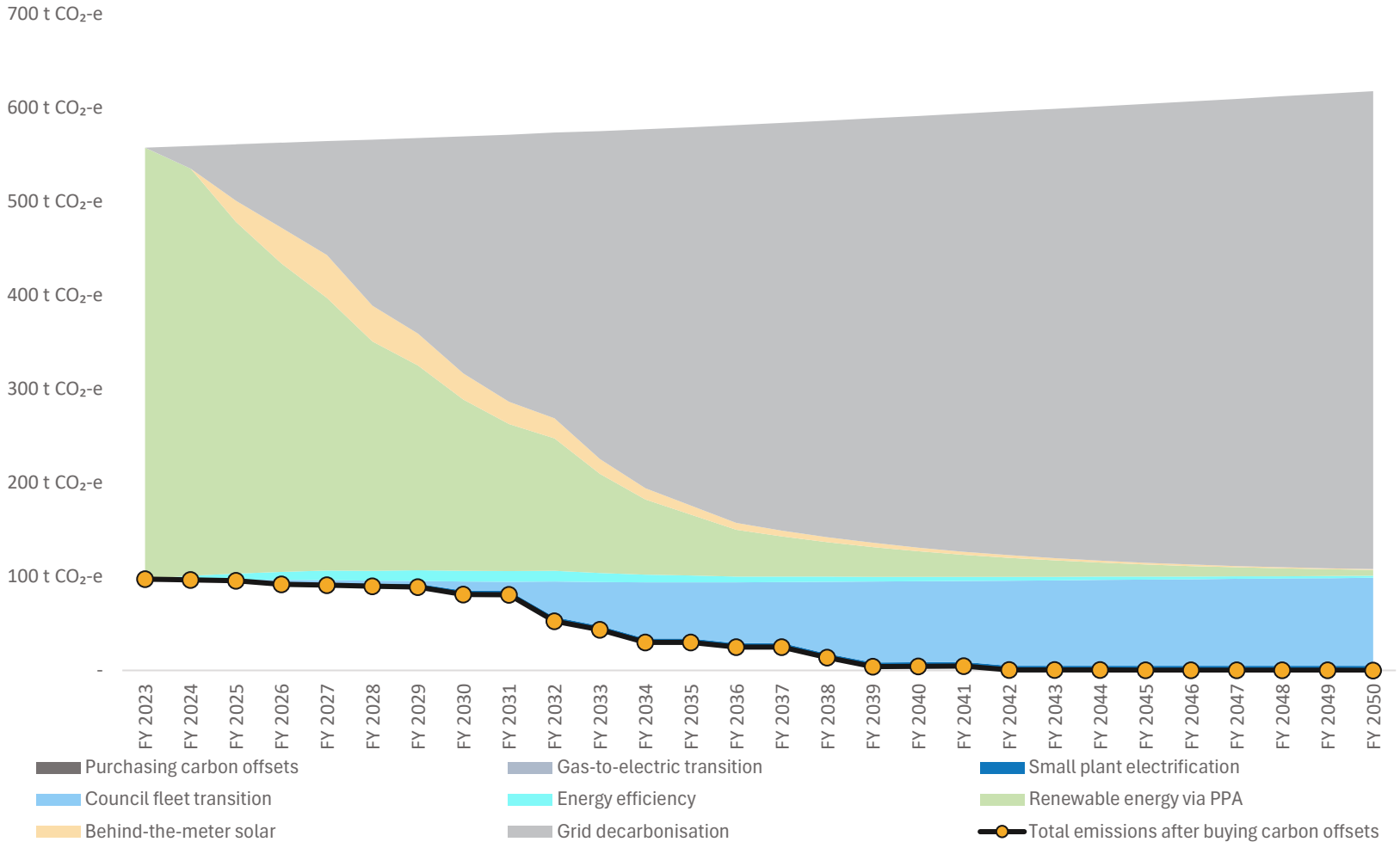


FIGURE 18: HUNTER'S HILL COUNCIL – NET ZERO PATHWAY

The emissions pathway forecast graph for Council's operations illustrates:

- **Grid decarbonisation** (grey area) contributes the most to emissions reductions. As the electricity grid transitions to renewable energy, emissions from grid-supplied electricity steadily decrease, with significant impact from FY 2024 through FY 2050.
- **Renewable energy via PPA** (blue-green area) contributes consistently to emissions reductions by ensuring that its electricity comes from renewable sources, regardless of grid decarbonisation progress.
- **Behind-the-meter solar** (yellow area) play a significant role in emissions reductions, particularly from FY 2024 to FY 2035. This allows the council to generate renewable electricity and reduce its dependence on the grid. The impact stabilizes after FY 2035.
- **Fleet transition** (light blue area) leads to a moderate reduction in emissions. This shift begins in the mid-2020s and results in a steady decline in emissions from fleet operations.
- **Energy efficiency** (aqua area) provides immediate and, though modest, consistent reductions in emissions through building upgrades and operational optimisations. The largest impact occurs between FY 2024 and FY 2034, after which the potential for further efficiency gains tapers off.
- **Gas-to-electric transition** (light purple area) plays a minor role, hardly discernible on the map.
- **Small plant electrification** (dark blue area) plays a minor role, hardly discernible on the map.
- **Offsets** (not visible on graph) play only a minor role in this model, nearly invisible on the graph. Some residual emissions, particularly from wastewater-related sources, remain difficult to eliminate. These emissions will likely need to be offset, though they represent only a small portion of the council's overall emissions by FY 2050.

4.2 Community

4.2.1 Business-as-usual (BAU) forecast emissions for community

A BAU forecast serves as a baseline for emissions scenario analysis, showing what would happen without any new interventions. It highlights the gap between current trends and desired reductions, helping to assess the effectiveness of proposed mitigation measures. Hunter's Hill LGA's emissions are projected up to FY 2050, providing an overview of LGA's potential emissions without further actions to reduce emissions.

4.2.1.1 Assumptions used for BAU forecast

As discussed in SECTION 4.1.2.1, the average year-on-year population growth between 2006 and 2023 is about 0.45%, excluding an outlier period between 2020 and 2021. With such population increase expected to contribute to growth in emissions due to higher demand for resources like fuel, energy, and waste services, this rate of change is factored into the BAU forecasts.

The following lists the modelling assumptions used to forecast the LGA's BAU emissions:

- Emissions not related to electricity increase at 0.45% annually to 2050;
- LGA's electricity demand rises at 0.45% per annum, but emissions intensity declines at a rate in line with the forecasts from the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and Australian Energy Market Operator (AEMO);

4.2.1.2 Summary of BAU forecast

FIGURE 19 shows business-as-usual forecasts for the LGA's emissions over the next decades.

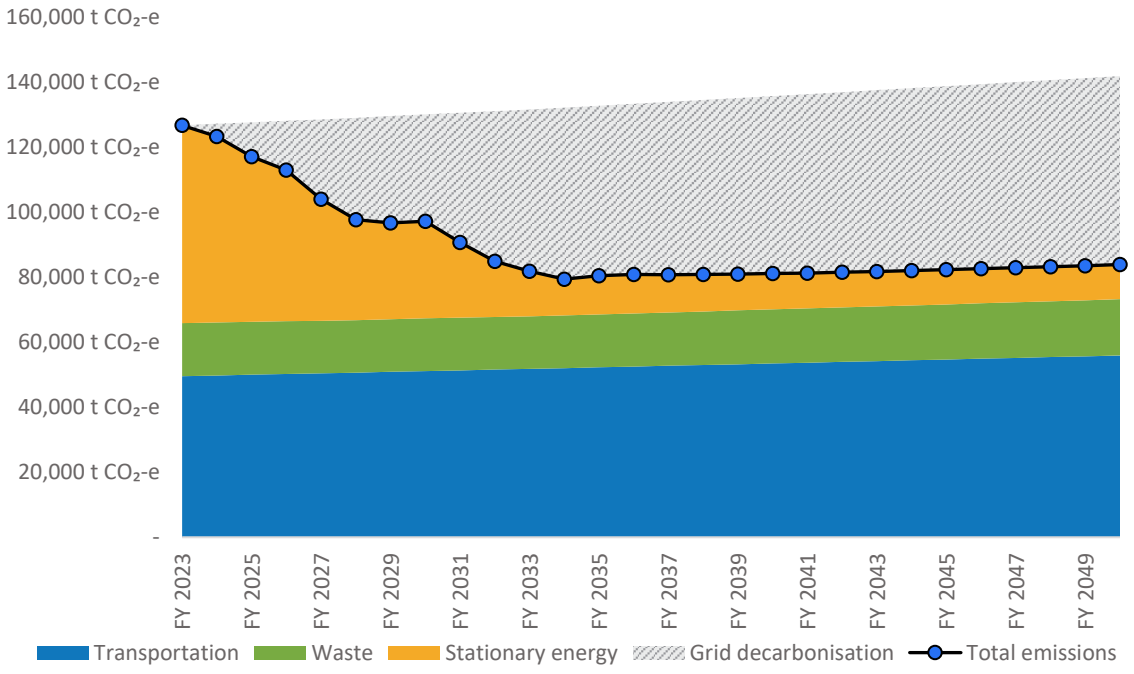


FIGURE 19: HUNTER'S HILL LGA – BUSINESS-AS-USUAL EMISSIONS FORECAST

4.2.2 Net zero pathway to 2050 for Hunter's Hill LGA

A net zero pathway and emissions reduction forecast model was developed, based on the assumed implementation of short- and long-term initiatives specified in CHAPTER 5. The pathway assumptions underpinning the forecast model are detailed in TABLE 9. Implementation timelines and scale of each measure within the pathway may be adjusted in the future as circumstances evolve and further insights are gained.

TABLE 9: HUNTER'S HILL COUNCIL – MODELLED SCENARIOS FOR THE COMMUNITY'S NET ZERO PATHWAY

Emission source	Scenario to reduce emissions	Timing
Natural Gas	Transition cooking, water and space heating needs from reticulated gas to electric alternatives across the LGA, beginning FY 2030.	FY 2030 → FY 2050
Fleet Fuel	Gradually replace internal combustion engine vehicles (ICEVs) to electric vehicles (EVs) across the LGA, starting FY 2030.	FY 2030 → FY 2050
Electricity – Solar PV	Progressively install solar PV systems at residential and commercial properties, targeting 80% uptake by 2050. System sizes are modelled as: • 5 kW for separate houses • 15 kW for medium/high-density dwellings • 50 kW for commercial properties.	FY 2025 → FY 2050
Electricity – Energy Efficiency	Implement energy efficiency measures at residential and commercial properties. It is assumed that electricity demand will be reduced by 10% by FY 2035, to a further 25% by FY 2050.	FY 2025 → FY 2035 FY 2036 → FY 2050
Electricity – Renewable Energy Purchasing	Increase the share of grid electricity purchased from renewable sources. It is assumed that this portion will increase by: • 5% for residential properties by FY 2040 • 30% for commercial properties by FY 2050.	FY 2025 → FY 2040 FY 2025 → FY 2050
Waste	Implement waste reduction and diversion measures across the LGA. Model assumptions include: • 15% reduction in waste generation by FY 2050 • 80% diversion of waste from landfills by FY 2050.	FY 2025 → FY 2050

4.2.2.1 Pathway Forecast

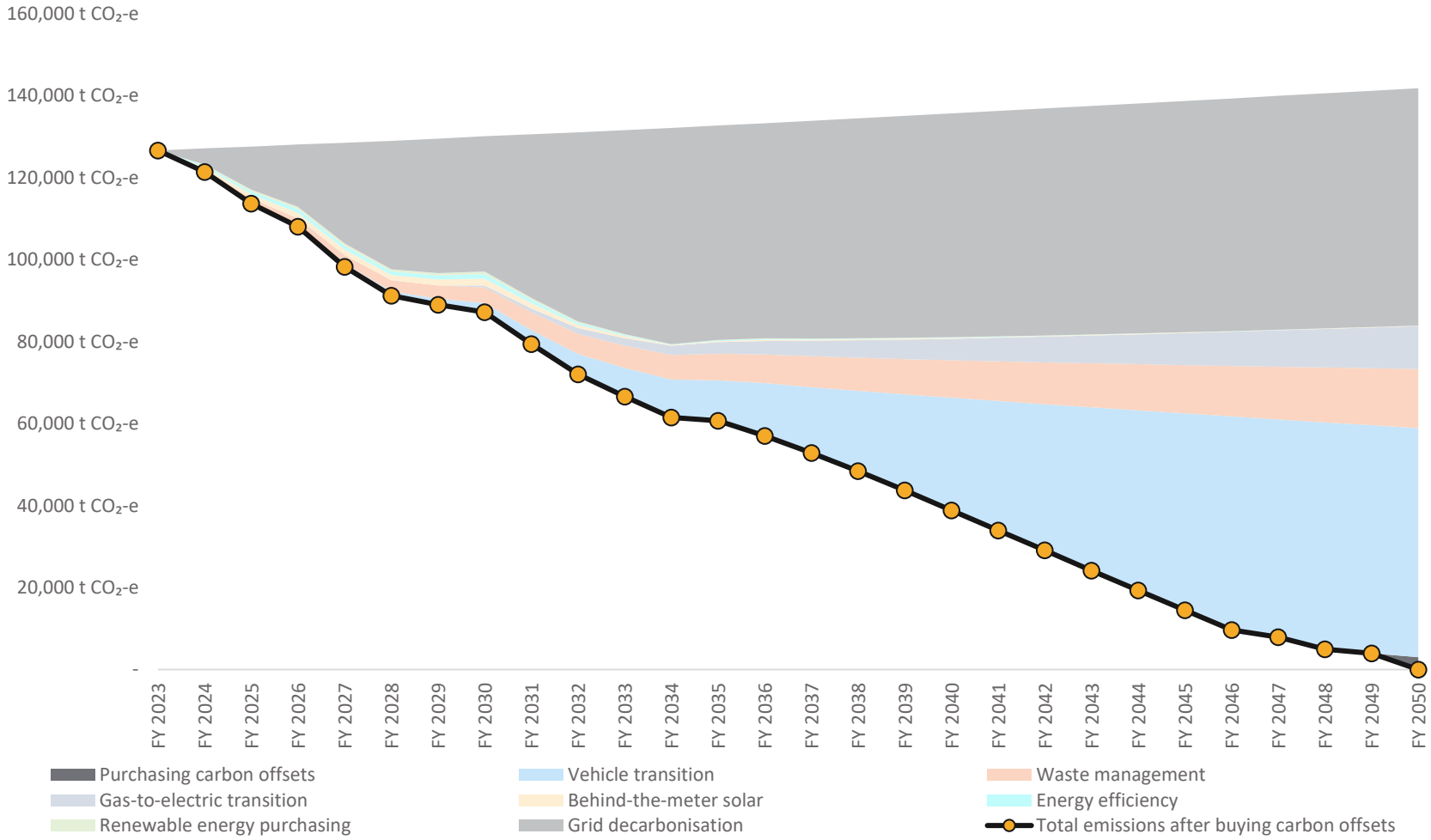


FIGURE 20: HUNTER'S HILL LGA – NET ZERO PATHWAY

The emissions pathway forecast graph for Hunter's Hill LGA illustrates:

- **Grid decarbonisation** contributes the most to emissions reductions. As the electricity grid transitions to renewable energy, emissions from grid-supplied electricity steadily decrease, with significant impact from FY 2024 through FY 2050.
- **Fleet transition** leads to a large reduction in emissions. This shift begins in the late-2020s and results in a substantial decline in emissions by 2050.
- **Waste management** contributes consistently to emissions reductions.
- **Gas-to-electric transition** plays a significant role in emissions reduction, becoming progressively important after 2030.
- **Behind-the-meter solar** play a significant role in emissions reductions, particularly from FY 2024 to FY 2035, as the community realises more of its solar PV potential.
- **Energy efficiency** provides a relatively minor emissions reduction role in the Hunters Hill community.
- **Offsets** play only a minor role in this model, with a small area discernible in the final year before 2050. Some residual emissions, particularly from waste-related sources, remain difficult to eliminate.

5 Net Zero Implementation Plan – Council & community

For the development of Council's Net Zero Implementation Plan for operations, strategic considerations outlined in the previous section are translated into clear, actionable and prioritised measures. Such measures consider impact and cost-effectiveness, highlighting initiatives that yield optimal emissions reduction on account of an efficient use of resources, with the goal of aligning emissions reduction efforts with Council's operational process, financial context, and the broader path to sustainable development.

To significantly reduce energy use and carbon emissions, Hunter's Hill Council needs to commit time, resources and financial support to a multi-year program that will see the implementation of measures that not only contributes to emissions abatement, but also improve Council's bottom line. Initiatives are grouped into short and long-term timelines, prioritised on their impact on emissions, cost and maturity of the recommended technologies, and designed to expand upon the broad measures outlined in SECTION 4.1.3. Some short-term initiatives are expected to continue into the long-term, while some initiatives will not be viable until the long-term due to financial, technological or other constraints.

As the NZIP is implemented, new initiatives may emerge that are not currently outlined, while some proposed ones may need to be adjusted or replaced with new opportunities. As such, it is recommended to review the NZIP by 2027 along with an updated carbon footprint to keep the plan dynamic and adaptable. Future revisions should focus on tracking of progress towards completion of short-term initiatives, refinement of long-term opportunities and engagement of new Council members, ensuring the plan stays relevant and effective.

5.1 Overview

Based on both Hunter's Hill Council and LGA carbon footprint, emissions abatement opportunities and stakeholder input on emissions reduction (as discussed in the Appendices) a Net Zero Implementation Plan for Council operations and the LGA has been developed, outlining actions that can be implemented to help the Council and community respond to climate change and lower emissions.

Particularly for community-focused actions, measures fall into nine categories available to Council, as shown in FIGURE 21 below:

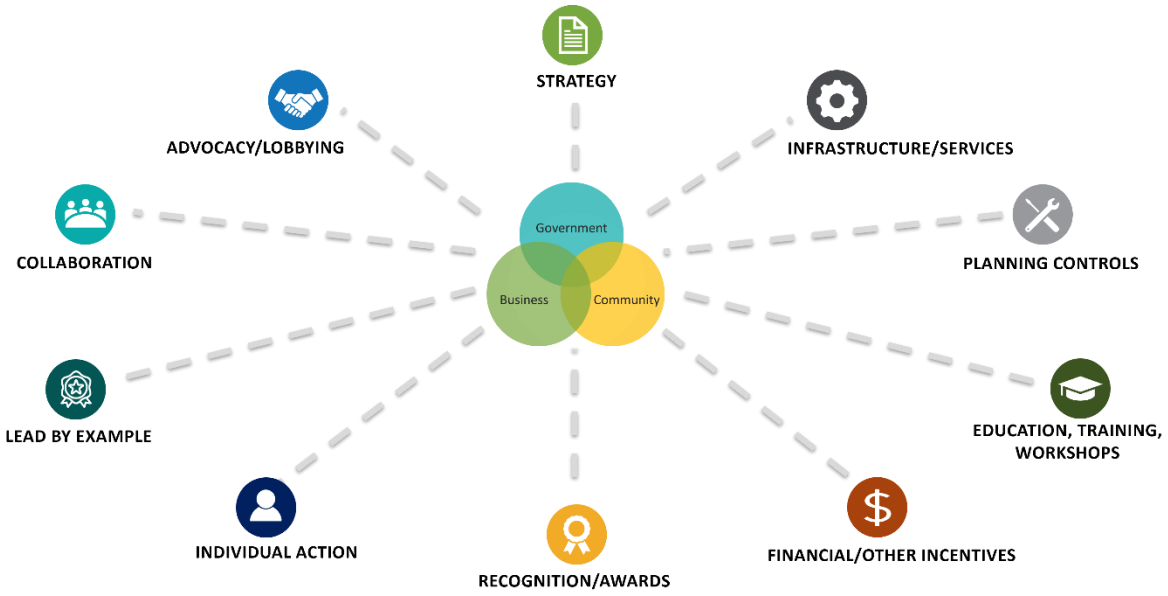


FIGURE 21: AREAS OF ACTION FOR COUNCIL TO HELP COMMUNITY REDUCE EMISSIONS

5.2 Short-term (FY 2025-27) Implementation Plan – Council operations

Following the evaluation of on-site measures, the existing electricity market, sustainable transport, behind-the-meter solar, energy efficiency, gas-to-electric transition, and sustainable procurement opportunities, a proposed short-term implementation plan for Council is outlined in TABLE 10 below.

TABLE 10: HUNTER'S HILL COUNCIL – SHORT-TERM IMPLEMENTATION PLAN FOR COUNCIL OPERATIONS

Action #	Action	Description	Emissions reduction category
1.1	Update procurement framework to include ESD and emissions considerations	Update Council's existing procurement framework to reflect greater consideration of emission reduction objectives and sustainability requirements during procurement and project planning.	Sustainable procurement
1.2	Adopt sustainability criteria within Council's project management framework	Adopt sustainability criteria within Council's project management framework to ensure that emissions are considered during the project planning stage as risks, budget and resourcing are evaluated and integrated.	Sustainable procurement
1.3	Investigate educational programs to increase awareness of sustainability across Council	Investigate introducing a series of ongoing education programs to improve sustainability literacy across Council. Topics could include eco-certifications, whole-life costing, etc.	Sustainable procurement

Action #	Action	Description	Emissions reduction category
2.1	Explore grant options	Prepare application for the CEUF Program and pursue other grants (e.g. EV charging grants) to fund the implementation of actions outlined in the Net Zero Implementation Plan and other sustainability projects across Council.	All Emissions
3.1	Collect data on waste	Capture data on tonnages of landfilled and diverted waste from Council facilities exclusively, split into waste streams: commercial & industrial (C&I), and construction & demolition (C&D).	Waste management
3.2	Collect data on Council's value chain	Consider the development of a comprehensive carbon footprint incorporating Scope 3 emissions, capture data (e.g. expenditure, material amounts) on activities within Council's value chain, with consideration of both downstream and upstream networks.	Sustainable procurement
3.3	Maintain database of Council Scope 1, 2 and 3 emissions	To allow regular updates of Council's carbon footprint every 1-2 years, improve internal procedures for collecting and managing the data required to calculate the carbon footprint, including setting up designated folders for staff to deposit data (e.g. fuel usage).	All Emissions
4.1	Monitor grid decarbonisation	Monitor trends in grid emissions intensity to optimise how the grid decarbonising can be leveraged in line with the review of PPA contract renewals or extensions.	Grid decarbonisation
4.2	Review PPA and plan for end-of-contract in 2026	Subject to an initial assessment of the feasibility of alternative market offers for purchasing renewable energy, ensure continuation of 100% renewable PPA past the expiry date in 2026.	Purchasing renewable energy
5.1	Roll out solar PV systems across Council facilities	Evaluate the performance of the solar array at the Council Chambers and Town Hall via the monitoring system and billing data, and assess the potential to install additional panels on the sloped east and west roofs, as well as the east and west faces of the front apex.	Behind-the-meter solar
5.2		Assess the feasibility of installing a small solar array of approximately 4 kW in capacity at the Fairland Hall.	Behind-the-meter solar

Action #	Action	Description	Emissions reduction category
5.3		Verify the efficiency of the solar array at the Henley Community Centre, and assess the feasibility for adding an additional ~5 kW of capacity on the centre's roof.	Behind-the-meter solar
5.4		Proceed with the planned requests for quotation and installation of a solar PV array at the Boronia Park Pavilion & Community Centre that matches the energy demand and utilisation of the new centre.	Behind-the-meter solar
5.5		Assess the potential for installing a 10-15 kW solar array on the west- and east-facing roofs of the Gladesville Road Community Centre.	Behind-the-meter solar
5.6		Verify the efficiency of the solar array at the Hunter's Hill Pre School, and assess the potential for adding an additional 5-10 kW on the rear flat roof.	Behind-the-meter solar
5.7		Install a 10-kW tilted solar array facing north on the roof of the Riverside Pre School.	Behind-the-meter solar
5.8		Install 5 kW of solar PV connected to the respective NMI on each building of the Papilio Early Learning Childcare.	Behind-the-meter solar
5.9	Investigate battery storage for sites with solar PV	Install a 7-kWh battery if solar PV installation is feasible at the Fairland Hall.	Behind-the-meter solar
5.10		Assess the feasibility of installing a 10-14 kWh battery at the Henley Community Centre to store surplus solar and increase solar self-consumption.	Behind-the-meter solar

Action #	Action	Description	Emissions reduction category
5.11		Assess the feasibility of installing a battery at the Boronia Park Pavilion & Community Centre along with the solar PV to maximise solar self-consumption.	Behind-the-meter solar
5.12		Explore the feasibility of installing a 20-28 kWh battery at the Gladesville Road Community Centre to store surplus solar energy and increase solar self-consumption.	Behind-the-meter solar
5.13		Consider installing a battery to supplement the proposed expansion of the solar array at Hunter's Hill Pre-School.	Behind-the-meter solar
5.14		Explore the feasibility of installing a 10-14 kWh battery at the Riverside Pre-School to store surplus solar energy, including over weekends, and increase solar self-consumption.	Behind-the-meter solar
5.15		Assess the feasibility of installing a 7-kWh battery at each building of the Papilio Early Learning Childcare to store surplus solar energy, including over weekends, and increase solar self-consumption.	Behind-the-meter solar
6.1	Improve base energy demand at Council sites	Assess the air handling unit (AHU) and exhaust fan shutdown controls at the Council Chambers and Town Hall to ensure the devices operate only when necessary at night. Further, review lighting shutdown procedures with cleaning and security staff to ensure all non-essential lights are turned off at night.	Energy efficiency
6.2		Review electrical systems at the Boronia Park Pavilion & Community Centre (e.g. restroom lighting) to ensure they automatically turn off after the facilities are secured at night.	Energy efficiency
6.3	Optimise HVAC use at Council sites	Consult an HVAC expert to evaluate retrofitting of chillers at the Council Chambers and Town Hall, for instance, through replacing thermal expansion valves with electronic expansion valves.	Energy efficiency

Action #	Action	Description	Emissions reduction category
6.4		Implement variable speed drive (VSD) control for the chilled water pump supplying the air handling units (AHU) and fan coil units (FCU) at the Council Chambers and Town Hall.	Energy efficiency
6.5		Assess the feasibility of variable air volume (VAV) with variable speed drive (VSD) controls on supply fans at the Council Chambers and Town Hall, particularly for AHU 3 and AHU 4, as there is sufficient space to install VSDs in the adjacent plant room. VSD installation for AHUs 6 & 7 may be more challenging due to limited space and will require further investigation.	Energy efficiency
6.6		The Hall and Stage AHU systems at the Council Chambers and Town Hall have high impact on peak demand despite their limited operational hours. Review ceiling insulation and other aspects that may help optimise energy usage for heating or cooling these spaces and reduce peak demand.	Energy efficiency
6.7		Current energy demand profiles of the Council Chambers and Town Hall during public holidays suggest a 7-day schedule is in place. As such, evaluate if the building management system (BMS) or current scheduling allows for a 365-day setup to ensure systems are turned off on holidays, potentially saving up to ten days of weekday demand.	Energy efficiency
6.8		Review the recently completed air conditioning system design at the Boronia Park Pavilion & Community Centre to see if optimal settings have been programmed in to any local AC controller. Implement best practice settings for start/stop times, timers, and temperature controls.	Energy efficiency
6.9		Educate staff on the prudent use of air conditioning at the Riverside Pre School as a straightforward initial step. Although, such action may only yield minor changes given that there are only two units.	Energy efficiency
6.10		Consider linking AC operation to the opening of external doors at the Riverside Pre School. However, this may restrict free movement between indoor and outdoor areas, as the AC might turn off or reduce its operation whenever a door is opened, discouraging frequent opening and closing of doors, thus potentially limiting the ease with which people move between indoor and outdoor spaces.	Energy efficiency

Action #	Action	Description	Emissions reduction category
6.11	Upgrade lighting at Council sites	Upgrade the surface fluorescent lights at the Weil Park Hall with equivalent LED fixtures, reducing energy demand by approximately 60%.	Energy efficiency
6.12		Replace the three non-LED fittings at the Fairland Hall with equivalent LED fixtures, reducing energy demand by approximately 60%.	Energy efficiency
6.13		Replace the stairway lights at the Henley Community Centre with equivalent LED fixtures, and upgrade the two office lights to square LED panels.	Energy efficiency
6.14		Install full LED lighting and movement sensors in all of The Priory/Riverglade Reserve's meeting rooms, amenities, kitchens, and other areas during the refurbishment.	Energy efficiency
6.15		Replace single split AC units at the The Priory/Riverglade Reserve with equivalent models having high energy efficiency ratings, and avoid installing gas heating. Similarly, if a multi-split system is selected, where one outdoor units serves multiple indoor units, ensure high energy efficiency and use of local sensors.	Energy efficiency
6.16		Upgrade all non-LED fittings at the Papilio Early Learning Childcare to equivalent LED fixtures to reduce energy demand by approximately 4 MWh per year.	Energy efficiency
6.17		Install sensor lights in the Henley Cottage's kitchen, hall, and toilets for additional energy savings, especially since the foyer and amenities lights are already turned off when not in use.	Energy efficiency
6.18	Improve power quality at Council sites	Review and confirm that the Council Chambers and Town Hall's power factor (PF) is 0.87 at the current capacity demand. Install 70 kVAr of power factor correction equipment to achieve a PF of 1.00, reducing the demand by 17 kVA per month or approximately $2,500 annually.	Energy efficiency

Action #	Action	Description	Emissions reduction category
7.1	Optimise fuel efficiency in fleet vehicles	Assess Council's current fleet operations to identify opportunities for enhancing fuel efficiency, including optimising route planning to reduce unnecessary mileage.	Sustainable transport
7.2	Create a plan to transition fleet to low or zero-emission vehicles	Update Council's fleet & procurement policies to reflect a proactive strategy for supporting accelerated adoption of vehicles featuring advanced fuel-efficient & electric technologies (e.g. hybrid EVs, plug-in hybrid EVs).	Sustainable transport
7.3	Increase charging infrastructure at Council	Integrate evaluation and strategic planning for EV charging infrastructure in the development of a Council fleet plan, with the aim of a phased, medium-to-long term transition to battery electric vehicles (BEVs) for Council's passenger cars and utility vehicles.	Sustainable transport
7.4		Consider incorporating EV charging stations in car parking spaces as part of the refurbishment project at The Priory/Riverglade Reserve.	Sustainable transport
7.5		Consider incorporating EV charging stations in car parking spaces as part of the site construction project at the Boronia Park Pavilion & Community Centre.	Sustainable transport

5.3 Long-term (FY 2028+) Implementation Plan – Council operations

Following the evaluation of on-site measures, the existing electricity market, sustainable transport, behind-the-meter solar, energy efficiency, gas-to-electric transition, and sustainable procurement opportunities, a proposed long-term implementation plan for Council is outlined in TABLE 11 below.

TABLE 11: HUNTER'S HILL COUNCIL – LONG-TERM IMPLEMENTATION PLAN FOR COUNCIL OPERATIONS

Action #	Action	Description	Emissions reduction category
1.1	Develop a sustainable procurement roadmap	Develop a sustainable procurement roadmap that incorporates sustainability requirements (e.g. low-carbon components, high levels of recycled content, energy-efficient) in specifications and evaluation criteria for services, equipment and products in Council's procurement.	Sustainable procurement
1.2	Increase awareness of sustainability across Council	Establish and conduct internal engagement and training programs to promote the integration of sustainability criteria in all Council procurement decisions.	Sustainable procurement
1.3	Collaborate with suppliers to reduce emissions	Collaborate with key suppliers on opportunities for lowering emissions across Council's supply chain.	Sustainable procurement
2.1	Improve base energy demand at Council sites	Regularly review load data to ensure optimal building tuning settings are followed, and adjust controls as needed.	Energy efficiency

Action #	Action	Description	Emissions reduction category
2.2	Upgrade to more energy-efficient HVAC systems at Council sites	Upgrade to a heat pump system to replace the cooling-only chiller and electric reheats at the Council Chambers and Town Hall, significantly improving energy efficiency and reducing peak demand by lowering heating and cooling energy use, particularly in the Town Hall. Include VAV digitally controlled diffusers and VSD control of electronically commutated (EC) plug fans in new AHUs. Noting that HVAC services are about 50% of total energy demand (~84 MWh/year), upgrades could reduce this by ~40%, saving ~35 MWh or ~$10,000 annually. As this will entail high investment costs, it is suggested for the upgrades to occur when current systems reach end of life.	Energy efficiency
2.3		As older split systems at the Fairland Hall are upgraded, choose energy-efficient models with low global warming potential (GWP) refrigerants	Energy efficiency
2.4		As older split systems at the Henley Community Centre are upgraded, choose energy-efficient models with low global warming potential (GWP) refrigerants.	Energy efficiency
2.5		As older split systems at the Gladesville Road Community Centre are upgraded, choose energy-efficient models with low global warming potential (GWP) refrigerants.	Energy efficiency
2.6		As older split systems at the Hunter's Hill Pre School are upgraded, choose energy-efficient models with low global warming potential (GWP) refrigerants.	Energy efficiency
2.7		As older split systems at the Riverside Pre School are upgraded, choose energy-efficient models with low global warming potential (GWP) refrigerants.	Energy efficiency
2.8		As older split systems at the Papilio Early Learning Childcare are upgraded, choose energy-efficient models with low global warming potential (GWP) refrigerants.	Energy efficiency

Action #	Action	Description	Emissions reduction category
2.9		As older split systems at the Henley Cottage are upgraded, choose energy-efficient models with low global warming potential (GWP) refrigerants.	Energy efficiency
2.10	Optimise HVAC use at Council sites	Review energy performance and optimisation opportunities for the HVAC systems at the Boronia Park Pavilion & Community Centre after 1-2 years of operation.	Energy efficiency
2.11	Upgrade lighting at Council sites	When upgrading sport field lighting at the Boronia Park Pavillion and Community Centre, evaluate LED options for better energy efficiency and improved lighting quality, catering to both training and competition requirements. Note that LED upgrades may not reduce total energy use if overall light levels are significantly increased (e.g. to enhance the field's amenity).	Energy efficiency
3.1	Increase charging infrastructure at Council	Agree on a strategy for the deployment of charging infrastructure and uptake of EVs among Council's fleet, inclusive of considerations for various charging infrastructure types and locations.	Sustainable transport
3.2		Consider installing additional charging stations at the Hunter's Hill Council Chambers and Town Hall as vehicles in the car park switch to electric vehicles (EVs), ensuring they can be powered by 100% renewable electricity.	Sustainable transport
3.3		As meals-on-wheels delivery vehicles switch to electric vehicles (EVs), consider installing EV charging stations in the Gladesville Road Community Centre's carpark to facilitate charging.	Sustainable transport
3.4	Increase uptake of low and zero-emission vehicles across Council	The 2RRR community radio station vehicles associated with the Henley Cottage, which are highly visible locally, could consider switching to electric vehicles (EVs), especially since their vehicle sponsor also has ambitious climate goals.	Sustainable transport
3.5		Sydney Community Services buses parked in front of the Hunter's Hill Croquet Club are visible locally and could consider switching to electric vehicles (EVs), where the croquet club could serve as a feasible charging point for these buses.	Sustainable transport

Action #	Action	Description	Emissions reduction category
3.6	Transition Council sites to electric solutions powered by renewable sources	Transition the Gladesville Road Community Centre and Boronia Park Grandstand currently using gas to electric solutions powered by renewable sources progressively over time. Council may consider implementing a 'no new gas' policy and engaging stakeholders to streamline the electrification process as assets are replaced. Evaluate the spatial and fitness-for-purpose aspects of electric solutions for various applications.	Gas-to-electric solution
4.1	Maintain awareness of sustainability across Council	Continue to provide internal engagement and training programs for promoting the integration of sustainability criteria in all Council procurement decisions.	Sustainable procurement
4.2	Maintain high level of focus on sustainability at Council	Continue to develop and refine specifications and evaluation criteria for services, equipment, and products in Council's value chain, ensuring inclusion of sustainability requirements.	Sustainable procurement
4.3	Develop a strategy for Scope 3 emissions	Develop a strategy with specific targets to reduce Scope 3 emissions across Council's value chain.	Sustainable procurement
5.1	Continue to evaluate feasibility of battery storage solutions	Explore the feasibility of further battery storage solutions at Council sites where solar capacity exceeds the daytime demand from the grid, or to support potential solar carports and EV charging infrastructure for Council fleet.	Behind-the-meter solar
5.2	Continue to rollout Solar PV at Council sites	Explore further opportunities for solar expansion, with an emphasis on solar carport solutions at Council sites.	Behind-the-meter solar

Action #	Action	Description	Emissions reduction category
6.1	Continue to transition Council's fleet & machinery to low and zero-emission vehicles and plant	Continue to upgrade the remainder of Council's fleet and machinery to low and zero-emission alternatives, particularly electric utility vehicles, as they become available.	Sustainable transport

5.4 Short-term (FY 2025-27) Implementation Plan – Community

TABLE 12: HUNTER'S HILL COUNCIL – SHORT-TERM IMPLEMENTATION PLAN FOR COMMUNITY

Action #	Action	Description	Emissions reduction category
1.1	Adopt a community NZIP and target	Consider adopting a community emissions reduction plan that sets clear net zero targets. Suggested targets for community emissions include: • Net Zero for Scope 1, 2 and 3 emissions by FY 2050 • 70% emissions reduction by FY 2035	All Emissions

1.2	Track and report LGA emissions	Monitor changes in community emissions by:
		• Periodically-published reports from resources such as Snapshot;
		• Direct emissions calculations using bottom-up approach with data on fuel sales, electricity, and gas usage from sources such as:
		  ○ Ausgrid's LGA Electricity Reports
		  ○ Resilient Sydney data extracts
		  ○ Jemena's gas usage data at LGA level
		  ○ Australian Bureau of Statistics (ABS) fuel data
		
		Additionally, gauge progress in reducing emissions by monitoring local adoption of solar PV systems, electric vehicle (EV) registrations, and development of charging infrastructure via data from:
		• Clean Energy Regulator (CER)
		• Australian Photovoltaic Institute (APVI)
		• PlugShare
			All Emissions

1.3	Dedicate additional human resources for community climate action	Consider allocating additional human resources dedicated to working with the Hunter's Hill LGA to enable collaborative action on climate change. Forming a dedicated team would allow for more effective community engagement, improved education and increased support for local climate initiatives.	All Emissions

Action #	Action	Description	Emissions reduction category
1.4	Update *Hunter's Hill Climate Change Risk Assessment*	As outlined in Council's *Sustainability Action Plan 2022,* revise the *Hunter's Hill Climate Change Risk Assessment* to include updated actions with timelines, responsibilities and resources. Focus on addressing both physical risks (e.g. extreme weather events) and transition risks (e.g. challenges in adopting a low-carbon economy) through mitigation strategies (e.g. reducing emissions) and adaptation measures (e.g. increasing community resilience).	All Emissions
2.1	Maintain 100% renewable energy sourcing for Council sites	Continue to lead by example in promoting renewable energy within the community by ensuring that Council keeps sourcing 100% renewable energy for its sites through a Power Purchase Agreement (PPA) or alternative cost-effective market offers.	Buying clean energy
2.2	Develop and share resources on renewable electricity purchasing	Develop and share resources to inform businesses and residents about available options for buying renewable electricity through their electricity suppliers.	Buying clean energy
3.1	Engage energy providers for community battery options and feasibility	Engage with energy network providers (e.g. Ausgrid) to understand opportunities for piloting a community battery that could leverage the existing grid infrastructure, including a potential feasibility study for a community battery project in Hunter's Hill LGA involving: • Assessing local energy usage patterns to understand how a community battery could benefit the residents; • Finding optimal locations for installing a community battery, considering factors like proximity to existing solar installations, availability of land, and minimal environmental or community impact; • Analyse the project's financial viability by conducting a cost-benefit analysis that looks at installation costs, maintenance expenses, and expected returns or savings.	Regional and community energy generation

Action #	Action	Description	Emissions reduction category
3.2	Seek funding for a community battery project	Seek funding for a community battery through programs such as the Australian Renewable Energy Agency (ARENA) Community Batteries Round 2. Consider partnering with neighbouring councils or regional organisations to apply for joint grant opportunities.	Regional and community energy generation
4.1	Address barriers to solar PV adoption at Council sites	Identify obstacles to increasing adoption of solar PV systems at Council sites, including heritage restrictions, planning regulations, structural issues and financial barriers. Develop and implement strategies to address these challenges, and, subject to feasibility studies on energy usage and demand, continue installing new solar PV systems or expand existing ones at Council sites, allowing Council to lead by example and promote benefits of solar energy.	Behind-the-meter solar
4.2	Develop solar PV guidelines for heritage sites	Partner with the NSW Government to develop clear and practical guidelines for installing solar PV systems on heritage-listed properties, aiming for renewable energy uptake while ensuring preservation and respect of the sites' historical and cultural significance.	Behind-the-meter solar
4.3	Support schools in 'Solar my School' program and targeted grants	As outlined in Council's *Sustainability Action Plan 2022,* progress with supporting local schools in applying for the 'Solar my School' program. Also, explore funding opportunities to offer solar panel grants—particularly for independent schools where Council support is more viable. Success in this initiative will lower emissions and energy costs while offering valuable learning opportunities for students.	Behind-the-meter solar
4.4	Connect residents and businesses with community solar providers	Provide educational resources and connect residents and businesses – especially those unable to install their own solar panels – with community solar providers.	Behind-the-meter solar
4.5	Promote battery rebates and VPPs	Promote NSW Government battery rebate programs for both homes and businesses, and encourage participation in Virtual Power Plant Programs (VPPs) to boost local energy resilience and grid stability.	Behind-the-meter solar

Action #	Action	Description	Emissions reduction category
5.1	Continue energy efficiency initiatives at Council sites	Continue deploying energy-efficient technologies at Council sites, enabling Council to demonstrate its commitment to sustainability, share successes with the community, and highlight benefits (e.g. cost savings and emissions reduction) of energy efficiency.	Energy efficiency and gas-to-electric technologies
5.2	Promote energy efficiency	Inform the community on how energy-efficient technologies can reduce energy costs, enhance resilience, and lower emissions. Provide resources and guidance to help households and businesses make informed decisions to improve their energy efficiency.	Energy efficiency and gas-to-electric technologies
5.3	Develop energy efficiency initiatives for low-income households	Work with the NSW Government, community housing providers (e.g. St George Community Housing), and other stakeholders to design and implement energy efficiency initiatives for low-income households, helping to reduce energy costs, lower emissions, and enhance energy resilience for vulnerable communities.	Energy efficiency and gas-to-electric technologies
5.4	Monitor and support housing energy policies	Track the implementation of housing energy policies and schemes (e.g. voluntary disclosure of home energy performance ratings per *NSW Consumer Energy Strategy)* by the NSW and Commonwealth Governments. Provide homeowners, builders and stakeholders with guidance and resources to ensure compliance and promotion of energy efficiency initiatives.	Energy efficiency and gas-to-electric technologies
5.5	Establish a home insulation upgrade program	Help homeowners boost energy efficiency with an insulation upgrade program that provides targeted education, practical workshops, and a trusted list of local tradespeople for retrofit support.	Energy efficiency and gas-to-electric technologies
5.6	Prioritise efficient, cost-effective initiatives	Set efficiency, effectiveness and cost-effectiveness as key criteria for all actions categorised under 'energy efficiency and gas-to-electric technologies'. Focus on initiatives that benefit both Council and the community, making sure that resources are used to maximise emissions reductions.	Energy efficiency and gas-to-electric technologies

Action #	Action	Description	Emissions reduction category
6.1	Promote benefits of low- and zero-emission vehicles	Inform the community about the benefits of low- or zero-emission vehicles, including reduced emissions, lower fuel costs, and improved air quality, to encourage broader adoption.	Sustainable transport
6.2	Advocate for digital economy and remote work	Support and advocate for the growth of the digital economy and encourage work-from-home arrangements to reduce commuting emissions, lower office energy use, and boost local economic resilience.	Sustainable transport
6.3	Promote walking and cycling with path improvements	Encourage increased walking and cycling in Hunter's Hill LGA by providing information and improving walking and cycling paths.	Sustainable transport
6.4	Collaborate with public transport providers for low-emission solutions	Work with public transport providers to improve service quality and reduce long-term emissions by optimising routes and adopting low- or zero-emission vehicles.	Sustainable transport
6.5	Advocate for dedicated bike lanes on key routes	Advocate for the creation of dedicated bike lanes, particularly on Alexandra St, Woolwich, Gladesville and Ryde Roads.	Sustainable transport
6.6	Permit electric scooters on local roads	Consider allowing electric scooters on local roads as a low-emission transport option. Work with stakeholders to review safety standards, regulations, and infrastructure needs through pilot projects.	Sustainable transport
7.1	Support *Northern Sydney Regional Waste Strategy* initiatives	Support the initiatives outlined in the *Northern Sydney Regional Waste Strategy* developed by the Northern Sydney Regional Organisation of Councils (NSROC), with a focus on avoiding and reducing waste, recovering resources, and protecting the environment through collaboration, education and community engagement.	Waste management
7.2	Promote circular economy principles	Encourage circular economy practices throughout the LGA by supporting participation in trials and community programs. Successful initiatives include community swaps (e.g. *Share&Swap Shops)* and *The Yarn,* a community and library space showcasing circular economy principles.	Waste management

Action #	Action	Description	Emissions reduction category
8.1	Collaborate with schools to promote sustainability	Work with educational institutions and organisations on promoting sustainability principles, including through ongoing coverage of environmental sustainability topics in the annual Youth Summits.	All Emissions
8.2	Transform Council operations and facilities to lead by example	Lead by example by making transforming Council's own operations and facilities, aiming to show a low-emissions future is possible and encourage community action—as seen with City of Melbourne's *Urban Forest Strategy* and City of Sydney's Zero Waste Campaign. Council should document and share these initiatives, recognising that while direct impact may be hard to measure, they can still inspire wider sustainable practices.	All Emissions
8.3	Prioritise cost-effective emissions reductions	Focus on the most cost-effective measures in the report to achieve the highest emissions reduction per dollar spent.	All Emissions
8.4	Seek increased government support	Advocate for increased government support to supplement Council resources, ensuring that resource constraints do not hinder the implementation of sustainable initiatives.	All Emissions

5.5 Long-term (FY 2028+) Implementation Plan – Community

TABLE 13: HUNTER'S HILL COUNCIL – LONG-TERM IMPLEMENTATION PLAN FOR COMMUNITY

Action #	Action	Description	Emissions reduction category
1.1	Conduct a community-wide climate change survey	Consider a follow-up survey to understand residents' concerns about climate change, including their behaviours, knowledge, and views on how it affects the future of Hunter's Hill LGA. Aim to ensure the survey a wider sample size to effectively inform and guide climate action strategies.	All Emissions
2.1	Promote battery storage adoption	Educate and inform the community on how battery storage systems can lower energy costs, enhance energy resilience, and reduce emissions. Use workshops, informational materials, and community events to raise awareness and encourage adoption.	Behind-the-meter solar
2.2	Secure battery incentives and bulk purchasing	Partner with regional councils, the NSW Government, and suppliers to secure incentives for battery storage systems. Explore developing bulk-buy initiatives to lower battery costs and create income opportunities for the community through bulk purchase savings, reduced energy bills, participation in virtual power plants (VPPs), and creation of local jobs.	Behind-the-meter solar
2.3	Develop solar and battery solutions for low-income households	Work with the NSW Government, community housing providers (e.g. St George Community Housing), and other stakeholders to design and implement solar and battery storage solutions for low-income households, helping to reduce energy costs, lower emissions, and enhance energy resilience for vulnerable communities.	Behind-the-meter solar
2.4	Develop solar and battery solutions for renters	Inform tenants and local property owners about solar and battery storage opportunities that offer mutual benefits. Address split incentives through solutions that mitigate challenges related to installation costs, energy savings, ownership and maintenance responsibilities, financial incentives and rebates, property value increases, and balancing long-term investments with short-term benefits.	Behind-the-meter solar

Action #	Action	Description	Emissions reduction category
2.5	Continue linking residents and businesses with community solar providers	Continue facilitating access of residents and businesses to community solar solutions by offering educational resources and linking with providers.	Behind-the-meter solar
5.1	Continue energy efficiency initiatives at Council sites	Continue deploying energy-efficient technologies at Council sites, enabling Council to demonstrate its commitment to sustainability, share successes with the community, and highlight benefits (e.g. cost savings and emissions reduction) of energy efficiency.	Energy efficiency and gas-to-electric technologies
5.2	Promote energy efficiency	Inform the community on how energy-efficient technologies can reduce energy costs, enhance resilience, and lower emissions. Provide resources and guidance to help households and businesses make informed decisions to improve their energy efficiency.	Energy efficiency and gas-to-electric technologies
5.3	Develop energy efficiency initiatives for low-income households	Work with the NSW Government, community housing providers (e.g. St George Community Housing), and other stakeholders to design and implement energy efficiency initiatives for low-income households, helping to reduce energy costs, lower emissions, and enhance energy resilience for vulnerable communities.	Energy efficiency and gas-to-electric technologies
5.4	Monitor and support housing energy policies	Track the implementation of housing energy policies and schemes (e.g. voluntary disclosure of home energy performance ratings per *NSW Consumer Energy Strategy)* by the NSW and Commonwealth Governments. Provide homeowners, builders and stakeholders with guidance and resources to ensure compliance and promotion of energy efficiency initiatives.	Energy efficiency and gas-to-electric technologies
4.1	Develop comprehensive EV infrastructure policy	Develop a comprehensive EV infrastructure policy for Hunter's Hill LGA by using resources from the NSW and Commonwealth Governments and following best practices from other councils and regional organisations. Outline strategic placement of charging stations, incentives for EV adoption, integration with existing transport plans, and partnerships with private and public stakeholders.	Sustainable transport

Action #	Action	Description	Emissions reduction category
4.4	Collaborate on EV charging strategy for Hunter's Hill LGA	Partner with the NSW Government, EV charging providers, motoring associations, and other key stakeholders to create a unified strategy for installing EV charging stations in the LGA. Focus on efficient installation, optimal coverage, and supporting EV adoption.	Sustainable transport
4.5	Seek funding for EV chargers	Pursue funding opportunities from NSW and Commonwealth Government programs, such as NSW Climate and Energy Action's *Electric vehicle destination charging grants,* to support deployment of EV chargers across the LGA.	Sustainable transport
4.6	Support local businesses in installing EV chargers	Encourage local businesses to install EV charging stations by providing incentives, technical support or resources for adopting EV infrastructure.	Sustainable transport
4.7	Transition Council fleet to EVs and install EV chargers at Council sites	Gradually transition Council's own fleet to EVs and install EV chargers at Council sites, allowing Council to lead by example and promote adoption of low- or zero-emission vehicles within the community.	Sustainable transport
5.1	Support community in adopting waste strategies	Help the community adopt future waste management strategies, such as the NSW Government's FOGO mandate. Provide education, composting bins and kitchen caddies to help residents in reducing waste and cutting emissions.	Waste management
5.2	Promote circular economy principles	Continue advancing circular economy principles throughout the LGA by supporting community participation in projects and programs, and encouraging initiatives focused on recycling, resource efficiency and waste reduction.	Waste management
6.1	Collaborate with schools to promote sustainability	Continue working with educational institutions and organisations on promoting sustainability principles, including through ongoing coverage of environmental sustainability topics in the annual Youth Summits.	All Emissions

Action #	Action	Description	Emissions reduction category
6.2	Prioritise immediate, measurable emissions cuts	Focus on initiatives that deliver immediate, measurable emissions cuts to build momentum for long-term sustainability, thereby ensuring clear progress towards net zero instead of depending mainly on future offsets.	All Emissions
6.3	Implement rigorous and transparent carbon offset reviews	Set up a thorough review process for carbon offset options. Each option should be carefully evaluated based on environmental, economic and ethical criteria. Confirm that offset choices are clearly justified, with measurable benefits to Council's goals, and communicated transparently to build community trust.	All Emissions

Appendix A – Summary of solar PV opportunities at Hunter's Hill Council

TABLE 14 below summarises the estimated costs and savings of solar PV and battery storage opportunities identified from the Council site assessments. Primarily the solar-only opportunities are considered feasible and cost-effective, with favourable payback periods of less than seven years.

TABLE 14: HUNTER'S HILL COUNCIL – SOLAR PV OPPORTUNITIES

Site Name	Description of potential opportunity	Solar PV capacity	Battery capacity	Indicative costs	Est. year-1 cost savings	Simple payback	Est. energy savings	Est. emissions abatement
Gladesville Road Community Centre	*Short-term option:* Assess the potential for installing a 10-15 kW solar array on the west- and east-facing roofs of the community centre.	15.0 kW	-	$19,500	$5,827	3.35 yrs	46.4%	11.4 t CO_2-e
	Medium-term option: Explore the feasibility of installing a 20-28 kWh battery at the community centre to store surplus solar energy and increase solar self-consumption.	-	28.0 kWh	$28,000	$2,379	11.8 yrs	32.3%	7.93 t CO_2-e
Boronia Park Pavilion & Community Centre	*Short-term option:* Proceed with the planned requests for quotation and installation of a solar PV array (est. 10 kW) that matches the energy demand and utilisation of the new centre.	10.0 kW	-	$13,000	$3,884	3.35 yrs	36.5%	7.60 t CO_2-e
	Medium-term option: Assess the feasibility of installing a battery (est. 24 kWh) at the community centre along with a solar PV to maximise solar self-consumption.	-	24.0 kWh	$24,000	$2,039	11.8 yrs	32.6%	6.79 t CO_2-e

Site Name	Description of potential opportunity	Solar PV capacity	Battery capacity	Indicative costs	Est. year-1 cost savings	Simple payback	Est. energy savings	Est. emissions abatement
Hunter's Hill Pre School	*Short-term option:* Verify the efficiency of the solar array, and assess the potential for adding an additional 5-10 kW on the rear flat roof of the preschool.	10.0 kW	-	$13,000	$3,409	3.81 yrs	***Not assessed*** – presumed operator pays for the site's grid electricity, hence the lack of data on Council's reporting system.	6.51 t CO_2-e
	Medium-term option: Consider installing a battery (est. 14 kWh) to supplement the expanded solar array.	-	14.0 kWh	$14,000	$1,271	11.0 yrs		3.96 t CO_2-e
Riverside Pre School	*Short-term option:* Install a 10-kW tilted solar array facing north on the roof of the preschool.	10.0 kW	-	$13,000	$3,409	3.81 yrs	***Not assessed*** – presumed operator pays for the site's grid electricity, hence the lack of data on Council's reporting system.	6.51 t CO_2-e
	Medium-term option: Explore the feasibility of installing a 10-14 kWh battery at the preschool to store surplus solar energy, including over weekends, and increase solar self-consumption.	-	14.0 kWh	$14,000	$1,271	11.0 yrs		3.96 t CO_2-e
Papilio Early Learning Childcare	*Short-term option:* Install 5 kW of solar PV on each building, connected to the respective NMI for each building.	10.0 kW	-	$13,000	$3,409	3.81 yrs	***Not assessed*** – presumed operator pays for the site's grid electricity, hence the lack of data on Council's reporting system.	6.51 t CO_2-e
	Medium-term option: Assess the feasibility of installing a 7-kWh battery at each building to store surplus solar energy, including over weekends, and increase solar self-consumption.	-	7.00 kWh	$7,000	$636	11.0 yrs		1.98 t CO_2-e

Site Name	Description of potential opportunity	Solar PV capacity	Battery capacity	Indicative costs	Est. year-1 cost savings	Simple payback	Est. energy savings	Est. emissions abatement
Henley Community Centre	*Short-term option:* Verify the efficiency of the solar array and assess the feasibility for adding an additional ~5 kW of capacity on the roof of the centre.	5.0 kW	-	$6,500	$1,942	3.35 yrs	40.5%	3.80 t CO_2-e
	Medium-term option: Assess the feasibility of installing a 10-14 kWh battery at the community centre to store surplus solar and increase solar self-consumption.	-	14.0 kWh	$14,000	$1,190	11.8 yrs	42.2%	3.96 t CO_2-e
Fairland Hall	*Short-term option:* Assess the feasibility of installing a small solar array, approximately 4 kW in capacity, with a battery, especially if the hall is used intermittently.	4.0 kW	-	$5,200	$1,554	3.35 yrs	54.5%	3.04 t CO_2-e
	Medium-term option: Install a 7-kWh battery if solar PV installation is feasible.	-	7.00 kWh	$7,000	$636	11.0 yrs	35.5%	1.98 t CO_2-e
Amenities Block	*Short-term option:* Assess the feasibility of a smaller PV system.	5.0 kW		$6,500	$1,942	3.35 yrs	***Not assessed***	3.80 t CO_2-e
Total		**69.0 kW**	**108 kWh**	**$197,700**	**$34,800**	**5.7 yrs**	**40.1%**	**75.9 t CO_2-e**

Appendix B – Summary of energy efficiency opportunities at Hunter's Hill Council

TABLE 15: HUNTER'S HILL COUNCIL – ENERGY EFFICIENCY OPPORTUNITIES

Site Name	Description of potential opportunity	Indicative costs	Est. cost savings	Simple payback	Est. emissions abatement
Boronia Park Pavilion & Community Centre	*Short-term option:* Ensure restroom lights automatically turn off after the facilities are secured at night.	***Not assessed*** – assumed Council incurs minimal costs for implementing the measure.			
	Short-term option: Check if the new air conditioning system has optimal settings programmed in the local controllers. Set start/stop times, timers and temperature controls to best practices.	***Not assessed*** – assumed Council incurs minimal costs for implementing the measure.			
Fairland Hall	*Short-term option:* Replace the three non-LED fittings with equivalent LED fixtures.	$300	$13	22.9 yrs	0.027 t CO_2-e
Henley Community Centre	*Short-term option:* Replace the stairway lights with LED fixtures and upgrade the two office lights to square LED panels.	$400	$90	4.44 yrs	0.184 t CO_2-e
Hunter's Hill Council Chambers and Town Hall	*Short-term option:* Install a power factor correction (PFC) equipment with capacity of 70 kVAr to improve the observed power factor (PF) of 0.87 to 1.00, reducing monthly peak demand and costs.	$10,500	$2,864	3.67 yrs	-
	Short-term option: Check the air handling unit (AHU) and exhaust fan controls to ensure these only run when needed at night. Also, review lighting shutdown procedures with cleaning and security staff to make sure all non-essential lights are off at night.	***Not assessed*** – assumed Council incurs minimal costs for implementing the measure.			
	Short-term option: Consult an HVAC expert about retrofitting of chillers via replacement of thermal expansion valves with electronic ones.	~$8,000	~$1,500	~5.33 yrs	

Site Name	Description of potential opportunity	Indicative costs	Est. cost savings	Simple payback	Est. emissions abatement
	Short-term option: Implement variable speed drive (VSD) control for the chilled water pump supplying the air handling units (AHUs) and fan coil units (FCUs).	~$12,000	~$2,500	~4.80 yrs	
	Short-term option: Evaluate the case for variable air volume (VAV) with variable speed drive (VSD) controls to supply fans, particularly for AHU 3 and AHU 4.	~$22,000	~$3,500	~6.29 yrs	
	Short-term option: Review ceiling insulation and other factors to optimise energy usage for heating or cooling and reduce peak demand for the hall and stage areas.	***Not assessed*** – assumed Council incurs minimal costs for implementing the measure.			
	Short-term option: Check if building management system (BMS) can be set to a 365-day schedule to turn off systems on holidays, saving up to ten days of weekday demand.	***Not assessed*** – assumed Council incurs minimal costs for implementing the measure.			
Papilio Early Learning	*Short-term option:* Upgrade all non-LED light fixtures, including ~35 twin-36W fluorescent fittings and a few compact fluorescent lamps (CFLs), to LED counterparts.	$4,000	$1,048	3.82 yrs	2.14 t CO_2-e
Riverside Pre School	*Short-term option:* Educate staff on prudent air conditioning use.	***Not assessed*** – assumed Council incurs minimal costs for implementing the measure.			
	Short-term option: Consider linking AC operation to the opening of external doors.	***Not assessed*** – assumed Council incurs minimal costs for implementing the measure.			
Weil Park Hall	*Short-term option:* Upgrade the surface fluorescent lights with equivalent LED fixtures.	$1,000	$49	20.3 yrs	0.100 t CO_2-e
Total		**~$58,200**	**>$11,564**	**<5.03 yrs**	**2.46 t CO_2-e**

List of amenities that were not visually assessed but were included in carbon inventory:

- Weil park – Toilet block
- Valentia Street Wharf – Toilet
- Clarkes Point Reserve – Toilet block
- Bedlam Bay – Toilet block
- Riverglade reserve – Toilet block (I believe this is solar)
- Gladesville reserve will have a new amenities block
- Buffalo Creek reserve – Toilet Block
- Boronia North (High street) – Toilet block
- Boronia Park – New and old amenities buildings
- Woolwich Baths – amenities

Appendix C – Establishing the emissions boundary

Defining the emissions boundary marks the first step in the carbon accounting process. The boundary denotes the coverage and extent of the carbon account, determined through a set of criteria designed to identify emission sources and decide which of the identified sources are to be included or excluded.

Emission sources under the Climate Active standard

Under the Australian Government's Climate Active standard, the following emission sources – Scopes 1 and 2, as well as relevant Scope 3 emission sources – are to be assessed for inclusion or exclusion in an organisation's emissions boundary.

1. Stationary energy and fuel used in buildings, machinery or vehicles under Council's control (e.g. natural gas, fuel consumption for generators or vehicles)
2. Electricity consumption in buildings, machinery or vehicles under Council's control
3. All other emissions likely to be influenced by Council must be assessed for relevance

Broad categories of Scope 3 emission sources for consideration include:

- Purchased goods and services.
- Capital goods
- Fuel- and energy-related activities (not included in Scope 1 or Scope 2)
- Upstream transportation and distribution
- Waste generated in operations
- Business travel
- Employee commuting
- Upstream leased assets
- Downstream transportation and distribution
- Processing of sold products
- Use of sold products
- End-of-life treatment of sold products
- Downstream leased assets
- Franchises
- Investments

Relevance test

The 'relevance test' under Climate Active determines whether an emission source aside from stationary energy, fuel and electricity under the operational control of an organisation, should be included or excluded from the emissions boundary. An emission source can be excluded if fewer than two of the five relevance criteria shown in TABLE 16 below are met.

TABLE 16: RELEVANCE TEST CRITERIA UNDER CLIMATE ACTIVE

Criteria	Description
Size	Emissions from this source are large compared to the organisation's Scope 1 and 2 emissions.
Influence	The organisation is able to influence or reduce these emissions.
Stakeholder	Stakeholders (e.g. the community) would consider these emissions critical.
Risk	These emissions contribute to the organisation's GHG risk exposure.
Outsourcing	These emissions come from activities previously undertaken by the organisation but now outsourced.

Included and excluded emission sources

As per Climate Active guidelines, an organisation's carbon footprint must include all relevant Scope 1, 2, and 3 emissions. FIGURE 22 shows the procedure for determining whether a Scope 3 emission source is included or excluded according to the Climate Active standard. Non-relevant emission sources can be excluded from the boundary. Relevant emission sources for which data is unavailable or calculated emissions are deemed immaterial can be non-quantified but must be included in the boundary.

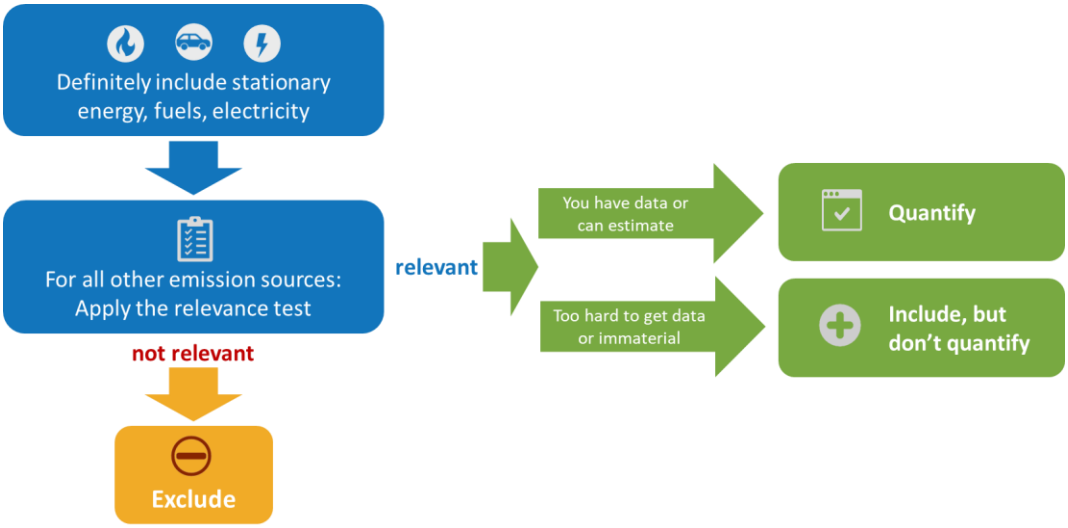


FIGURE 22: IDENTIFYING INCLUDED AND EXCLUDED EMISSION SOURCES UNDER CLIMATE ACTIVE

Appendix D – Grant funding project options

Hunter's Hill Council can consider packaging up various emission reduction opportunities identified in this report into well-defined project proposals that align with the objectives of grant programs like the Commonwealth Government's Community Energy Upgrades Fund (CEUF). By developing clear, actionable plans that highlight energy efficiency improvements, renewable energy installations, or other electrification-related initiatives, Council can increase its chances of securing funding to support these projects.

The CEUF program is designed to support councils to reduce their energy consumption, costs, and emissions by upgrading energy infrastructure. The CEUF provides financial assistance to help with projects that improve energy efficiency, install renewable energy systems like solar panels, or make other upgrades that lead to significant energy savings. Through this program, eligible applicants can access up to 50% funding to support the transition to lower-energy operations.

For Council's consideration, this section provides a grouping of the key identified measures into three distinct projects, each aimed at maximising energy savings and emission reductions. Any or all of these projects can be pursued through the CEUF program, as they align with the fund's objectives and eligibility criteria.

Solar PV and battery rollout across Council sites

The objective of this project is to significantly reduce Hunter's Hill Council's reliance on grid-supplied electricity by installing solar photovoltaic (PV) systems and batteries across multiple Council sites. The project would enable the rollout of PV and batteries to all sites described in Appendix A.

Key financial and environmental impacts:

- Energy efficiency and reduced energy use: The installation of 69 kW of solar PV and 108 kWh of battery storage is estimated to deliver energy savings of 43.1% across all council sites, significantly reducing the reliance on grid electricity.
- Cost savings: The project is expected to generate Year-1 savings of $20,075, providing immediate financial relief and enabling the council to allocate funds to other important community services or infrastructure.
- Environmental impact: The upgrade is projected to reduce annual greenhouse gas emissions by 75.9 tonnes of CO_2-e, contributing to the council's sustainability goals and efforts to combat climate change by reducing the carbon footprint of its operations.
- Payback period: With a total investment of $191,200 and annual savings of $21,643, the overall simple payback period for the project is estimated at 9.5 years, making it a long-term, financially sound investment.

These figures demonstrate the significant environmental and financial benefits that can be achieved by implementing solar PV systems and batteries across the Hunter's Hill Council sites. In addition, the project would support broader electrification and grid stability objectives through the integration of energy storage technologies. By reducing energy reliance on the grid and taking advantage of renewable energy, the project would help Council position itself for a sustainable future while achieving operational cost savings.

Comprehensive energy efficiency and demand reduction upgrade at the historic Council Chambers

This project would replace outdated HVAC systems at Council Chambers with a high-efficiency heat pump, optimised air distribution with Variable Air Volume (VAV) diffusers, installation of Variable Speed Drive (VSD) fans, and implementation of Power Factor Correction (PFC) equipment. Additionally, the project will include the integration of a Building Management System (BMS) to centralise and automate controls, ensuring maximum efficiency and synergy between all components.

This project includes the following key upgrades:

- Heat pump system replacement:
    - Cost: AUD 52,000 (including labour)
    - A high-efficiency heat pump system will replace the existing cooling-only chiller and electric reheats. This will provide both heating and cooling, significantly reducing energy use and eliminating the need for inefficient electric reheats.
- Variable Air Volume (VAV) with digitally controlled diffusers:
    - Cost: AUD 19,500 (including labour)
    - VAV diffusers will optimise air distribution by delivering conditioned air only where and when needed, reducing unnecessary energy use.
- Variable Speed Drive (VSD) control of EC plug fans in new AHUs:
    - Cost: AUD 39,000 (including labour)
    - VSDs will control fan speeds based on air demand, minimizing energy use during off-peak periods while enhancing air handling efficiency.
- Power Factor Correction (PFC) Equipment (70 kVAr):
    - Cost: AUD 12,000 (including labour)
    - PFC equipment will improve the building's power factor, reducing reactive power and lowering peak demand charges, further optimising energy consumption and load.
- Building Management System (BMS) integration:
    - Cost: AUD 15,000 - 20,000 (including installation and programming)
    - The BMS will centralise control of all HVAC, VAV, VSD, and PFC systems, automating system responses based on real-time building conditions, schedules, and energy demand. The system will also provide remote monitoring, data logging, and predictive maintenance insights.

Key financial and environmental impacts:

- Energy efficiency and reduced energy use: The integration of energy-efficient technologies and a Building Management System (BMS) will lead to an estimated 40-60% reduction in energy consumption for heating, cooling, and ventilation. This substantial reduction will lower the overall energy demand and contribute to more efficient energy use within the facility.
- Cost savings: The upgrade is expected to save between AUD 17,000 and AUD 24,000 annually in energy costs. These savings will contribute to financial sustainability, allowing the organisation to reinvest in other essential services or infrastructure improvements.
- Environmental impact: The energy savings from the upgraded system will help reduce the facility's carbon footprint by cutting down on electricity consumption. This reduction in greenhouse gas emissions supports broader environmental goals and sustainability initiatives.
- Improved power factor and peak demand reduction: Alongside the energy savings, the upgraded system will improve the facility's power factor and help reduce peak demand charges, leading to additional financial savings and optimised energy use.
- Payback period: With a high-end project cost of AUD 142,500 and annual savings between AUD 17,000 and AUD 24,000, the project is expected to pay for itself within 5.9 to 8.4 years. This makes the investment both financially viable and environmentally beneficial over the long term.

Together, these upgrades will reduce energy consumption, lower peak demand, and contribute to the Council's greenhouse gas (GHG) reduction goals. The improvements will also enhance workplace amenity, improve occupant comfort and productivity, and reduce operational complexity.

Sports ground lighting upgrade

This project seeks to convert the existing conventional high-intensity discharge (HID) lamps to energy-efficient LED lighting at 2 of Council's sports grounds. The upgrade will reduce energy consumption, lower maintenance costs, and enhance the quality of lighting on the field, supporting local sports and community activities. The sports ground is a key local asset used by the community for evening training sessions during winter and occasionally for weekend matches.

The following upgrades could be considered:

- Boronia Park 7 towers with 31 HIDs
- Bedlam Bay 4 towers with 9 HIDs

Key financial and environmental impacts:

- Although the council's Power Purchase Agreement (PPA) ensures that all electricity used is sourced from renewable energy, and thus direct emissions are not a concern, this project still supports broader sustainability objectives. By reducing overall energy consumption, the council is demonstrating leadership in energy efficiency and responsible resource management, which aligns with its long-term sustainability commitments.
- The LED lighting upgrade offers significant benefits for Hunters Hill Council. The existing HID lighting system, consisting of 40 lamps across Boronia Park and Bedlam Bay, consumes approximately 31,200 kWh annually, which will be reduced to 9,360 kWh with the implementation of LED lights. This results in an annual energy saving of 21,840 kWh,

significantly improving energy efficiency at these sites. These calculations are based on the following assumptions:

- Each HID lamp consumes 1.0 kW, and each LED lamp consumes 0.3 kW.
- The lights operate for 3 hours per day, Monday to Friday, across 52 weeks per year, for a total of 780 operating hours annually.
- The electricity cost is assumed to be $0.25 per kWh.
- The reduction in energy consumption translates to annual financial savings of approximately $5,460, which can be reinvested into other community-focused initiatives and infrastructure projects. These cost savings reflect the reduced energy demand and improved efficiency provided by the LED system.

Appendix E – Stakeholder engagement on community emissions reduction

Attitudes towards climate change

To understand community attitudes toward climate change, a survey was conducted focusing on the perceived effects, local impacts, and motivations for action.

Survey respondents expressed the greatest concern for the long-term effects of climate change on future generations and societal well-being. This was closely followed by concerns over extreme weather conditions and rising temperatures, which are increasingly affecting daily life. Infrastructure and adaptation challenges were also highlighted, reflecting an awareness of the need to upgrade local systems to withstand climate changes. Some participants expressed frustration with government and community inaction, viewing it as a barrier to progress. Biodiversity loss and environmental degradation were mentioned by a smaller number of respondents but remain a key environmental concern.

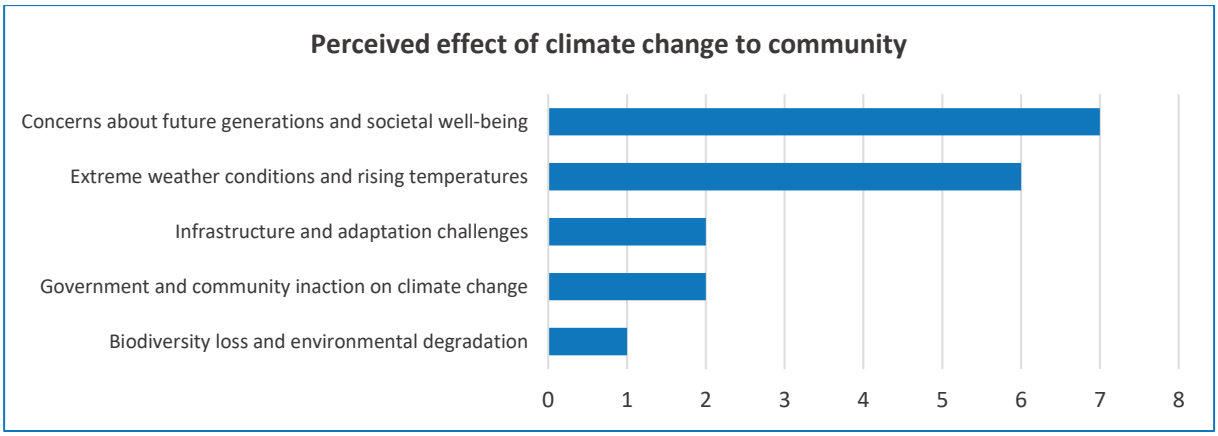


FIGURE 23: PERCEIVED EFFECT OF CLIMATE CHANGE TO THE COMMUNITY

Locally, the most pressing concerns include the urban heat island effect during summer, which amplifies heatwaves, and the impact on local biodiversity, especially in parks and gardens. Both were mentioned frequently in the survey. Additionally, respondents showed concern about the increased risk of bushfires in surrounding areas, which has become more pronounced in recent years due to changing environmental conditions. While other issues were raised, they did not receive as much focus as these primary concerns.

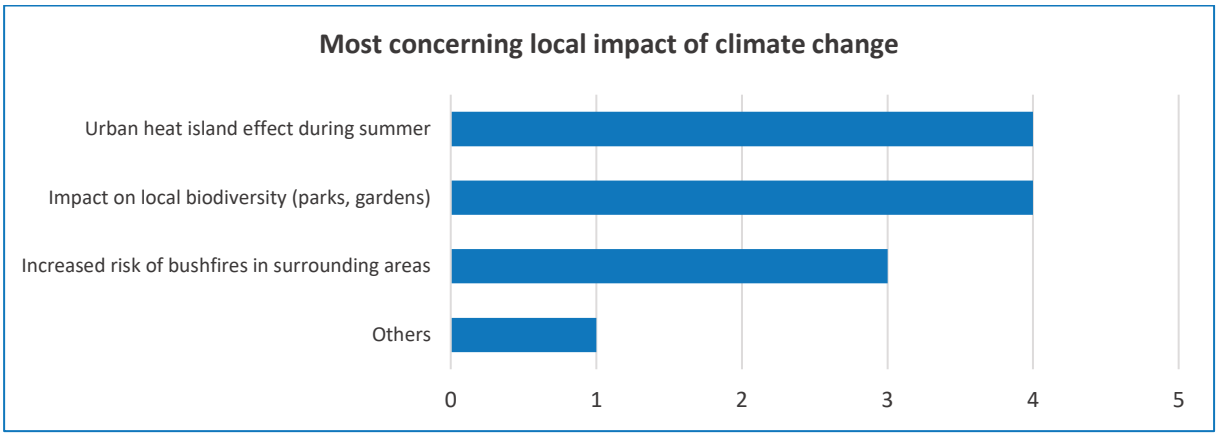


FIGURE 24: MOST CONCERNING LOCAL IMPACT OF CLIMATE CHANGE

In terms of motivations for taking action on climate change, the survey results show a strong focus on ensuring a sustainable future for the next generations, which emerged as the community's top priority. Preserving biodiversity and natural habitats is also highly valued, with respondents recognising the importance of protecting local ecosystems. Protection from extreme weather events, though considered important, ranked lower than long-term sustainability goals. Other motivations, such as preventing the impacts of rising sea levels or reducing economic risks, were noted but received less emphasis.

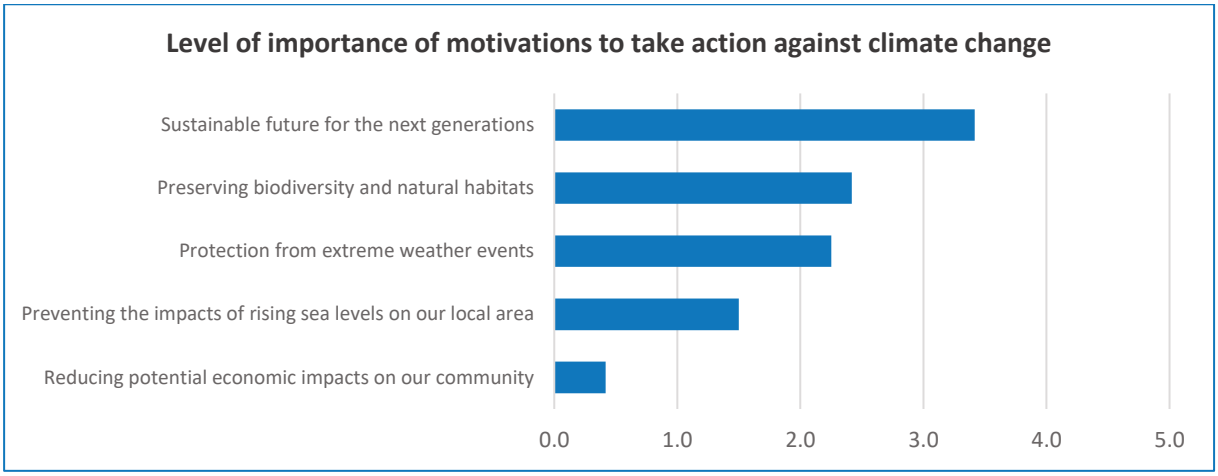


FIGURE 25: LEVEL OF IMPORTANCE OF MOTIVATIONS TO TAKE ACTIONS AGAINST CLIMATE CHANGE

The ranking of motivations for climate action, as shown in the survey, further supports the community's focus on long-term sustainability and environmental preservation. The top motivation, ensuring a sustainable future for the next generations, underscores the community's prioritisation of the welfare of future societies. Similarly, preserving biodiversity and natural habitats received strong support, aligning with the high value placed on protecting local ecosystems. While the protection from extreme weather events is considered a significant concern, it ranks lower than the broader sustainability goals. Issues such as preventing the impacts of rising sea levels and mitigating potential economic risks were less prominent, indicating that while these are still seen as important, they do not drive community action as strongly as the larger, future-focused environmental concerns.

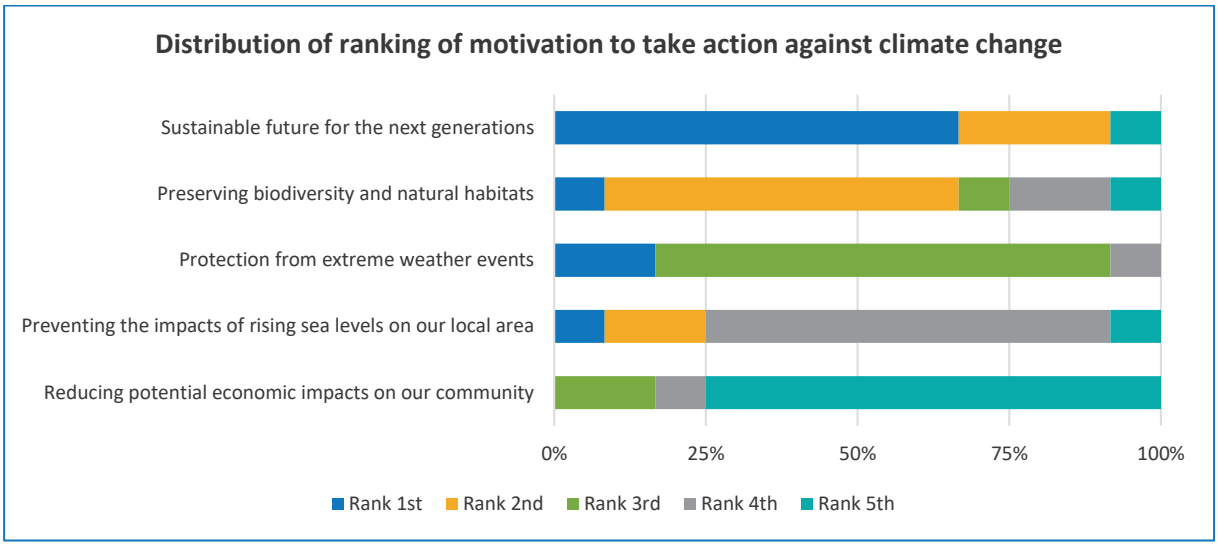


FIGURE 26: DISTRIBUTION OF RANKING OF MOTIVATION TO TAKE ACTION AGAINST CLIMATE CHANGE

Existing initiatives

Community perceptions on the effectiveness of local initiatives in reducing emissions was also assessed focusing on various strategies currently in place. Respondents overwhelmingly viewed waste management and recycling efforts as the most effective initiative. This indicates strong community support for these programs as essential tools in minimising emissions and addressing environmental challenges. Transportation alternatives, such as cycling and public transit, also ranked highly, with many respondents recognising their importance in reducing reliance on vehicles that contribute to high emissions. Similarly, renewable energy installations, particularly solar panels, were seen as an effective solution for clean energy generation and emissions reduction. However, green space and biodiversity conservation, as well as energy efficiency programs, were regarded as less impactful in comparison to the top three strategies, though still valued by the community.

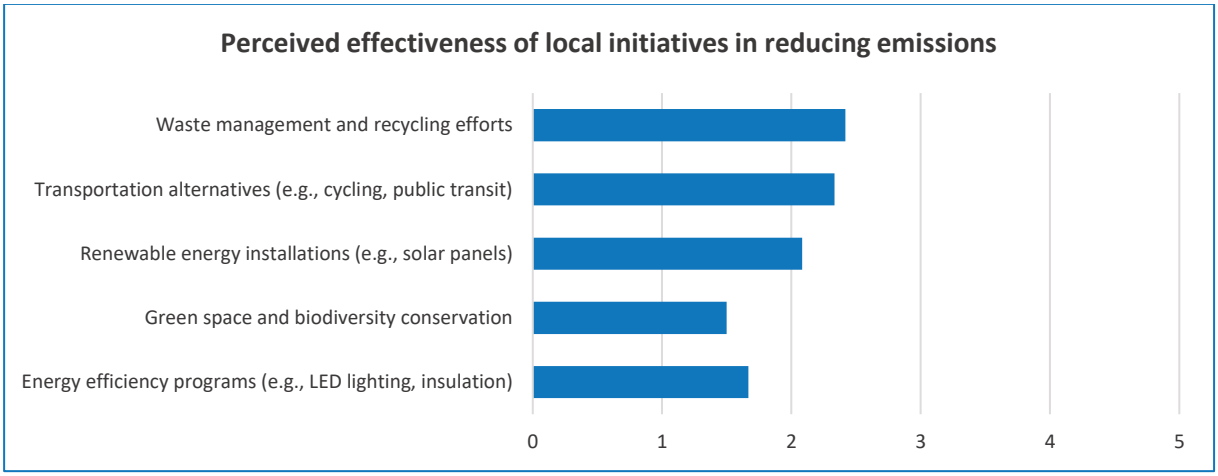


FIGURE 27: PERCEIVED EFFECTIVENESS OF LOCAL INITIATIVES IN REDUCING EMISSIONS

In addition to identifying the perceived effectiveness of these initiatives, the survey also asked respondents to rank them according to their importance. Waste management and recycling, renewable energy installations, and transportation alternatives remained prominent in these rankings,

with a majority of respondents placing them at the top. Green space conservation and energy efficiency programs, though receiving some high rankings, were often placed lower. This suggests that while these initiatives are recognized as important, they are perceived as having a more indirect or long-term impact on reducing emissions. The detailed rankings provide insight into the community's preferences, showing a clear focus on immediate and practical solutions for climate action.

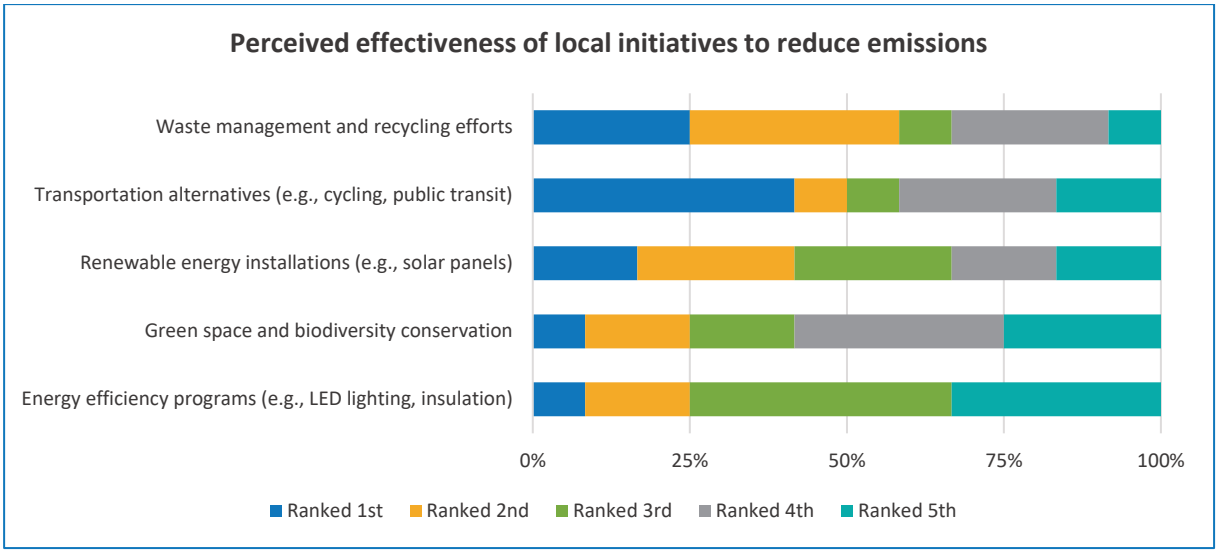


FIGURE 28: PERCEIVED EFFECTIVENESS OF LOCAL INITIATIVES TO REDUCE EMISSIONS

The survey also explored which initiatives the community believes the council should prioritize. Improved waste management and the development of micro forests and gardens were seen as critical areas for future action, reflecting a strong desire for sustainable practices and enhanced green spaces to combat climate change. Respondents also highlighted the need for walk and bike tracks, emphasizing the importance of alternative modes of transportation that align with emissions reduction goals. While there was recognition of the importance of electric vehicle charging stations and smaller waste bins, these initiatives were seen as less urgent, with the community favouring broader and more systemic changes in waste management and green infrastructure over these more specific measures.

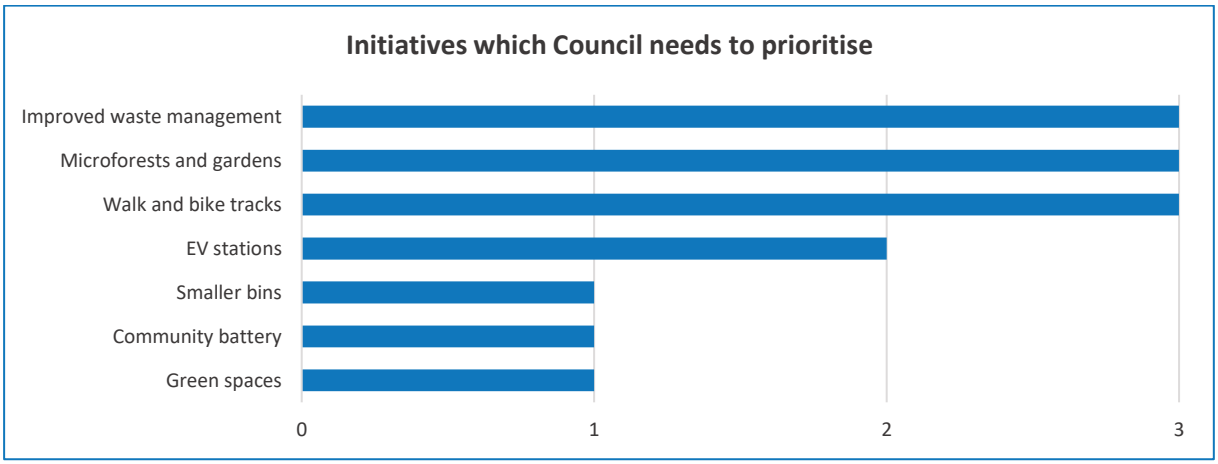


FIGURE 29: INITIATIVES WHICH COUNCIL NEEDS TO PRIORITISE

Targeting waste

This section analyses community involvement and perceptions related to waste reduction initiatives. These insights help understand how current and planned activities, along with the challenges and support required, shape local waste management strategies. From composting at home to public engagement in recycling, the community demonstrates strong participation, while also highlighting areas for further improvement.

FIGURE 30 shows high levels of community participation in various waste reduction activities. Composting organic waste at home, reducing single-use plastic usage, and kerbside recycling were the most common activities, with participation levels all reaching 11 responses. Reusing or repairing items and buying or selling second-hand goods were also popular, though slightly lower in frequency. The community clean-up efforts, while still significant, saw lower engagement, indicating that community-wide, organized waste management activities are less commonly practiced than individual or household-level actions. "Other" initiatives were the least mentioned, showing that the primary focus remains on established practices like composting and recycling.

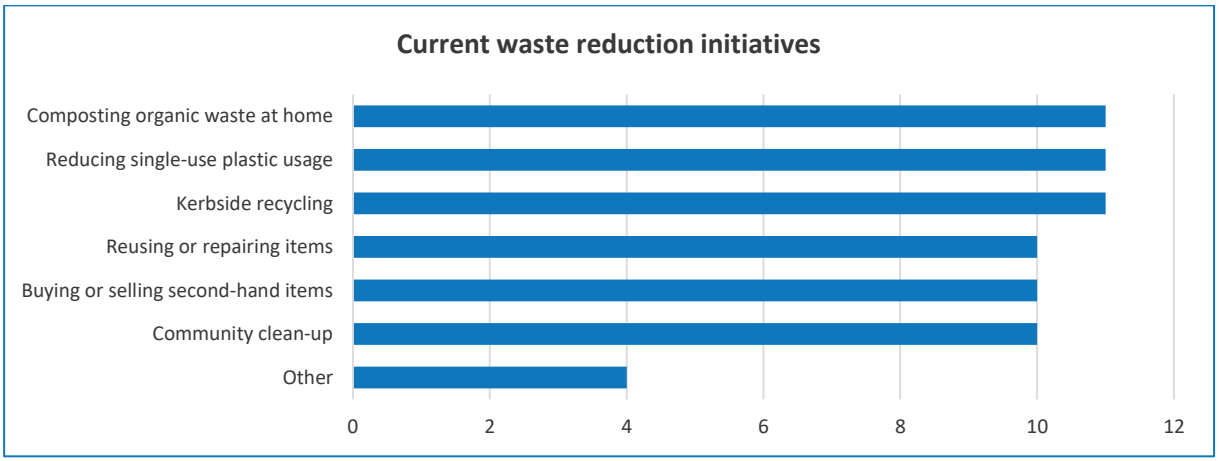


FIGURE 30: CURRENT WASTE REDUCTION INITIATIVES

The chart below reflects the community's future intentions to engage in waste reduction. Composting organic waste and reusing or repairing items remained the top planned initiatives, showing continuity in the community's environmental consciousness. Interestingly, activities like reducing single-use plastics, buying second-hand items, and kerbside recycling showed less future intent compared to current participation levels. This may indicate that some members of the community believe they have already optimized these practices or that there is less room for expansion. The "Other" category appeared more prominently in future planning, possibly reflecting emerging ideas or alternative solutions for waste reduction.

FIGURE 31: PLANNED WASTE REDUCTION INITIATIVES

FIGURE 32 highlights areas where the community feels improvements are necessary to overcome barriers to effective waste management. The largest area of focus is the improvement of waste management systems, indicating that many see systemic issues as the primary challenge. Community education and participation also emerged as important, with respondents emphasizing the need for awareness and collective action. Improvements in public transport and cycling infrastructure were mentioned but ranked lower, suggesting that transportation-related challenges may not be viewed as directly related to waste reduction compared to more specific waste management actions.

FIGURE 32: ACTIONS TO ADDRESS CHALLENGES IN WASTE REDUCTION

The final chart below examines ways to increase community participation in these initiatives. Waste education and awareness through events emerged as the most critical method for increasing engagement. Composting and waste sorting enforcement also garnered significant support, reflecting the community's desire for structured and accountable waste management practices. Accountability of waste collectors and the enforcement of proper waste sorting were important, but slightly less so, indicating a belief that better public education might naturally lead to improved waste practices. Interestingly, regular feedback and communication about recycling efforts were ranked lowest, which suggests that while respondents value actions, they may not feel as strongly about ongoing communication or monitoring efforts.

FIGURE 33: ENGAGING COMMUNITY IN WASTE REDUCTION AND RECYCLING EFFORTS

The above analyses show a community that is already heavily involved in waste reduction practices but also recognizes the need for improved waste management systems and further public education to overcome existing barriers and enhance participation in recycling and composting efforts.

Targeting transportation

The following charts provide insights into the community's current and planned transport-related initiatives, as well as the perceived barriers to reducing transport emissions. The analysis highlights the community's preferences for public transport, active modes of travel, and electric vehicle adoption, along with the challenges they face in implementing these changes. Understanding these factors is crucial for designing effective strategies to reduce transport emissions in the community.

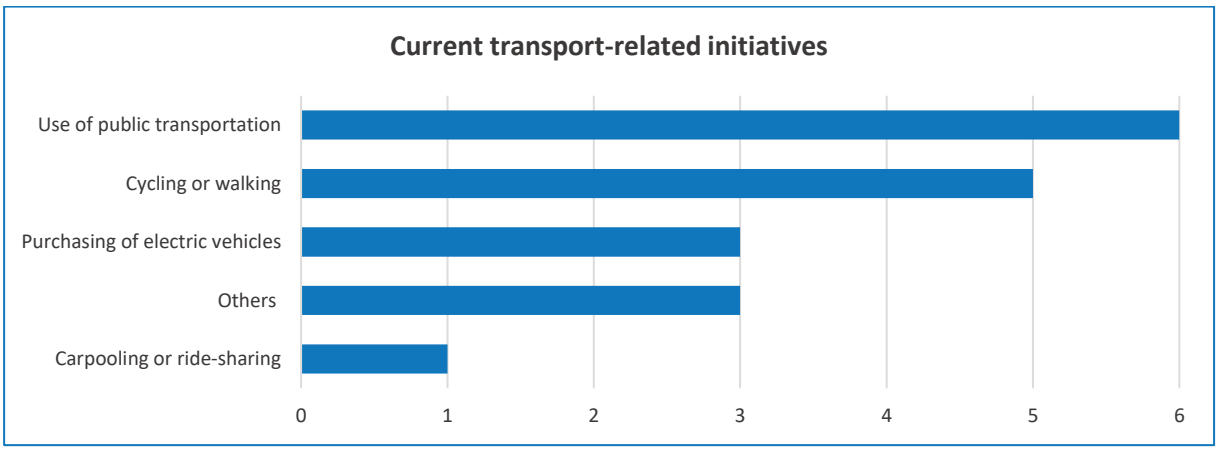


FIGURE 34: CURRENT TRANSPORT-RELATED INITIATIVES

The chart above demonstrates the community's current transport habits. The use of public transportation is the most popular initiative, followed closely by cycling or walking, reflecting a strong preference for low-emission modes of transportation. The purchasing of electric vehicles ranks third, indicating that while there is growing interest in EVs, they have not yet surpassed public or active transport options. Other unspecified initiatives are relatively common, while carpooling or ridesharing remains the least adopted, suggesting that collective vehicle use is less favoured compared to individual or mass transportation methods.

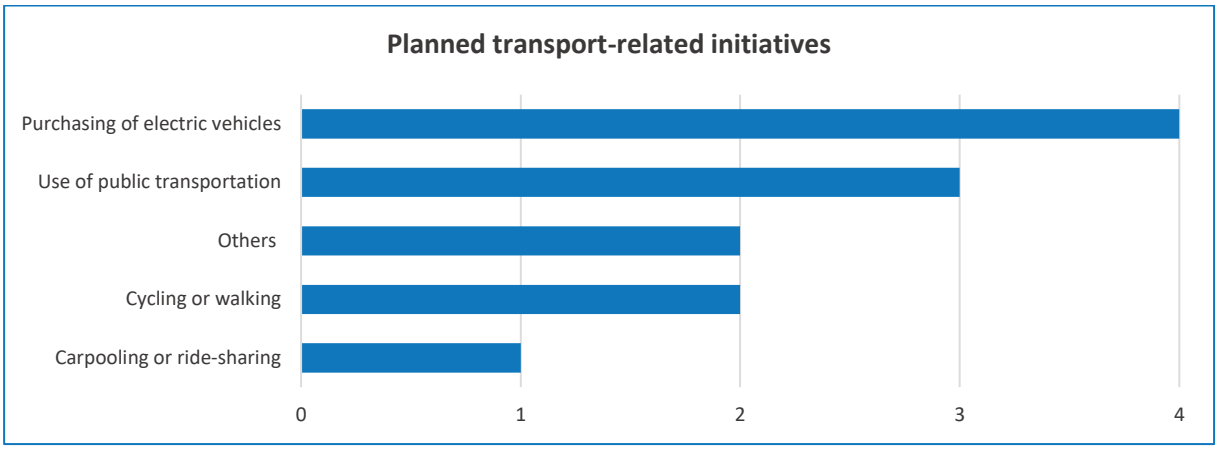


FIGURE 35: PLANNED TRANSPORT-RELATED INITIATIVES

FIGURE 35 provides insight into the community's future transportation plans. Interestingly, the purchasing of electric vehicles is the top planned initiative, suggesting a shift towards personal electric mobility. This indicates that while public transportation is currently more widely used, there is a growing intention to invest in electric vehicles. The use of public transportation still ranks highly in future, maintaining its importance. Cycling or walking, while a popular current practice, sees less future growth compared to the rise in electric vehicle adoption. Carpooling or ridesharing, though still minimal, remains a future option for some community members.

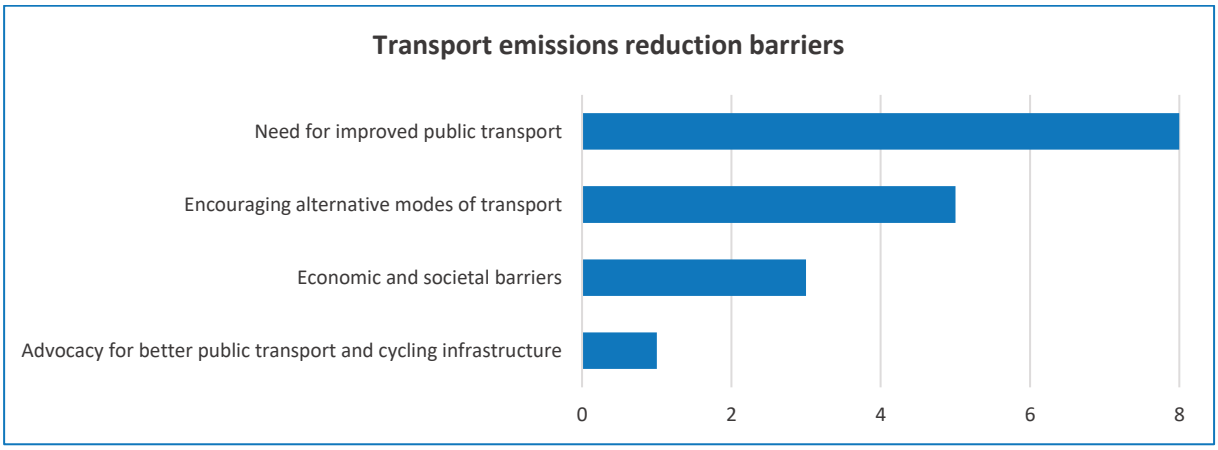


FIGURE 36: TRANSPORT EMISSION REDUCTION INITIATIVES

The third chart above highlights the key challenges the community faces in reducing transport-related emissions. The most significant barrier is the need for improved public transport, emphasizing the community's desire for more efficient and accessible transportation options. Encouraging alternative modes of transport, such as cycling and walking, is another important challenge, indicating a need for infrastructure or incentives to promote these options. Economic and societal barriers, such as the cost of new technologies or societal resistance to change, also pose challenges. Advocacy for better transport infrastructure appears to be less of a focus compared to these broader systemic barriers.

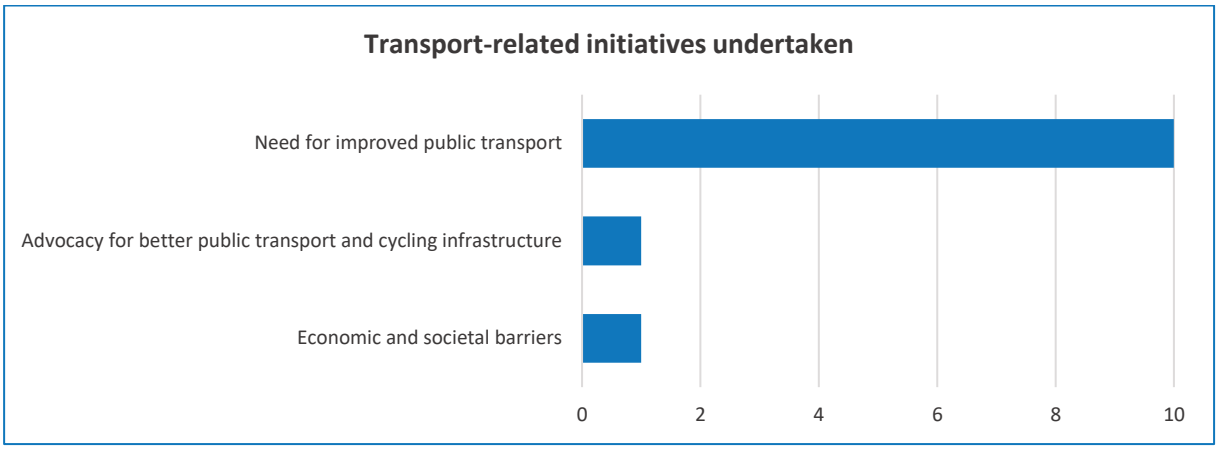


FIGURE 37: TRANSPORT-RELATED INITIATIVES UNDERTAKEN

The final chart reflects the community's efforts to address transport issues. The predominant focus has been on improving public transport, which aligns with the identified barrier of needing better services in this area. Advocacy for better public transport and cycling infrastructure is also underway but at a smaller scale. Addressing economic and societal barriers has seen some attention, though it remains less emphasized compared to the drive for better transport services.

In summary, the survey reveals that while public transportation and active travel modes are currently popular, there is a strong emerging interest in electric vehicles for future use. However, the community faces significant barriers, particularly in improving public transportation and overcoming economic challenges, that must be addressed to further reduce transport emissions.

Targeting energy

This section explores the community's current and planned energy-related initiatives, as well as the key opportunities for reducing energy-related emissions. They provide a snapshot of where the community is actively engaged in energy efficiency and renewable solutions and where there is potential for further improvements. Understanding these insights helps guide the community's focus toward more sustainable energy practices.

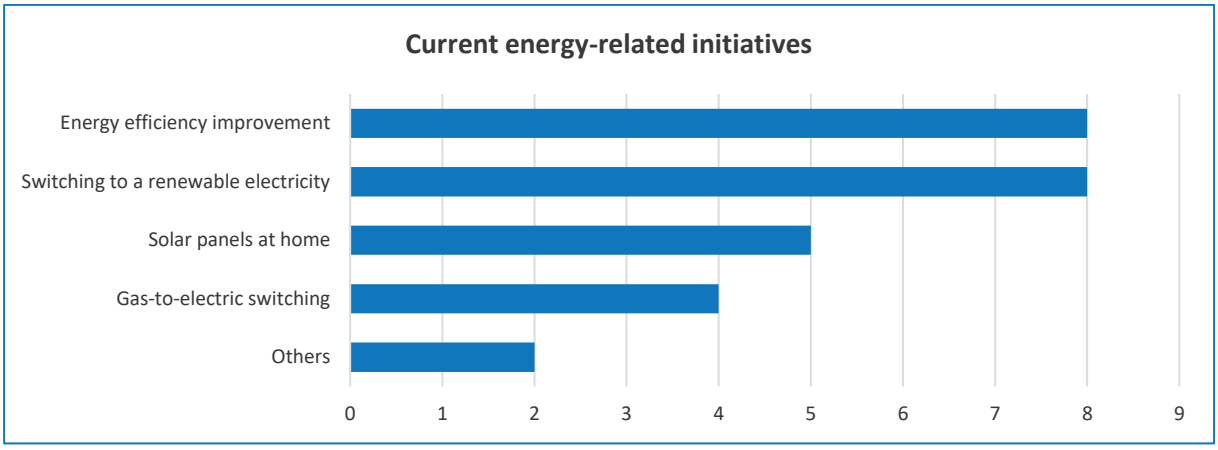


FIGURE 38: CURRENT ENERGY-RELATED INITIATIVES

The figure above reveals that the community is actively engaged in energy efficiency improvements and switching to renewable electricity. These two initiatives were the most common actions, showing strong support for reducing energy consumption and transitioning to cleaner energy sources. Solar panel installations at home are also a popular choice, indicating a significant uptake of personal renewable energy generation. Gas-to-electric switching, while not as widely adopted as the other initiatives, still shows a notable level of engagement. "Other" initiatives were less frequently mentioned, indicating that the community tends to focus on well-established practices for energy efficiency and renewable energy use.

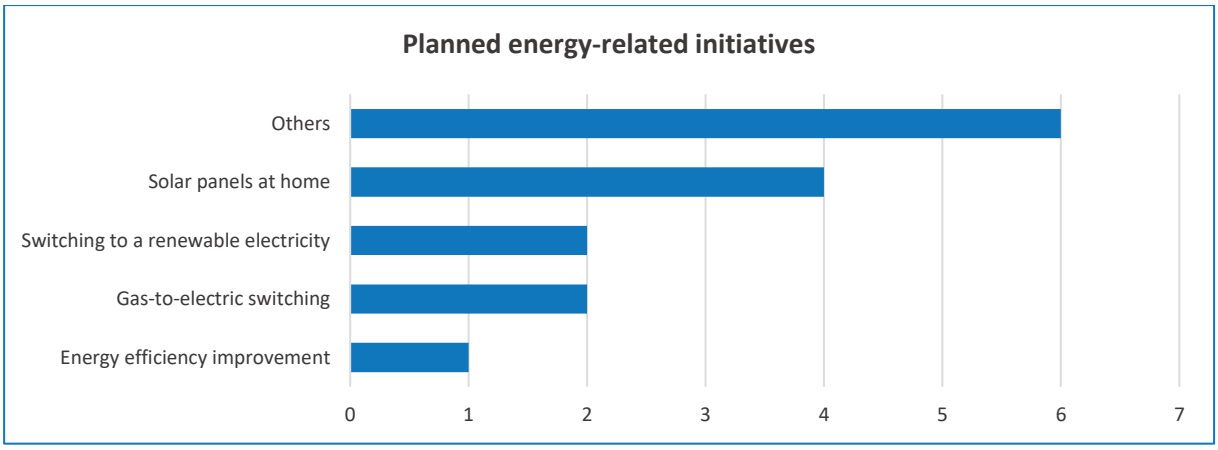


FIGURE 39: PLANNED ENERGY-RELATED INITIATIVES

The second chart reflects the community's future intentions regarding energy practices. "Others" lead the planned initiatives, suggesting that new or emerging energy solutions are gaining interest. Solar panels at home continue to be a popular future plan, highlighting ongoing interest in personal renewable energy generation. Switching to renewable electricity and gas-to-electric switching also feature in future plans, though their intent is less than for solar panel adoption. Energy efficiency improvements, while significant in current practices, seem to receive less focus in future planning, which might indicate that many have already optimized these efforts or perceive limited additional benefits.

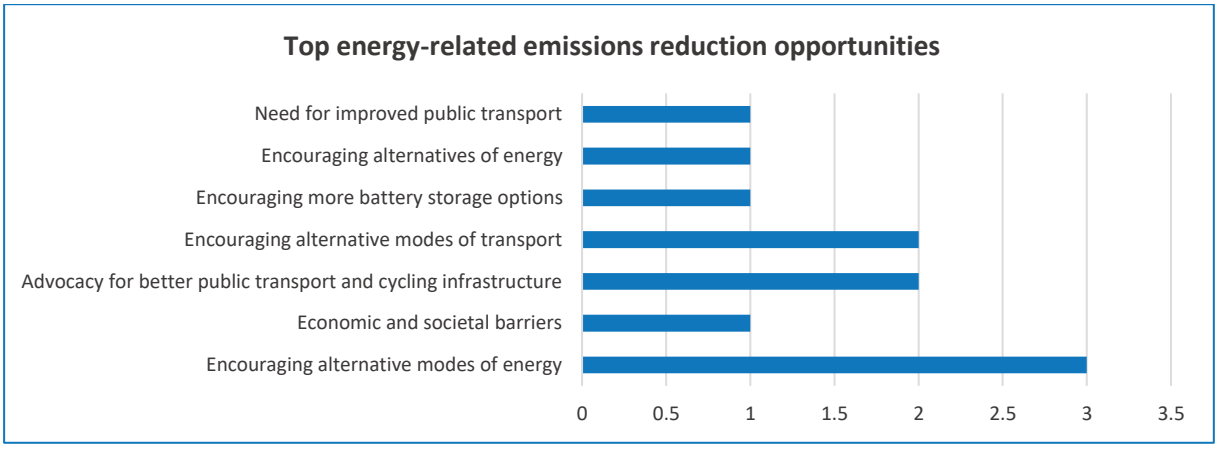


FIGURE 40: TOP ENERGY-RELATED EMISSIONS REDUCTION OPPORTUNITIES

The last chart above identifies key areas where the community sees potential for reducing energy-related emissions. Encouraging alternative modes of energy is seen as the most significant opportunity, reflecting the community's desire to diversify energy sources and reduce reliance on traditional, high-emission energy. Advocacy for better public transport and cycling infrastructure, along with encouraging alternative modes of transport, were also identified as important areas for emissions reduction, suggesting a strong link between energy efficiency and transportation solutions. Encouraging battery storage options and promoting alternatives to energy sources also offer viable opportunities. While economic and societal barriers remain, they are seen as less of an obstacle compared to the focus on energy diversification and improved infrastructure.

In summary, these charts show that the community is deeply engaged in energy efficiency and renewable energy practices, with strong future interest in expanding these efforts. The emphasis on alternative energy sources and transportation solutions as key emissions reduction opportunities suggests that the community is looking for comprehensive and integrated approaches to achieving a low-carbon future.

Barriers and support

This section examines the barriers faced by households in reducing emissions and the potential areas where Hunter's Hill Council can support the community in transitioning to a low-carbon future. The data provides insights into the obstacles related to changing habits, the cost of sustainable practices, and areas where council intervention could help accelerate sustainability efforts.

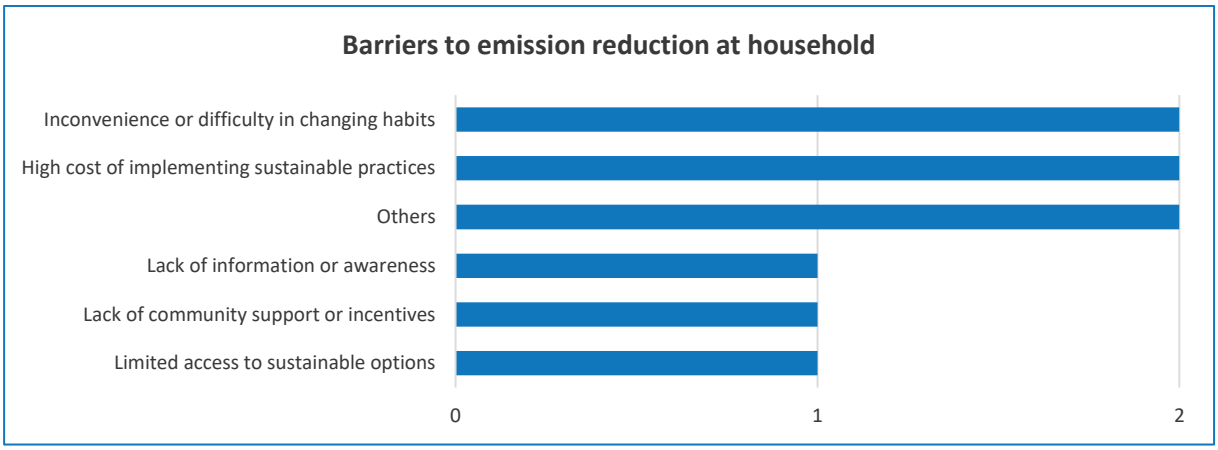


FIGURE 41: BARRIERS TO EMISSION REDUCTION AT HOUSEHOLDS

FIGURE 41 above highlights the main challenges individuals face when trying to adopt sustainable practices. Inconvenience or difficulty in changing habits and the high cost of implementing sustainable practices are cited as the most significant barriers. This indicates that both behavioural and financial factors are major hurdles for households. Lack of information or awareness and limited access to sustainable options also hinder emissions reduction efforts. The chart shows that these barriers are relatively balanced across respondents, suggesting that addressing one or a combination of these issues could significantly ease the transition to lower emissions.

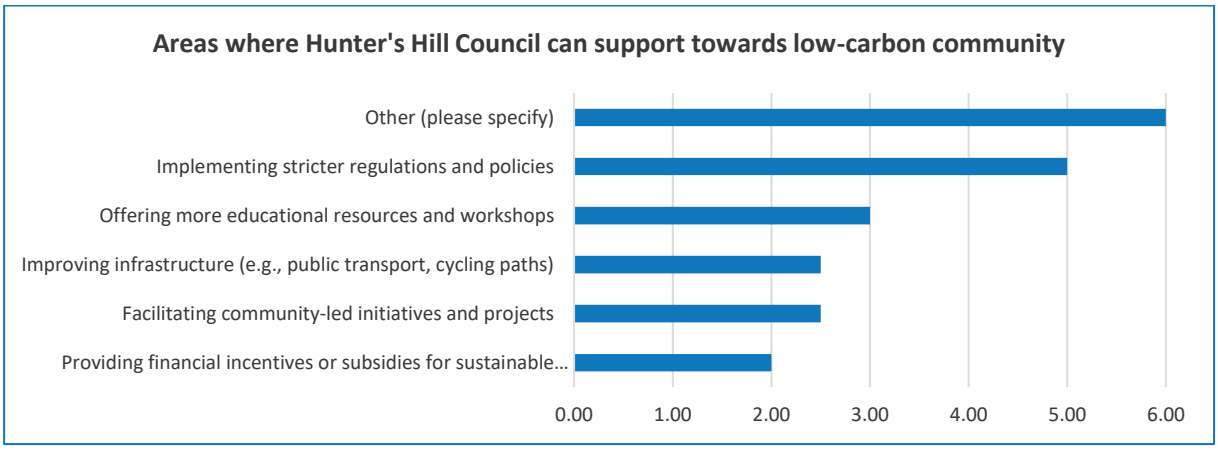


FIGURE 42: AREAS WHERE HUNTER'S HILL COUNCIL CAN SUPPORT TOWARDS A LOW-CARBON COMMUNITY

The chart above highlights the top areas where the council can play a role. "Other" initiatives lead the chart, suggesting that residents may have additional ideas or needs not captured by traditional categories. Implementing stricter regulations and policies is the second highest-ranked area, indicating that residents see value in strong governance to enforce sustainable practices. Offering more educational resources and workshops also ranks highly, reflecting the community's desire for knowledge and guidance. Infrastructure improvements, such as public transport and cycling paths, along with facilitating community-led initiatives, are seen as valuable ways the council can support the community in achieving lower emissions.

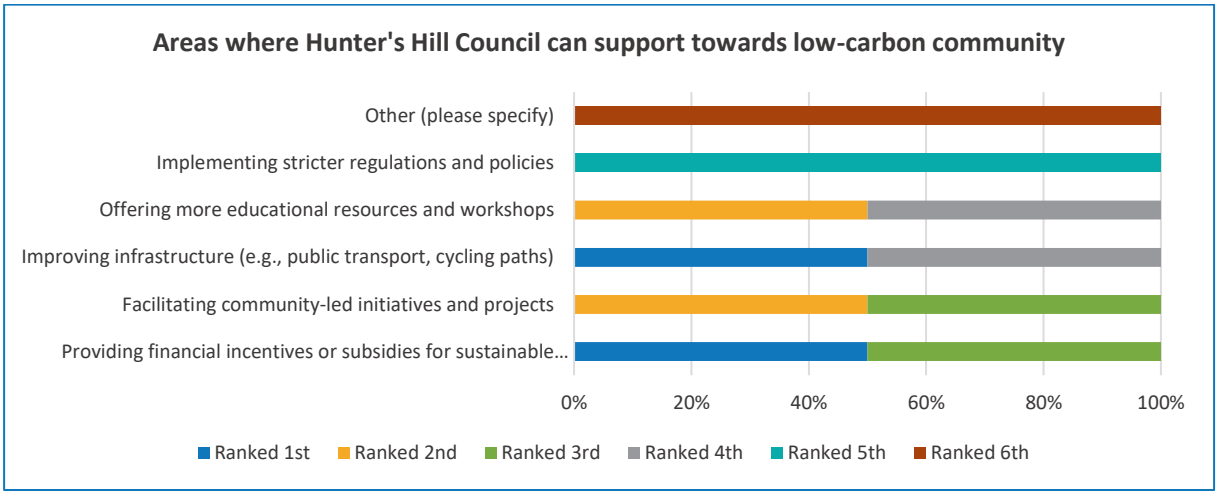


FIGURE 43: RANKING AREAS WHERE HUNTER'S HILL COUNCIL CAN SUPPORT TOWARDS A LOW-CARBON COMMUNITY

The third chart above provides a detailed ranking of how residents prioritize the council's role in supporting a low-carbon community. Implementing stricter regulations and policies ranks high across multiple categories, reaffirming the importance of government action. Providing financial incentives or subsidies for sustainable practices is particularly important, as many residents ranked this area first or second, emphasizing the financial burden of sustainability transitions. Community-led initiatives and

improving infrastructure are also well-supported, suggesting that the community values a combination of top-down and grassroots approaches to emission reduction.

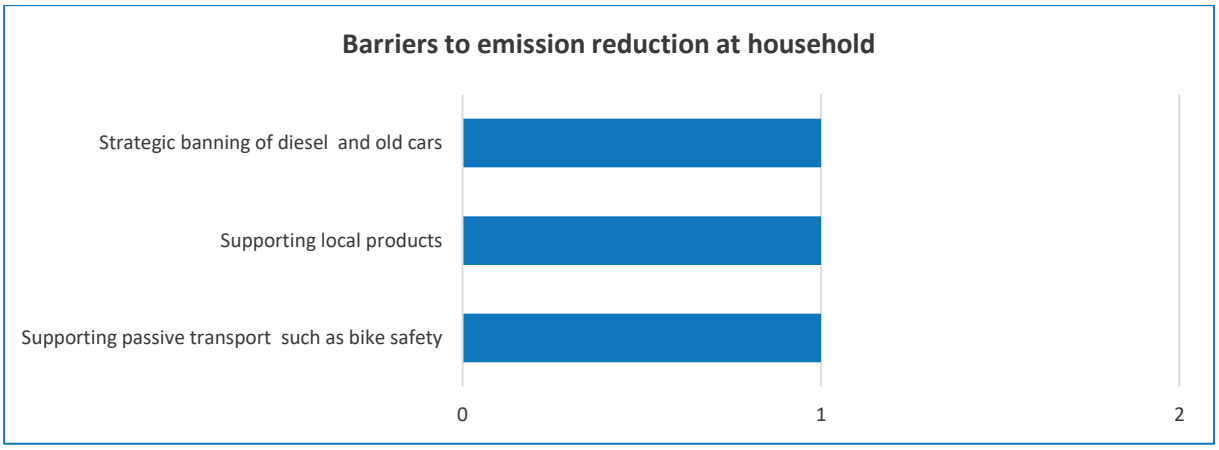


FIGURE 44: BARRIERS TO EMISSION REDUCTION AT HOUSEHOLDS

The final chart above addresses more specific challenges, such as the "strategic banning of diesel and old cars" and the need for "supporting local products" and "supporting passive transport such as bike safety." These barriers show that transportation-related emissions remain a key concern, and households see regulatory and safety measures as crucial steps toward reducing their carbon footprint.

These charts collectively suggest that while households face significant barriers to reducing emissions, including financial, behavioural, and structural challenges, there is a clear appetite for council support in the form of regulations, incentives, and infrastructure improvements. Addressing these barriers in a comprehensive manner will help the community transition toward a more sustainable and low-carbon future.

Appendix F – Council's activity data for FY 2023

The following sections detail the activity data used to estimate greenhouse gas emissions for each emission source in Council's carbon footprint for FY 2023.

Natural gas

Natural gas used for purposes such as cooking, water heating, and space heating at the Gladesville Road Community Centre and Boronia Park Grandstand represents a minor portion (i.e. ~0.1%) of Council's total emissions. Generated reports from Council's energy reporting system were extracted for usage data in FY 2023. TABLE 17 below shows estimated usage at the two Council sites confirmed to receive piped natural gas.

TABLE 17: HUNTER'S HILL COUNCIL – NATURAL GAS USE IN FY 2023

Site Name	Site Address	Gas usage in FY 2023 (GJ)
Gladesville Road Community Centre	44 Gladesville Rd, Hunter's Hill	1.26
Boronia Park Grandstand	Park Rd, Boronia Park	0.46
Total		**1.72**

Stationary fuel

Petrol fuel used for Council-owned power tools such as chainsaws and whipper snippers accounts for 4% of Council's total emissions. Based on Council's internal fuel record, which includes detailed information on equipment type, purchased fuel volume, type and cost, a total of **1.39 kL** of unleaded petrol was consumed for powering stationary equipment in FY 2023.

Fleet fuel

Fuel used for Council's light and heavy fleet makes up about 86% of the total emissions. Diesel, the primary fuel type, alone reflects 52% of the total emissions, while petrol usage accounts for the remaining 34%. Based on Council's internal fuel record, diesel-operated equipment includes a backhoe, tractor, five ride-on mowers, three trucks, and four utility vehicles; petrol-operated equipment includes a sedan, a wagon, two sports utility vehicles (SUVs) and two more utility vehicles. TABLE 18 below summarises fuel usage by type in FY 2023:

TABLE 18: HUNTER'S HILL COUNCIL – FLEET FUEL USE IN FY 2023

Fuel type	Fuel usage in FY 2023 (kL)
Diesel	15.0
Petrol	11.2

Electricity

Council has established a renewable energy power purchase agreement (PPA) for use in streetlighting and operations at Council assets, effective initially from July 1 2022, to December 31 2026. As per the latest Climate Active guidelines on accounting for electricity emissions[8], under the market-based approach, grid electricity usage under a PPA may only be claimed as zero emissions (i.e. assigned an emission factor of zero) through surrendering of large-scale generation certificates (LGCs). With generated LGCs through PPA surrendered, purchased grid electricity does not contribute emissions to Council's carbon footprint.

To show how grid electricity is consumed at Council facilities, usage data in FY 2023 was extracted from Council's energy reporting system. TABLE 19 and TABLE 20 below summarise Council's grid electricity usage by asset type and sub-type for FY 2023.

TABLE 19: HUNTER'S HILL COUNCIL – GRID ELECTRICITY USE IN FY 2023 BY ASSET TYPE

Council asset type	Electricity usage in FY 2023	Percentage
Streetlighting	315,923 kWh	52.9%
Council facilities	281,387 kWh	47.1%
Total	**597,310 kWh**	**100%**

TABLE 20: HUNTER'S HILL COUNCIL – GRID ELECTRICITY USE IN FY 2023 BY ASSET SUB-TYPE

Council asset sub-type	Electricity usage in FY 2023	Percentage
Streetlighting	315,923 kWh	52.9%
Council Chambers and Town Hall	168,414 kWh	28.2%
Community Services	33,475 kWh	5.6%
Sports and Recreation	32,725 kWh	5.5%
Parks and Bushland	15,163 kWh	2.5%
Other Council Buildings	13,576 kWh	2.3%
Children Services	10,308 kWh	1.7%
Hire Venues	7,195 kWh	1.2%
Car Park	531 kWh	0.1%
Total	**597,310 kWh**	**100%**

[8] Climate Active. (2023). *Climate Active Electricity Accounting*. Retrieved July 24, 2024, from https://www.climateactive.org.au/sites/default/files/2023-08/Climate-Active-Electricity-Accounting%20-%20PDF.pdf

Water

Water and wastewater services provided to Council facilities represents 10% of the total estimated emissions. Such indirect emissions come from fuel and energy spent by the utility in the treatment and distribution processes to achieve specific hygiene and sanitation standards. Council's reporting system was extracted also for water usage data in FY 2023. A summary of consumption by asset sub-type is provided in TABLE 21 below:

TABLE 21: HUNTER'S HILL COUNCIL – WATER USE IN FY 2023 BY ASSET SUB-TYPE

Council asset sub-type	Water usage in FY 2023	Percentage
Sports and Recreation	3,268 kL	29.7%
Children Services	2,539 kL	23.1%
Parks and Bushland	1,689 kL	15.4%
Other Council Buildings and Assets	1,612 kL	14.7%
Community Services	1,152 kL	10.5%
Council Chambers and Town Hall	693 kL	6.3%
Hire Venues	29 kL	0.3%
Occupied Buildings	12 kL	0.1%
Total	**10,994 kL**	**100%**

Appendix G – Emission reduction opportunities for Council

Objectives and opportunities

This section identifies key strategic objectives and explores opportunities to reduce emissions across Scope 1, 2 and 3. All three scopes were considered, in line with State and Commonwealth Government commitments to achieving net zero emissions.

Key actions undertaken to identify and clarify the opportunities for Council's emissions reduction include:

- **Site assessments** (April 2024)
  Site-specific emission reduction opportunities for Council operations were identified and gauged for feasibility at a high level.
- **Carbon footprint development** (March 2024)
  Council's main emission sources were determined for focused emissions reduction efforts.
- **Technological research and forecasting**
  Relevant technologies were evaluated for emissions abatement potential and optimal timing.

TABLE 22 summarises the key objectives and areas of opportunity identified to form the basis of Council's *Net Zero Implementation Plan* for its operations, further detailed in the sections that follow.

TABLE 22: HUNTER'S HILL COUNCIL – KEY OBJECTIVES AND AREAS OF OPPORTUNITY FOR COUNCIL'S NET ZERO STRATEGY

Key objectives	Areas of opportunity
Scope 1 emissions	
• Reduce gas usage at Council sites. • Reduce emissions across Council's fleet and outdoor equipment. • Develop charging infrastructure at Council.	• Gas-to-electric technologies • Sustainable transport
Scope 2 emissions	
• Continue eliminating electricity emissions through strategic renewable energy purchases. • Reduce Council's reliance on grid-supplied electricity. • Optimise electricity usage at Council sites.	• Buying clean energy • Behind-the-meter solar • Energy efficiency
Scope 3 emissions	
• Enhance sustainability requirements during procurement and project planning.	• Sustainable procurement
All Scopes	
• Monitor changes to Council's organisational emissions over time.	• Data management

Developing the opportunities to achieve the listed objectives adopts a holistic approach, addressing a wide range of emission sources to ensure a thorough strategy for long-term cost savings and emission reductions.

Policies, market trends, and the evolving landscape were considered in identifying the opportunities for the NZIP. In particular, the electricity grid is expected to decarbonise over the coming decade as coal-fired power stations in NSW and across Australia are phased out and replaced with renewable energy generation technologies (e.g. solar PV, wind, pumped hydro and grid-scale batteries). Under the expected decarbonisation scenario, the Australian Energy Market Operator (AEMO) predicts[9] that the electricity grid will be approximately 85% decarbonised by 2035, and close to 100% by 2040.

For considering emission reduction opportunities specific to Council's needs, the following sections break down the relevant key elements, listed as follows:

- **Objective** Describes the main aim of the emissions reduction opportunities;
- **Description** Provides an overview of the current state relevant to each area of opportunity within Council context;
- **Opportunities** Highlights emissions reduction initiatives;
- **Risks and mitigation** Identifies potential risks and associated mitigants corresponding to the opportunities;
- **Costs and benefits** Provides qualitative or quantitative estimates of the financial and non-monetary impact and benefits of the opportunities.

[9] *2024 Integrated System Plan ISP*. (2024). https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp

Buying clean energy

Objective

- **Continue eliminating electricity emissions through strategic renewable energy purchases.**

Description

In partnership with the Southern Sydney Regional Organisation of Councils (SSROC), Hunter's Hill Council has entered into a PPA that sources 100% of its electricity from renewable sources, effective initially from July 2022 until December 2026. With generated LGCs through the PPA retired, Council currently claims zero emissions from grid electricity purchased for its operations, resulting in significant emissions reduction in Council's carbon footprint.

Opportunities

Several key suggested actions related to purchasing renewable energy for Hunter's Hill Council operations include:

- Through a partnership with the Southern Sydney Regional Organisation of Councils (SSROC), continue to source renewable energy via PPA, ensuring the contract is renewed as the current one expires.
  - Alternatively, monitor opportunities for improved value-for-money in PPA contracts from other suppliers.
- As the grid decarbonises in the longer term, assess the costs and benefits of continued purchase of renewable energy from various PPA pricing offers, compared to other emissions reduction measures.

Risks and mitigation

Due to the possibility of costs increasing and contract terms becoming less favourable, Council should start negotiations well before the current contract's expiration, and engage with multiple providers for competitive offers.

Costs and benefits

While market fluctuations can affect the contract pricing already inclusive of cost premiums associated with sourcing renewable energy, Council's PPA will continue to offer the major benefit of drastically reducing Council's organisational emissions.

Behind-the-meter solar

Objective

- **Reduce Council's reliance on grid-supplied electricity.**

Description

Three solar PV systems installed at Council sites with total capacity of about 50 kW were identified through the site visits and data provided, listed in TABLE 23 below.

TABLE 23: HUNTER'S HILL COUNCIL – INSTALLED SOLAR PV SYSTEMS

Site name	Capacity	Est. annual generation
Hunter's Hill Council Chambers and Town Hall	33.8 kW	47.3 MWh
Hunter's Hill Pre School	~10 kW	14.0 MWh
Henley Community Centre	~6 kW	8.40 MWh

Opportunities

Council has the potential to install new systems or expand existing ones, with or without battery storage. As informed by site visits, several additional solar PV systems for meeting energy demand at Council sites are proposed for the short-to-medium term, tabulated in TABLE 24 below:

TABLE 24: HUNTER'S HILL COUNCIL – PROPOSED SOLAR PV SYSTEMS

Site name	Proposed capacity	Est. annual generation
Gladesville Road Community Centre	15 kW	21.0 MWh
Boronia Park Pavilion & Community Centre	10 kW	14.0 MWh
Hunter's Hill Council Pre School	10 kW	14.0 MWh
Riverside Pre School	10 kW	14.0 MWh
Papilio Early Learning Childcare	10 kW	14.0 MWh
Henley Community Centre	5 kW	7.00 MWh
Fairland Hall	4 kW	5.60 MWh

Opportunities

Over the medium-to-long term, Council could consider supplementing the proposed solar PV systems with battery solutions, to capture surplus solar energy currently exported to the grid for use at Council's facilities, catering to demand profiles specific to each site (e.g. low levels of self-consumption during weekends compared to weekdays due to reduced utilisation). Suggested battery sizes to supplement the proposed systems above are listed in TABLE 25 below:

TABLE 25: HUNTER'S HILL COUNCIL – PROPOSED BATTERY STORAGE SYSTEMS

Site name	Proposed capacity
Gladesville Road Community Centre	28 kWh
Boronia Park Pavilion & Community Centre	24 kWh
Henley Community Centre	14 kWh
Hunter's Hill Pre School	14 kWh
Riverside Pre School	14 kWh
Fairland Hall	7 kWh
Papilio Early Learning Childcare	7 kWh

Risks and mitigation

There are minimal risks associated with solar PV installations, provided that the systems are appropriately sized, designed, installed, connected and maintained on sound structures. Lithium-ion batteries can pose fire risks due to their chemical composition, with hazards arising from overcharging, physical damage, and exposure to high temperatures. Mitigation includes buying reliable brands, regular inspections, and proper installation practices. Batteries also present risks of electric shocks, explosions, and chemical exposure. Adhering to legal standards like the Electrical Safety Act 2002 and the Work Health and Safety Act 2011, along with relevant Australian and international standards (e.g. AS 1319, AS/NZS 4509.1, and IEC 62109-1), is crucial for safety.

Costs and benefits

Solar PV systems have long been demonstrated to be cost-effective, with solar module prices falling and widespread commercial adoption driving further acceleration. Payback on combined PV and battery systems is generally achieved within 6-9 years, while payback on PV systems alone can be achieved in as little as 3-4 years. Positive cash flow can then be directed to an 'energy fund' or similar for use in other projects, or for cost management while maintaining service delivery levels. However, battery storage typically results in a less favourable business case compared to solar-only systems at this time.

The estimated maximum investment for solar PV and battery systems across Council sites is **~$191,000,** with annual savings of **~$33,000** and an estimated overall payback period of **~5.8 years.** Savings are based on self-consumed and exported solar energy, as well as stored energy, with batteries potentially charged by off-peak grid power and surplus solar power. Feed-in-tariff rate for solar exports is assumed to be $0.040/kWh, and average energy rate is calculated to be ~$0.38/kWh. APPENDIX A provides a more detailed summary of proposed capacities, costs and expected benefits for identified solar and battery systems.

Energy efficiency

Objectives

- **Optimise electricity usage at Council sites.**
- **Enhance sustainability requirements during procurement and project planning.**

Description

Council has undertaken a range of energy efficiency initiatives across various facets of its facilities' infrastructure, in particular lighting upgrades. TABLE 26 below lists energy efficiency opportunities implemented across several Council sites based on the information supplied by Council and observations from site visits:

TABLE 26: HUNTER'S HILL COUNCIL – IMPLEMENTED ENERGY EFFICIENCY OPPORTUNITIES

Council asset / site	Energy efficiency opportunities implemented
Boronia Park Pavilion & Community Centre	• Lights in the new community building under construction are assumed to be all LEDs.
Fairland Hall	• Installed twelve twin 18W recessed LED fittings in the hall, single twin 18W LED recessed fitting in the kitchen, and several LEDs in the toilets.
Gladesville Road Community Centre	• Installed LED lights throughout the centre.
Henley Community Centre	• Upgraded all lights in the lounge, bar and foyer to LED fittings or globes.
Henley Cottage	• Upgraded all lights in the radio station, hall, kitchen, toilet and foyer to LEDs.
Hunter's Hill Council Chambers and Town Hall	• Upgraded all upper and lower level lights in the Administration building to LEDs. • Implemented manual scheduling of hall and stage lighting operations.
Hunter's Hill Croquet Club	• Installed LED battens for indoor lighting, observed to be off when clubhouse is locked (e.g. via sensors or manual off switching)
Hunter's Hill Pre School	• Upgraded all lighting in all rooms, amenities, offices and kitchen spaces to LEDs.
Papilio Early Learning Childcare	• Some LEDs observed to be installed in the nursery and pre-school buildings. • Implemented prudent operation practices for multiple split AC units.
Riverside Pre School	• Upgraded all lighting in all rooms, amenities, offices and kitchen spaces to LEDs.
Streetlighting	• Upgraded all streetlighting across LGA to LEDs.
Weil Park Hall	• Installed LED luminaire to four sporting field light towers.

Opportunities

Building on the progress made by Council to achieve incremental savings from energy-efficient technology, several additional potential opportunities have been identified and tabulated in APPENDIX B.

Risks and mitigation

Energy efficiency upgrades generally carry low risks, provided that business cases, design specifications, and contractor management processes are robust. Key risks and mitigation strategies include:

- **Ensuring ongoing savings:** Monitor energy savings and tune systems as required so benefits are sustained over time.
- **Maintenance issues:** Establish a routine maintenance schedule, provide training to Council staff in proper upkeep of equipment, and communicate long-term benefits to stakeholders early.
- **Technological change:** Continuously update design and procurement guidelines to align with advancements in technology, practice and service.

Costs and benefits

A detailed financial assessment of all proposed energy efficiency measures has not been conducted at this time. The main goal for Council is to continue investing in energy efficiency opportunities to help Council reach its net zero target and minimise the need for carbon offsets. A high-level cost breakdown for an energy efficiency upgrade package at the Town Hall, for potential consideration for funding through grant programs such as the Commonwealth's CEUF, has been provided in the Appendices.

Gas-to-electric technologies

Objective

- **Reduce gas usage at Council sites.**

Description

Natural gas usage represents well under 1% of Council's total emissions, with just two sites confirmed to receive piped natural gas mostly for space heating: Gladesville Road Community Centre and Boronia Park Grandstand.

Opportunities

The main abatement opportunity for Council is to replace the major gas equipment with electric heat pumps as units reach the end of useful life. Various technologies such as heat pump water heaters, induction cooking, and electric BBQs can also readily replace equivalent gas-operated equipment. Further, water heaters can be powered or boosted by solar PV systems.

Shifting from gas to electric technologies offers multiple benefits, including:

- Unlike electricity, gas is more difficult to decarbonise, hence renewable energy can be leveraged by Council to power electric heat pumps and induction cooking at effectively zero emissions.
- Eliminating gas use through the use of electric appliances producing no on-site emissions substantially improves local air quality and public health and safety.
- Adopting electric systems can enhance Council's energy resilience by reducing its vulnerability gas supply chain shocks.

Risks and mitigation

Risks and mitigation strategies for a gas-to-electric transition are mostly centred around the technology itself. Particularly for switching gas boilers and water heaters to electric heat pumps, performance factors such as the type, proper sizing, low-temperature operational characteristics, and coefficient of performance must all be considered during the planning stage.

Costs and benefits

Cost and benefits of electrified heating solutions must be evaluated when the existing equipment reaches its end of life, or when the business case is potentially favourable if gas usage and rates are high.

Sustainable transport

Objectives

- **Reduce emissions across Council's fleet and outdoor equipment.**
- **Develop charging infrastructure at Council.**

Description

As shown in the carbon footprint section of this report, emissions from Council's fleet collectively make up 86% of the total emissions in FY 2023. Council currently operates several vehicles consisting of light to heavy fleet, as well as several outdoor equipment. TABLE 27 lists Council's fleet split into fuel type and vehicle sub-type.

TABLE 27: HUNTER'S HILL COUNCIL – FLEET BY FUEL AND VEHICLE TYPE

Fuel and vehicle type	Fuel usage in FY 2023	Count of vehicles	Percentage
Diesel	15.0 kL	14	70%
Ride-on Mower	2.13 kL	5	25%
Utility	4.57 kL	4	20%
Truck	2.93 kL	3	15%
Backhoe	0.42 kL	1	5%
Tractor	4.93 kL	1	5%
Petrol	11.2 kL	6	30%
Utility	3.50 kL	2	10%
SUV	4.78 kL	2	10%
Wagon	2.34 kL	1	5%
Sedan	0.62 kL	1	5%
Total		**20**	**100%**

Opportunities

Several key suggested actions related to fleet electrification for Hunter's Hill Council to reduce its transport emissions include:

- In the development and future reviews of Council's fleet strategy, integrate a comprehensive plan of migrating the current fleet to EVs. Look to align with the NSW Government's target of electrifying its fleet by 2030, with an interim target of 50% EV procurement by 2026.
- Evaluate the capacity of Council's current EV charging infrastructure, and as informed by cost-benefit assessments and Council's fleet strategy, expand the network to support the increasing uptake of EVs.
- Consider switching the utility vehicles to their plug-in hybrid vehicle (PHEV) counterparts, as a means to reduce emissions in the short-term where EV model availability is not yet mature or cost-effective.
- Over the long-term, transition Council's fleet to lower or zero-emissions counterparts, where it is assessed to be technically feasible and financially sound.
- Consider applying for grant funding to support the transition, for example from the NSW Climate and Energy Action's *Electric vehicle destination charging grants* program.

Risks and mitigation

High initial investment needed in switching to EVs and developing EV charging infrastructure could restrict Council from addressing opportunities to reduce emissions across Council's fleet. Leasing arrangements, financial incentives and grant funding can offset costs from vehicles and charging infrastructure. Charging infrastructure can be financed through arrangements with equipment suppliers and 3rd parties.

Aligning purchases with when existing vehicles reach the end of their serviceable life can help spread out costs over time. The costs and benefits of a shift to low emissions vehicles are likely to distributed differently and, potentially, unevenly across Council budget centres, necessitating a more coordinated, whole-of-organisation accounting approach for optimising "whole of life" costs.

Limited availability and high costs of specific EV types may also delay the transition. As an interim solution, Council could consider switching to more viable alternatives, such as PHEVs. Monitoring market developments and improvements in the TCO as more models become available and cost-effective is also useful in informing Council's procurement strategies.

Costs and benefits

Fleet transition costs can be minimised by regularly assessing the business case and cost-effectiveness of switching Council's current range of internal combustion engine vehicles (ICEVs) to electric vehicles (EVs) models by using publicly-available evaluation systems such as *Transport for NSW*'s total cost of ownership (TCO) calculator. TCO considers all expenses associated with owning and operating a vehicle

or equipment throughout its lifecycle, including acquisition, operational and maintenance costs among others.

Through the *NSW Electric Vehicle Strategy,* the NSW Government has outlined actions to make EVs more affordable state-wide, focusing on reduced upfront costs, world-class charging network, easier driving of EVs, more jobs, and sustainable road funding. Highlighted financial incentives for Council to consider include:

- **Medium-to-large fleet support**
  Through the *Drive* electric NSW EV fleets incentive, local councils and businesses are offered incentives for purchasing battery or hydrogen fuel cell EVs through a reverse auction process, encouraging bulk purchases to maximise value-for-money.
- **Stamp duty exception**
  From September 2021, battery electric vehicles (BEVs) valued under $78,000 are exempt from stamp duty. All EVs, including PHEVs, will be exempt from stamp duty from July 1st 2027, or when EVs make up at least 30% of new car sales.

Sustainable procurement

Objective

- **Enhance sustainability requirements during procurement and project planning.**

Description

Sustainable procurement, while not currently central to Council's emissions reduction efforts, is gaining traction as organisations seek ways to minimise Scope 1 and 2 emissions, while addressing Scope 3 emissions.

Opportunities

Initiatives such as sourcing power from renewable sources, installing LEDs for lighting systems, purchasing low or zero-emission vehicles, incorporating recycled materials in construction, integrating energy efficiency and low-emissions design requirements for new buildings, and assessing life-cycle costs of purchases are all facilitated by the three components of sustainable procurement, namely: policy/procedures/guidelines, engagement/training, and specifications.

Sustainable procurement policy, procedures and guidelines

A sustainable procurement policy can outline Council's commitment to buying products and services that align with its emissions reduction and broader sustainability goals. Actions that can help Council embed sourcing of low and ultimately, zero-emissions inputs to Council include:

- Develop and adopt a Sustainable Procurement Policy for integrating sustainable procurement requirements in Council's operations, quotation and tender specifications. Consider drawing on a robust framework such as the NSW Sustainable Procurement Guide for Local Government10 that aims to help Councils develop and embed sustainable procurement practices in their organisation.
    - A key concept covered in the guide includes the 'quadruple bottom line' (QBL), which refers to the balancing of economic, environmental, and social impacts while maintaining governance requirements to meet organisational and community values/expectations. Emphasis is placed on the importance of whole-of-life costs of products and services, life cycle assessments, and circular economy principles. Practical advice on implementing sustainable procurement processes (e.g. comparison through eco-labels, standards and certifications), as well as strategies for managing supplier relationships and avoiding 'eco-wash' are also offered by the guide.
- Incorporate Sustainable Development Goals (SDGs) such as Climate Action (i.e. take urgent action to combat climate change and its impacts) and Partnerships for the Goals (i.e. strengthen the means of implementation and revitalise the Global Partnership for Sustainable Development).

[10] Local Government NSW. (2017). *Sustainable Procurement Guide for Local Government in NSW*. Retrieved August 3, 2024, from https://lgnsw.org.au/common/Uploaded%20files/PDF/esstam-sustainable-procurement-guide-30.05.17.pdf

- Place importance on suppliers' knowledge of their organisation's carbon footprint and existence of a net zero strategy. Ask suppliers for their net zero target, and request emissions or emissions intensity of their products.
- Consider carbon neutral accreditation (e.g. Climate Active) of suppliers as added evidence of commitment to sustainability, and specifically to providing zero emissions products and services to Council.
- Recognise that as the grid decarbonises and organisations shift away from gas and fuel consumption, more emphasis is placed on emissions embodied in materials used for project delivery (e.g. capital works) and circular economy outcomes.

Engagement and training

For the development of a training program on procuring products and services, consider engaging:

- Staff involved in capital works who specify requirements for energy and water use efficiency, embodied emissions of materials, and on-site renewables and battery storage for new construction or renovation of community facilities;
- Staff responsible for sourcing professional and related services for Council;
- Roads and pavement teams who may look to encourage the use of sustainable materials in construction and maintenance;
- Fleet procurement staff who assess and specify vehicles and equipment that will impact fuel use and other environmental performance measures for years;
- Operational staff who may ensure that replacements for failed equipment are energy-efficient and fit for purpose.

Design, equipment and services specifications

The aim of sustainable procurement policies/frameworks and education/training is to improve specifications for products/services to meet low or zero emissions requirements. Prioritising emissions performance in updating evaluation criteria for tenders could place focus on:

- Sourcing low-emission materials and engaging carbon neutral suppliers for road and pavement construction;
- Requiring new buildings to meet Green Star standards and developing a pathway for ongoing work towards net-zero buildings as part of building design policies;
- Requiring business service suppliers to lower their emissions and gain carbon neutrality accreditation;
- Installing LEDs and smart controls to reduce energy demand across building and public lighting;
- Replacing air conditioning systems with efficient, low-emission systems incorporating smart controls;
- Purchasing energy-efficient office equipment and appliances.

Risks and mitigation

Reviewing procurement policies and process should include assessing risks and mitigation strategies. Notable risks and mitigants for sustainable procurement are:

- **Higher costs**
  With sustainable products and services potentially being more expensive than traditional counterparts, Council could leverage bulk purchasing where appropriate.
- **Resistance to change**
  Engaging stakeholders in the early stages and communicating long-term benefits could help mitigate Internal resistance to adopting new procurement practices.
- **Verification challenges**
  Accreditation standards such as the Climate Active carbon neutral certification are well-established systems for validating supplier claims.

Costs and benefits

A strong sustainable procurement strategy focuses on sourcing goods and services based on their whole-of-life costs, favouring efficiency and lower lifetime expenses. Contractors and suppliers who adopt sustainable practices are often more cost-effective due to reduced operational costs.

Offsetting / Insetting

Objective

- **Monitor changes to Council emissions (and liabilities) over time.**

Description

To achieve net zero emissions ahead of full decarbonisation, Council may need to explore purchasing carbon offsets generated from external projects, or undertaking emissions reduction projects (e.g. sequestration) within its own supply chain, an approach known as 'insetting.'

Opportunities

Purchasing carbon offsets is a common strategy for organisations looking to achieve net zero or declare carbon neutrality, entailing emissions reduction over time to minimise offset liability. High-quality offsets generated from local and international abatement activities eligible under the Australian Government's Climate Active program include:

- Australian Carbon Credit Units (ACCUs) from the Clean Energy Regulator;
- Certified Emissions Reductions (CERs) from Clean Development Mechanism (CDM) projects;
- Removal Units (RMUs) based on land use, land-use change, and forestry activities;
- Voluntary Emissions Reductions (VERs) from the Gold Standard;
- Verified Carbon Units (VCUs) from the Verified Carbon Standard (VCS)

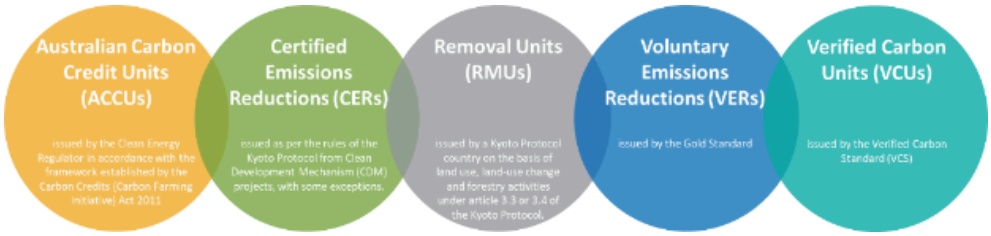


FIGURE 45: ACCEPTED CARBON OFFSET STANDARDS UNDER CLIMATE ACTIVE

Alternatively, Council can compensate for its residual emissions by generating its own offsets through projects that remove carbon dioxide from the atmosphere and store it as carbon in plants or soil (i.e. sequestration) under standards such as the Emissions Reduction Fund. Sequestration projects include forestry plantation and reforestation by environmental or mallee plantings. Generated offsets could be used to reduce Council's own emissions, or sold to the ERF, secondary market or overseas as additional revenue. Additionally, Climate Active is separately developing guidelines for including carbon sequestration via planting activities in a carbon neutrality claim.

Risks and mitigation

When purchasing carbon offsets, the main risk for Council to consider is ensuring reputable carbon offsets from credible sources that provide a good balance of cost and quality, which can be mitigated by considering location, type, volume, price and accreditation standards for finding the best balance between price and location or sustainability credentials.

Costs and benefits

The cost of offsets to address an organisation's emissions can vary widely depending on factors such as type of offset project, location, accreditation standard, credit availability and market demand. As of September 2023, offsets can be purchased for as low as ~$7.00/t CO_2-e up to ~$78/t CO_2-e. Council may also consider additional overhead costs (e.g. licence and verification fees) to fully grasp the total expense of offsetting.

Data management

To facilitate robust and accurate emissions reporting in the future, both for internal use and potential external reporting, it is recommended that Council establish a comprehensive tracking system that takes into account the sources of activity data, recording processes, emission factors applied, implementation of data quality improvement plans, and the identification and documentation of changes attributable to specific activities.

It is advisable for Council to establish a system for managing and tracking all greenhouse gas (GHG) emissions data, which are typically dispersed across the following reporting systems:

- Utility or resource data management platform (provided by a third party);
- Electricity data obtained from retailers;
- Fuel card or bulk fuel records from diesel and petrol suppliers;
- Water consumption data from supplier;
- Internal tracking and records for electricity, natural gas, water, stationary and fleet fuel use;
- Internal records of waste data from waste contractors;
- Asset register of air-conditioning units (chillers, split-type and packaged units), including information on refrigerant gas used and recharge capacity;
- Expenditure records from finance extract;
- Tracking of yearly FTE numbers and annual employee surveys for staff commute information.

TABLE 28 below outlines the current tracking of reported emission sources and suggests improvements to enable the reporting of a comprehensive footprint across Council.

TABLE 28: HUNTER'S HILL COUNCIL – ACTIVITY DATA SOURCES AND SUGGESTED IMPROVEMENTS IN DATA COLLECTION

Emission source	Activity data source	Suggested improvement in data collection
Natural gas	Energy reporting & management system	• Nil – continue to record gas usage via an energy reporting system for a streamlined data collection process.
Stationary fuel (petrol)	Internal reporting	• Nil – maintain consolidation of fuel usage on Council's fleet, stationary and outdoor equipment in a database.
Fleet fuel	Internal reporting	• Ensure complete recording of travelled distances for all fleet vehicles to validate data accuracy.
Grid electricity	Energy reporting & management system	• Continue to capture electricity usage for both Council assets and streetlighting via an energy reporting system for a streamlined data collection process. • Ensure all metering systems are operational and capable of collecting detailed interval data for energy demand analyses.

Emission source	Activity data source	Suggested improvement in data collection
Streetlighting	Energy reporting & management system	Continue to capture electricity usage for both Council assets and streetlighting via an energy reporting system for a streamlined data collection process.
Water	Utility reporting & management system	Nil – continue to monitor water usage at Council sites via a utility reporting system for a streamlined data collection process.
Waste	None	Develop an internal database for capturing data on generated waste at Council sites, split into waste streams: commercial & industrial (C&I), and construction & demolition (C&D).

Appendix H – Emissions reduction opportunities for LGA

Overview

As outlined in SECTION 4.1, it is recommended for Hunter's Hill Council to commit to net zero emissions for its operations by FY 2050. Should a similar goal be set for the community, a 'net zero strategy' for the residential, commercial and industrial sectors should encompass similar emissions reduction opportunities as those highlighted for Council operations in APPENDIX G. Seven key areas of emissions abatement are listed below and illustrated in FIGURE 46.

1. Grid decarbonisation
2. Buying clean energy
3. Community and regional generation
4. Behind-the-meter solar
5. Energy efficiency and gas-to-electric technologies
6. Sustainable transport
7. Waste management
8. Offsetting / Insetting

FIGURE 46: AREAS OF OPPORTUNITIES TO REDUCE LGA EMISSIONS

In the following sections, the brief overview, available emissions reduction opportunities, and potential risks and associated mitigants for each of these areas are further outlined.

Grid decarbonisation

Description

Since 2012, ten coal-fired power stations in Australia have closed, with more retirements planned for almost all remaining stations. As Australia transitions to a net zero economy, renewable energy generation (e.g. solar, wind), combined with battery storage and supported by gas-powered generation, is identified as the most cost-effective way to supply electricity to homes and businesses.

The Australian Energy Market Operator's (AEMO) *2024 Integrated System Plan* outlines the optimal mix of generation, storage, and transmission to meet energy needs while satisfying government emissions reduction and other relevant policies at the lowest long-term costs to consumers.

Under the 'step change' scenario, coal closures are expected to accelerate, replaced by renewable energy firmed by other technology (e.g. pumped hydro, batteries, and gas-powered generation), and connected with modernised transmission and distribution networks, with power systems upgraded to run entirely on renewable energy occasionally. The capacity of new generation, firming, storage and transmission needs in the electricity market that underpins the 'optimal development path' through to 2050 is shown in FIGURE 47 below:

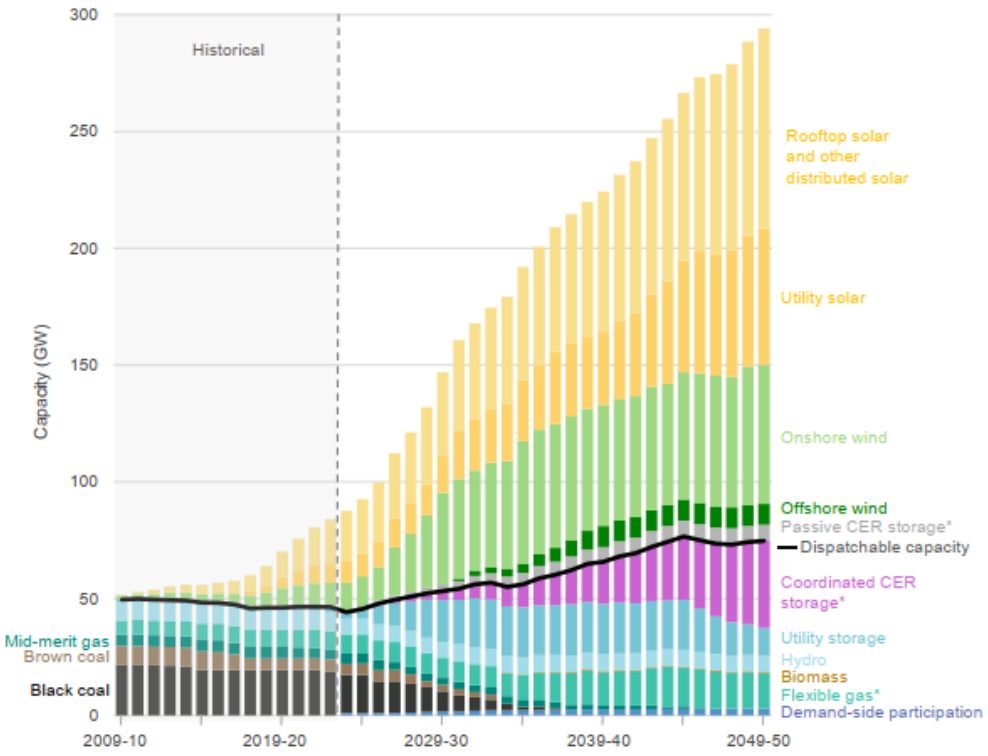


FIGURE 47: NATIONAL ENERGY MARKET (NEM) CAPACITY UNDER THE 'STEP CHANGE' SCENARIO

Opportunities

As the grid decarbonises, Hunter's Hill LGA can expect significant reduction on electricity emissions due to a lower grid carbon intensity. Under the 'step change' scenario, renewables are projected to reach ~70% of annual generation in 2027-28, and ~99% by 2049-50, with the requirement that the current rate of investment in renewables accelerate. FIGURE 48 illustrates the forecast share of generation from renewable sources under each of three future scenarios outlined in the *2024 ISP.*

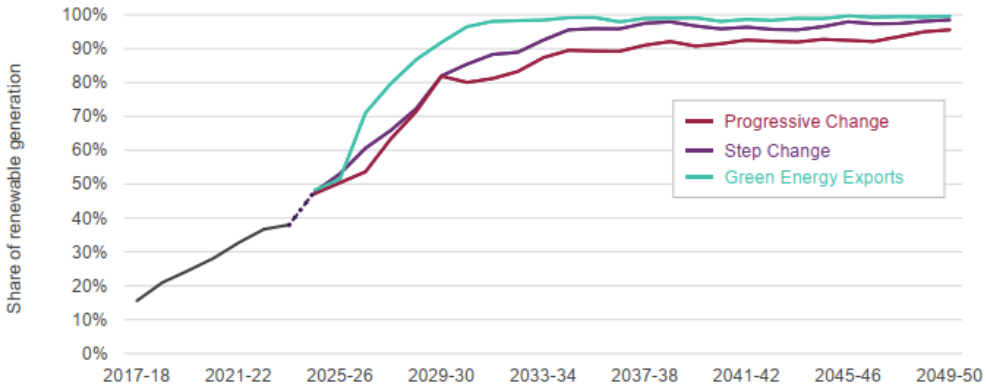


FIGURE 48: FORECAST SHARE OF GENERATION FROM RENEWABLE SOURCES

Risks and mitigation

The *2024 ISP* identifies risks to achieving the optimal pathway for the energy transition, including:

- Delays in infrastructure investment;
- Short notices in coal closures;
- Gaps in power system security and market framework innovations;
- Challenges in integrating consumer energy resources (CER) into the grid;
- Lack of community acceptance;
- Shortages in equipment, materials and skilled labour.

Any of the risks above could slow grid decarbonisation. While both Council and LGA have limited control over the grid carbon intensity, the main mitigation strategy is to focus on building local capacity to reduce emissions.

Buying clean energy

Description

Households and businesses in Hunter's Hill LGA can reduce emissions from electricity usage before the grid fully decarbonises by purchasing renewable energy through several options:

- **Small-scale technology certificates (STCs)** and **large-scale generation certificates (LGCs):** Collectively known as renewable energy certificates (RECs), STCs and LGCs can be bought and subsequently surrendered or retired in the REC Registry to be counted towards emissions reduction. An LGC or STC represents 1 megawatt-hour (MWh) of renewable electricity.
- **Renewable energy power purchase agreement (PPA):** Businesses that typically consume between 500 MWh and 50 gigawatt-hours (GWh) can sign an agreement with an electricity retailer or directly with a renewable energy farm to buy electricity and/or LGCs. Emission reductions can then be claimed when the certificates are retired.
- **Carbon-neutral electricity:** Households and businesses can buy carbon-neutral electricity from retailers who offset emissions with Australian or international carbon offsets.
- **GreenPower®:** Through their retailer, consumers can opt for a portion of their electricity to come from renewable sources for an extra cost. GreenPower® certifies retailers to purchase and surrender LGCs and ensures that the energy comes from 100% renewable sources and generators that meet industry standards.

Opportunities

The options listed above allow consumers to reduce emissions ahead of a full grid decarbonisation. PPAs are currently most accessible and cost-effective to mid to large-sized businesses, but as the market evolves, renewable energy may become more affordable for all. Additional emission reductions could be achieved by electrifying vehicles, public transport and gas appliances, powered with renewable energy.

Risks and mitigation

Key risks and mitigating actions include:

- **Cost variability:** Options for buying renewable energy may carry higher costs, especially for smaller consumers, leading to low adoption. Council can encourage uptake by leading by example via continuously buying renewables itself and promoting long-term contracts.
- **Uncertainty in grid decarbonisation timelines:** Delays in the broader energy transition could limit purchasing options and slow down the grid decarbonisation process. A main mitigation strategy for both Council and LGA is to respond with local generation (e.g. rooftop solar).

Regional and community renewables

Description

Hunter's Hill Council is located in an inner-city area close to Sydney Harbour, characterised by space constraints and a well-vegetated, shady, partly heritage-listed environment. These factors limit the potential for large-scale community solar infrastructure. However, several opportunities remain viable, such as Virtual Power Plant (VPP) schemes, where homeowners can join a virtual network of solar and storage systems. Additionally, community battery initiatives, like those currently being rolled out by Ausgrid across NSW, offer potential. There are also opportunities for behind-the-meter solar solutions at community facilities, which could help improve energy independence and resilience.

Opportunities

There are several opportunities for Hunter's Hill Council to promote and expand community renewable energy options:

- **Promotion of viable options**: The council can actively promote renewable energy options such as Virtual Power Plants (VPPs), community batteries, and behind-the-meter solutions to residents and businesses.
- **Exploration of infrastructure with network providers**: Collaborating with network providers like Ausgrid and energy retailers to explore potential infrastructure options, especially community batteries, which are more feasible than large solar arrays due to heritage, space, and shading constraints.
- **Support for low-income groups**: The council can facilitate access to renewable energy for low-income households by advocating for financial support programs, subsidies, or targeted initiatives.
- **Advocacy for purchasing from regional generation projects**: Encouraging purchasing of green energy through Power Purchase Agreements (PPAs) and community solar farms from Sydney region projects to drive demand for local renewable energy across the community.

Risks and mitigation

Several risks need to be considered when exploring community renewable energy initiatives in Hunter's Hill.

- **Financial and economic risks:** The business case for front-of-meter community renewables especially batteries may be challenging due to high upfront costs and uncertain long-term returns. Mitigation includes seeking government grants or incentives to improve the financial viability of community battery projects. Additionally, partnering with energy retailers and network operators can help to develop feasible proposals.
- **Safety risks:** Electrical and fire safety concerns arise from installing solar PV systems and batteries, particularly in older buildings. Mitigation includes keeping up to date with technology trisla and pilot projects, ensuring strict adherence to modern safety standards and regulations.
- **Long-term sustainability:** Ensuring the long-term management, operation, and maintenance of renewable infrastructure, such as community batteries, could be difficult without clear structures in place. Establish governance structures early on, such as working with relevant organisations and partnerships with network providers, to manage and maintain renewable infrastructure. Long-term service agreements or performance guarantees from providers can also help ensure sustainability and accountability.

Behind-the-meter solar

Description

The Australian Photovoltaic Institute (APVI) has developed maps of solar PV installations across the country using data from the Clean Energy Regulator (CER) and large-scale systems registered under the Large-Scale Renewable Energy Target (LRET). As of June 2024, solar PV installations in Hunter's Hill LGA are:

- 922 systems with an estimated total capacity of 6.72 MW installed across 3,900+ suitable dwellings[11], representing about 22% uptake;
- 873 of these systems (est. total capacity of 5.58 MW) are residential, while 49 systems (est. total capacity of 1.15 MW) are commercial. Per APVI, residential installations are defined as systems with a capacity under 15 kW, and commercial installations are systems with a capacity between 15 and 100 kW. Currently, there are no power stations (systems over 100 kW) in the LGA.

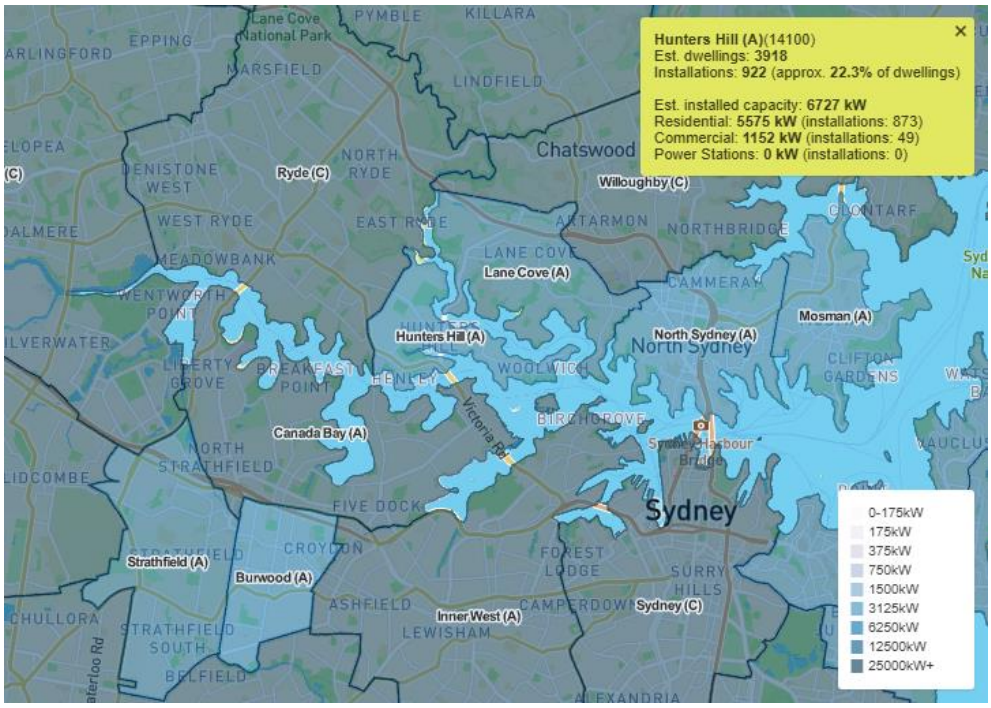


FIGURE 49: HUNTER'S HILL LGA – SOLAR PV INSTALLATIONS

[11] APVI defines suitable dwellings as the total of free-standing (i.e. separate) and semi-detached houses based on Census 2021, and may exclude flats or apartments, with this figure adjusted using the historical house growth rate between the 2016 and 2021 Censuses.

Opportunities

Hunter's Hill Council can support the community uptake of behind-the-meter solar by advising on Development Application (DA) requirements for heritage-listed homes, providing fact sheets with simple advice for households, facilitating financial assistance options for low-income residents, and promoting the financial and environmental benefits of renewable energy technologies including home batteries.

Risks and mitigation

Heritage restrictions can complicate installations for certain homes. To mitigate this, Council can work with relevant planning authorities to help simplify the DA process for heritage-listed properties and provide clear guidelines that balance solar adoption with preservation requirements.

Financial barriers, particularly for low-income households, may also limit adoption. The council can address this by offering or promoting financial assistance programs such as low-interest loans, rebates, or grants to make solar more accessible. Additionally, providing simple fact sheets and hosting educational workshops can increase community awareness and engagement.

Managing excess daytime solar generation is another challenge, as it can lead to local grid issues. Encouraging the adoption of home battery systems can help build local energy storage and improve resilience, ensuring that solar energy is efficiently used and stored for future needs.

Energy efficiency and gas-to-electric technologies

Description

Energy efficiency measures offer cost-effective opportunities for households and businesses in the Hunter's Hill LGA to reduce energy costs, reduce emissions, and deliver other benefits such as improved climate resilience. Energy efficiency rating schemes for building and appliances are well developed in Australia, providing a means for the community to identify higher performing products.

Opportunities

Examples of energy efficiency opportunities include:

- Encouraging use of energy-efficient devices, such as LED lights, inverter air-conditioners and appliances, and variable speed-driven (VSD) motor systems;
- Improving building or housing insulation and sealing of doors and windows to minimise heat loss, optimising energy use of heating and cooling systems;
- Implementing water conservation and efficiency measures to reduce electricity use in water pumping, treatment and heating;
- Ensuring residential and commercial building designs comply with evolving building policies, such as the Building Code of Australia and NSW Building Sustainability Index (NSW BASIX), and house efficiency disclosure at point of sale.
- Replacing gas-using equipment with electric counterparts, such as heat pumps and induction cookers.

Risks and mitigation

Energy efficiency measures face challenges, especially in older buildings where retrofitting can be complex and costly. These buildings may require specialised solutions to accommodate outdated structures or systems, making cost-effective retrofits difficult. Additionally, there are potential construction and electrical safety risks that need to be carefully managed during upgrades.

Upfront costs for energy efficiency measures can be high, and the payback period may take time, discouraging some property owners. To mitigate this, it's important to communicate the multiple benefits of energy efficiency, such as quieter homes, increased property value, enhanced comfort, and improved resilience to extreme weather events like heatwaves.

Sustainable transport

Description

Electric vehicles (EVs) – including battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and fuel cell electric vehicles (FCEVs) – are expected to replace petrol- and diesel-powered internal combustion engine vehicles (ICEVs) in Australia over the coming decades, with this transition supported by development of charging infrastructure, government incentives and increased vehicle availability.

EV charging infrastructure

In June 2023, the Electric Vehicle Council (EVC) reported in its *State of Electric Vehicles* that there are 967 individual high-power public EV chargers in 558 locations across Australia. Of these, 438 locations have fast chargers (i.e. 24-99 kW DC charging), and 120 locations have ultra-fast chargers (i.e. 100+ kW DC charging). Online platforms such as PlugShare provide maps of these public charger locations. At present, there are no public EV chargers in Hunter's Hill, with the closest accessible public charger located in the City of Ryde.

As a member of the Northern Sydney Regional Organisation of Councils (NSROC), Hunter's Hill Council is involved in the draft report *Facilitating EV Charging Infrastructure: Council Policies and Controls,* which aims to support the sustainable, equitable, inclusive and innovative rollout of EV charging infrastructure in the region. Key topics covered in the document include:

- **Guiding principles**
  A framework that can help guide Council in developing and implementing EV charging policy and infrastructure is based on the following four principles: protecting the value of place, taking a leadership role, promoting inclusivity, and fostering partnerships with charge point operators (CPOs).
- **Assessment process**
  Assessment tables provide Council with a range of criteria against which Council can evaluate EV charging infrastructure proposals.
- **EV policy application**
  Council can integrate the guiding principles into its own EV policy and assessment framework.
- **Wording example for planning controls**
  Council can use provided templates for different planning control scenarios, such as for new developments, shared charging infrastructure, private kerbside parking, chargers on public land, and public chargers in Council-owned and managed car parks.
- **Monitoring and evaluation guidelines**
  Council can ensure the successful implementation of EV charging infrastructure by following the provided model for a high-level monitoring and evaluation plan.

EV model availability

As of June 2023, the EVC also reported that 91 light EV models in 148 variants are available in Australia, including 73 electric car models, seven electric utes and ten electric vans. For heavy vehicles, there are twelve electric truck models and 22 electric bus models. However, adoption is limited due to regulatory barriers on vehicle mass and width requirements.

Opportunities

Government support for EVs

Through the *NSW Electric Vehicle Strategy,* the NSW Government has outlined actions to make EVs more affordable state-wide, focusing on reduced upfront costs, world-class charging network, easier driving of EVs, more jobs, and sustainable road funding. Highlighted financial incentives include:

- **Medium-to-large fleet support**
  Local councils and businesses are offered incentives for purchasing battery or hydrogen fuel cell EVs through a reverse auction process, encouraging bulk purchases to maximise value for money.
- **Stamp duty exception**
  From September 2021, battery electric vehicles (BEVs) valued under $78,000 are exempt from stamp duty. All EVs, including PHEVs, will be exempt from stamp duty from July 1st 2027, or when EVs make up at least 30% of new car sales.

Risks and mitigation

The transition to electric vehicles (EVs) poses some risks, including insufficient charging infrastructure and the upfront costs of both EVs and the necessary charging stations. To mitigate these challenges, Council can help support the rollout of charging networks, and explore partnerships and government grants to help offset costs.

Another risk is the strain on local grid capacity, particularly during peak charging times. Councils can collaborate with energy providers to assess grid readiness, promote off-peak charging, and integrate renewable energy solutions to support EV adoption sustainably.

Waste management

Description

Northern Sydney Regional Waste Strategy

Hunter's Hill Council is part of the Northern Sydney Regional Organisation of Councils (NSROC), which published the *Northern Sydney Regional Waste Strategy* as a response to the NSW Government's *Waste and Sustainable Materials Strategy 2041 (WASM)* to provide a 20-year vision for managing waste in the region, with a focus on actions from 2022 to 2027 and a goal to reduce waste, recover resources, and protect the environment through a regional approach.

Since most councils in the region do not own or control local waste facilities, the strategy emphasises joint procurement of services and shared infrastructure to manage waste more sustainably. Strategic themes and associated objectives and initiatives are summarised as follows:

- **Avoid and reduce waste**
  Embed circular economy principles to reduce waste generation and carbon emissions.
- **Recover resources**
  Set a pathway to achieve 80% recovery across all waste streams by 2030, with a focus on organic waste diversion and plastic recycling.
- **Protect the environment**
  Improve resource recovery through community recycling centres (CRCs) and reducing illegal dumping and litter.
- **Strategic collaboration**
  Foster joint procurement and regional partnerships to meet service and infrastructure needs.
- **Education and engagement**
  Support long-term behaviour change with the aim of increasing engagement, improve recovery, reduce generated waste and promote collaboration. Additionally, advocate for better waste management outcomes at the state level.

Opportunities

Hunter's Hill Council has several opportunities to support community waste initiatives, starting with close collaboration with the NSW Government and the EPA. By aligning with state policies and accessing grant funding, the council can drive local waste reduction projects more effectively.

Implementing a FOGO program is an impactful step the council can take, diverting organic waste from landfills. Providing information, composting bins and kitchen caddies can help empower residents to easily manage their organic waste at home.

Council can also further its engagement in circular economy initiatives by working with other councils and local businesses. This collaboration can help create new uses for waste materials, contributing to a sustainable, zero-waste future.

Risks and mitigation

Like other councils, Hunter's Hill Council faces risks related to low community engagement in waste reduction initiatives. Without strong participation, programs like FOGO and recycling may not reach their full potential, limiting overall waste diversion.

Challenges arise in certain building types, such as multi-dwelling units, which may lack adequate infrastructure for waste separation. This could create barriers to achieving comprehensive waste reduction across the LGA.

Additionally, Council has limited leverage on upstream products and services, making it difficult to control the types of materials entering the community. Implementing new waste programs can also be costly, adding financial risk if participation and outcomes do not justify the investment.

Mitigation strategies could include ongoing engagement with the community and businesses to ensure consistent participation and support for waste initiatives. Regular education campaigns, workshops, and collaboration with local businesses could help increase awareness and drive behaviour change.

Additionally, working across council boundaries to find circular economy solutions can be highly effective. Collaborating with neighbouring councils can help share resources, create economies of scale, and develop regional solutions that reduce waste and encourage recycling and reuse.

Offsetting / Insetting

Description

While local councils can, at considerable cost, acquire carbon offsets to help the broader community achieve net zero, it's usual for offsets to be used at the organisation level. Therefore, the primary goal should remain reducing local emissions through direct actions, with offsets acting as a back-up or complementary measure.

Hunter's Hill has limited options for insetting due to its inner urban location. The densely developed environment and lack of agricultural or large industrial sectors reduce opportunities for local carbon sequestration or large-scale renewable energy projects, making offsetting more practical for achieving carbon neutrality.

Opportunities

The biggest opportunity for Hunter's Hill Council lies in pursuing a net zero pathway for the community that eliminates emissions completely by 2050. By focusing on reducing emissions at the source, the community can avoid the need for purchasing offsets, ensuring that its funds are invested in projects that provide direct benefits to the local community and environment, such as energy efficiency improvements and renewable energy installations.

Should offsets ever become part of the council's community emissions reduction strategy, they provide an opportunity to support practical projects within Australia and NSW, contributing to broader environmental goals.

Risks and mitigation

To mitigate offsetting risks, prioritise reducing emissions through energy efficiency and renewable energy projects before purchasing offsets. If offsets are used, ensure they are high-quality, verified credits from reputable sources. Additionally, diversifying and balancing offset use, including with investments in local projects, helps reduce risks.

Appendix I – GPC methodology

The following details the two complementary approaches for calculating and reporting emissions presented in the GPC, further illustrated in FIGURE 50 below:

1. **City-induced framework**
   The city-induced framework measures emissions from activities within the city's geographic boundary, covering selected Scope 1, 2 and 3 emission sources. Reporting is done using two levels:
   - **BASIC:** The BASIC level covers emissions from sources common to all cities and communities (e.g. stationary energy, in-boundary transport and waste). Data and methodologies are relatively accessible.
   - **BASIC+:** The BASIC+ level expands on BASIC by including industrial processes, agriculture, forestry, transboundary transport and energy losses, requiring more complex data and calculations.
2. **Scopes framework**
   The scopes framework groups emissions by Scope 1, 2 and 3. In particular, Scope 1 emissions allow for the separate accounting of all emissions originating within the geographic boundary of the city, thereby facilitating a 'territorial' approach to aggregating multiple cities' inventories consistent with national-level GHG reporting.

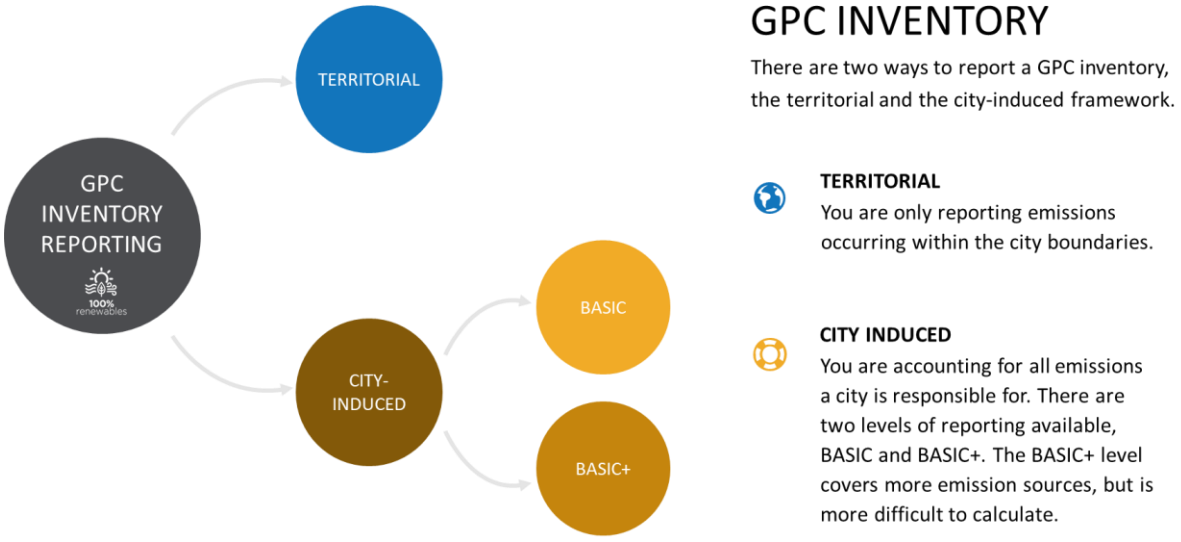


FIGURE 50: CITY-INDUCED AND TERRITORIAL APPROACHES FOR REPORTING A GPC INVENTORY

A GPC-compliant inventory must report both territorial and city-induced emissions. The scopes framework supports the reporting of only Scope 1 emissions within the city, while the city-induced method under the BASIC level includes Scope 1 and 2 emissions from energy use (i.e. stationary energy and transport-related emissions), as well as Scope 1 and 3 emissions from waste. The BASIC+ level requires additional reporting of emissions from industrial processes, product use, land use, and transboundary transportation along with upstream Scope 3 emissions from energy use. TABLE 29 summarises the differences between BASIC and BASIC+ reporting levels:

TABLE 29: DIFFERENCES BETWEEN BASIC AND BASIC+ REPORTING LEVELS

Emission source	Scope	BASIC	BASIC+
Stationary fuel combustion	1	✓	✓
In-boundary transportation	1	✓	✓
Grid-supplied electricity	2	✓	✓
Waste and wastewater generated and disposed in the city	1	✓	✓
Waste and wastewater generated in the city and disposed outside	3	✓	✓
Electricity transmission and distribution losses	3	x	✓
Out-of-boundary transportation	3	x	✓
Industrial Processes and Product Use (IPPU)	1	x	✓
Agriculture, Forestry, Land Use (AFOLU)	1	x	✓

Sectors and subsectors

According to the GPC, carbon emissions from city activities are categorised into six main sectors representing the topmost categories of city-wide emission sources:

1. Stationary energy
2. Transportation
3. Waste
4. Industrial processes and product use (IPPU)
5. Agriculture, forestry and other land use (AFOLU)
6. Other Scope 3 emissions

Each sector is further divided into sub-sectors that detail granular emission sources.

Stationary energy

Stationary energy covers emissions from energy use, such as electricity and natural gas. Sub-sectors include:

- Residential buildings
- Commercial and institutional buildings
- Manufacturing industries and construction
- Energy industries
- Agriculture, forestry and fishing activities
- Fugitive emissions

Transportation

Transportation includes emissions from private and public transport across land, sea and air. Sub-sectors are:

- On-road
- Railways
- Waterborne navigation
- Aviation
- Off-road vehicles and equipment

Waste

Waste emissions arise from decomposing organic matter from waste that is landfilled, composted, anaerobically digested or incinerated. Sub-sectors are:

- Solid waste disposal (i.e. waste going to landfill)
- Biological treatment (e.g. composting or anaerobic digestion)
- Incineration and open burning
- Wastewater

Industrial Processes and Product Use (IPPU)

Emissions under this sector originate from industrial processes and the use of products that release greenhouse gases. Sub-sectors are:

- Industrial processes that comprise emissions not associated with energy use (e.g. production of mineral products, chemicals or metals);
- Product use resulting in greenhouse gas emissions (e.g. refrigerants from air conditioning, use of oil and lubricants).

Agriculture, Forestry, and Other Land Use (AFOLU)

AFOLU covers emissions from agricultural and land use activities, split into the following sub-sectors:

- Livestock (e.g. enteric fermentation, emissions from animal manure)
- Land use change (e.g. clearing of forests, or natural regrowth)
- Aggregate sources (e.g. rice cultivation, fertiliser use)

Other Scope 3 Emissions

While some Scope 3 emissions are included in the other sectors, this sector covers all other indirect emissions from goods and services produced outside the city boundary. Reporting of these emissions is optional and must not be included in totals under BASIC/BASIC+ levels.

TABLE 30 shows how emission sources are grouped into GPC sectors, subsector and scopes, including their applicability to BASIC and BASIC+ reporting levels.

TABLE 30: APPLICABILITY OF GPC SECTORS, SUBSECTORS AND SCOPES TO REPORTING LEVELS

Sectors and sub-sectors	Scope 1	Scope 2	Scope 3
Stationary energy			
Residential buildings	✔	✔	✔
Commercial buildings	✔	✔	✔
Institutional buildings	✔	✔	✔
Manufacturing industries and construction	✔	✔	✔
Energy industries	✔	✔	✔
Energy generation supplied to the grid	✔		
Agriculture, forestry, and fishing activities	✔	✔	✔
Non-specified sources	✔	✔	✔
Fugitive emissions from coal	✔		
Fugitive emissions from oil and natural gas systems	✔		
Transportation			
On-road	✔	✔	✔
Railways	✔	✔	✔
Waterborne navigation	✔	✔	✔
Aviation	✔	✔	✔
Off-road	✔	✔	
Waste			
Solid waste generated in the city	✔		✔
Solid waste generated outside the city	✔		
Biological waste generated in the city	✔		✔
Biological waste generated outside the city	✔		
Incinerated and burned waste generated in the city	✔		✔
Incinerated and burned waste generated outside city	✔		
Wastewater generated in the city	✔		✔
Wastewater generated outside the city	✔		
Industrial processes and product use (IPPU)			
Industrial processes	✔		
Product use	✔		
Agriculture, forestry, and fishing activities (AFOLU)			
Livestock	✔		
Land	✔		
Other agriculture	✔		
Other scope 3			
Other scope 3			

✔ = sources required for reporting

✔ = sources required for BASIC reporting

✔ + ✔ = sources required for BASIC+ reporting

✔ = additional scope 1 sources required for territorial reporting

= other scope 3 sources

= non-applicable emission sources

Detailed information about the community emission sources

Stationary energy

Community-wide electricity usage data for Hunter's Hill LGA was sourced from Ausgrid's 2022-2023 Local Council Community Electricity Report. Data is further split into 'residential', 'non-residential' and 'streetlighting' categories. Non-residential facilities include commercial and industrial buildings, split into 'small/medium sites' (i.e. less than 160 MWh per annum) and 'large sites' (i.e. more than 160 MWh per annum). It is assumed that there are no significant 'high-voltage consumers' (i.e. large non-residential customers connected to 11-kV lines) in the LGA. Streetlighting refers to electricity consumption for the main road streetlights, with the amount aligning with the data used for calculating Council's operational emissions in SECTION 3.1.2 and detailed in APPENDIX F. TABLE 31 below summarises electricity usage in the LGA by facility or asset category for FY 2023.

TABLE 31: HUNTER'S HILL LGA – ELECTRICITY USE IN FY 2023 BY FACILITY OR ASSET CATEGORY

Facility or asset category	Electricity usage in FY 2023	Percentage
Residential	43,713 MWh	67.0%
Non-residential	21,186 MWh	32.5%
Streetlighting	316 MWh	0.5%
Total	**65,215 MWh**	**100%**

Through participation in the Resilient Sydney program, Council has access to community-wide usage data on piped natural gas collated by a software solutions provider on emissions tracking and decarbonisation tracking. As the most recent data available, natural gas usage in the LGA from FY 2022 was used as a proxy for FY 2023. TABLE 32 below summarises gas usage in the LGA by facility category.

TABLE 32: HUNTER'S HILL LGA – NATURAL GAS USE IN FY 2023 BY FACILITY CATEGORY

Facility category	Nat. gas usage in FY 2022	Percentage
Residential	111,318 GJ	77.3%
Non-residential	32,751 GJ	22.7%
Total	**144,069 GJ**	**100%**

Emission factors from the National Greenhouse Accounts (NGA) Factors were applied to the above activity data to estimate emissions from stationary energy sources.

Transportation

To estimate on-road emissions from transport vehicles in the LGA, the 'fuel sales method', a recognised 'top-down' approach under the GPC, was used. This method calculates emissions based on the total fuel sold within the city boundary, treating fuel sales as a proxy for transportation activity.

For this method, data on fuel sales across New South Wales was downscaled to LGA level using apportioning factors based on the estimated number of vehicles within the LGA, accounting for vehicle and fuel type affecting fuel use distribution.

The 'fuel sales method' draws on the following inputs:

- Transport fuel sales for New South Wales from Australian Petroleum Statistics 2023
- Number of registered motor vehicles by vehicle and fuel type for New South Wales and Hunter's Hill LGA, from data published by the Australian Bureau of Statistics

TABLE 33 below shows modelled estimates of in-boundary fuel sales in the LGA.

TABLE 33: HUNTER'S HILL LGA – MODELLED ESTIMATES OF FUEL USE IN FY 2023

Fuel type	Est. amount sold in FY 2023
Petrol	9.45 ML
Gasoline	9.25 ML
Ethanol	0.21 ML
Diesel	9.57 ML
Other / LPG	1.34 ML
Total	**20.4 ML**

In line with GPC guidelines, all fuel sales from dispensaries within the LGA are accounted for as Scope 1 emissions, even if used for transboundary trips. Maintaining all fuel sales in Scope 1 also enables more effective multi-LGA aggregation. In the future, Council may conduct surveys or research on transboundary trips concerning the LGA to reallocate total fuel sales into Scope 1 and 3 emissions.

Scope 2 emissions for on-road transport relate to electricity used for charging EVs. Accounting for such emissions by estimating electricity usage for charging EV stations may result in double-counting of emissions, as it is currently not feasible to separate transport-related electricity use from stationary consumption. Therefore, it is assumed that electricity use by EV chargers are captured in the stationary energy sector.

It is also assumed that emissions from railway, water-borne, aviation and off-road transport modes are negligible.

Waste

Through the Resilient Sydney program, Council also has access to community-wide generated waste amounts and potable water usage, with most recent available data from FY 2022 and 2021, respectively, used as proxy for FY 2023.

Data on solid waste amounts are split into facility categories (i.e. residential, non-residential) and waste streams (i.e. municipal solid waste, commercial & industrial). Biological treatment of waste refers to composting of green waste. Recycled materials (e.g. container, paper) diverted from landfill are considered to contribute zero emissions. Wastewater emissions were estimated by downscaling NSW-wide wastewater emissions by the share of water supplied to properties in the LGA. It is assumed that no waste is burned in the LGA.

With treatment and disposal occurring solely outside of the LGA's boundary, emissions from solid waste disposal and wastewater treatment are accounted for under Scope 3.

TABLE 34 below summarises amounts of potable water, solid waste, green waste and recycled materials by facility category. However, detailed data on the split of recycled materials by facility category is currently unavailable.

TABLE 34: HUNTER'S HILL LGA – PROXY DATA ON WATER AND WASTE AMOUNTS FOR FY 2023

Water / Waste	Year	Recorded Amount		
		Residential	*Non-residential*	*Total*
Potable water	FY 2021	1,205,281 kL	794,059 kL	1,999,340 kL
Landfilled waste	FY 2022	2,893,770 kg	8,255,582 kg	11,149,352 kg
MSW	FY 2022	2,893,770 kg	-	2,893,770 kg
C&I	FY 2022	-	8,255,582 kg	8,255,582 kg
Green waste	FY 2022	1,595,000 kg	-	1,595,000 kg
Recycled materials	FY 2023			1,007,630 kg

Note on methodological differences with Snapshot

It is important to note that the emissions calculated in this inventory differ from the estimates provided on *Snapshot* due to methodological differences, particularly in calculating transport and waste emissions.

Transport:

- ***Snapshot*:** The *Snapshot* estimate is based on activity data from Google Environmental Insights Explorer (EIE), an online tool that offers anonymised, aggregated transport activity data at the municipal level, as derived from mobile phone data. Total distance is expressed in kilometres, classified by boundary (i.e. inbound, outbound and in-boundary trips) and transport mode. In particular, 'on road' transport refers to automobiles, motorcycles and buses. As EIE data lacks details on fuel type, estimates are based on vehicle and fuel type data from the Australian Bureau of Statistics (ABS). Fuel efficiency, energy content and emission factors are then integrated through a series of functions to derive emissions.
- **This Inventory:** The method for estimating transport emissions in this inventory treats fuel sales data from the Australian Petroleum Statistics as a proxy for transport activity across the state, further downscaled to the LGA level by applying a ratio representing the number of vehicles in the LGA, with consideration of vehicle (e.g. passenger vehicles, campervans, trucks) and fuel types (e.g. petrol, diesel).

Waste:

- ***Snapshot:*** The *Snapshot* estimate for emissions under the solid waste subsector is based on data from the *National Waste Report* at the sector and state level, further integrated with solid waste emissions data from Australia's National Greenhouse Accounts (NGA) and downscaled by scaling factors (i.e. population, jobs, building approvals) to estimate emissions at the LGA level. Emissions under the wastewater subsector are estimated using wastewater emissions data from NGA, also applied with scaling factors (i.e. population, jobs).
- **This Inventory:** Council-provided data on community-wide waste amounts are directly used to estimate emissions under the solid waste and biological treatment subsectors. For the wastewater subsector, emissions are estimated by downscaling NSW-wide wastewater emissions by the share of water supplied to LGA properties.

Appendix J – Cost of abatement

Net cost of abatement represents the financial investment required for interventions that reduce, avoid, or negate greenhouse gas emissions, less the savings those measures yield. Where savings exceed costs over the life of a particular measure, the net cost of abatement will be negative (i.e., abatement is delivered together with increased long-term cash flow). Typically expressed as cost per metric tonne of CO_2-equivalent it quantifies the net expense to mitigate 1 tonne of CO_2-e.

While a full abatement cost analysis is beyond this project's scope, the summary table below—extracted from recent projects completed by 100% Renewables for similar councils—offers Council with a high-level understanding of how various interventions compare in terms of cost of emissions abatement.

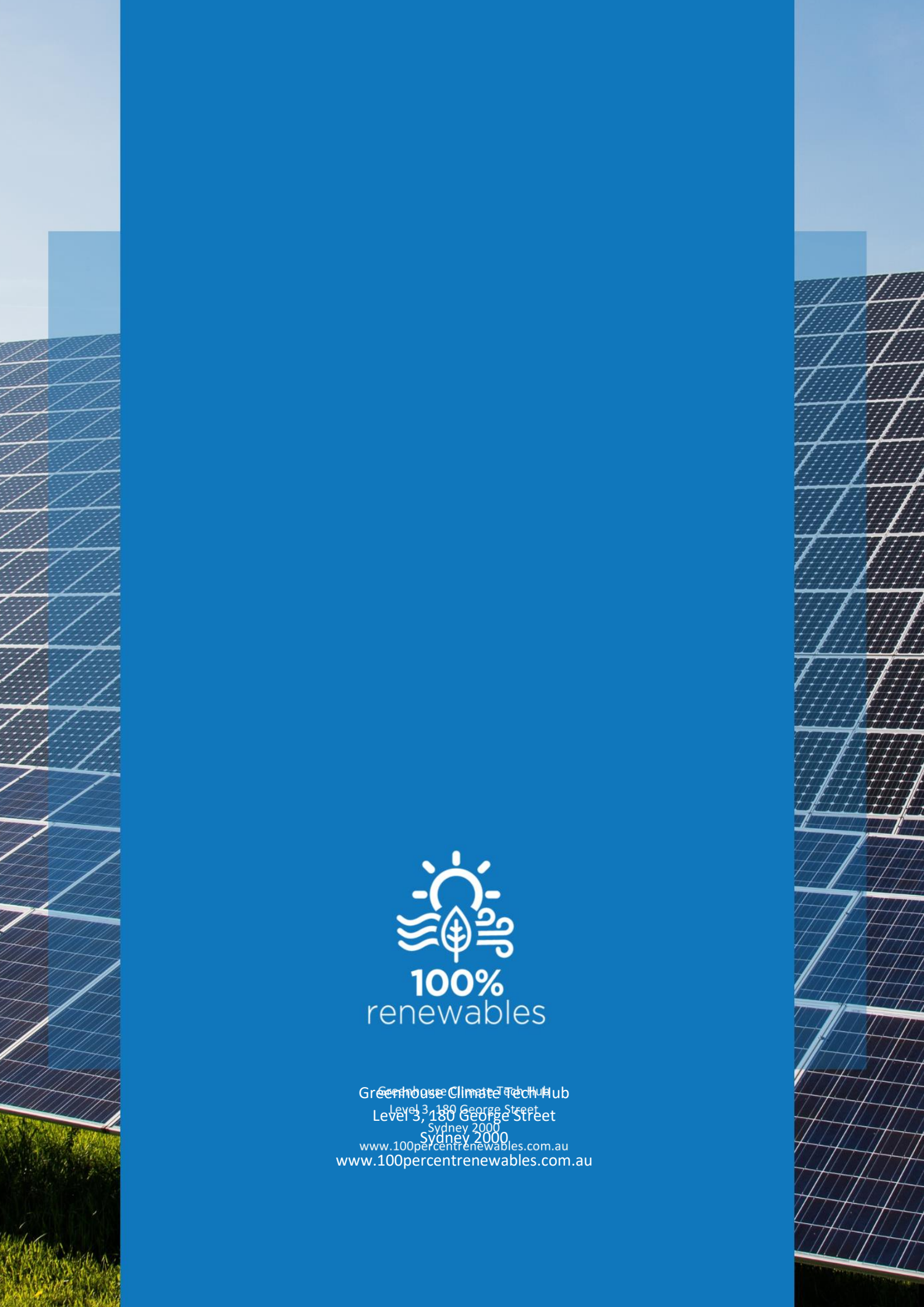
TABLE 35: COSTS OF EMISSIONS ABATEMENT EXAMPLE

Action to abate emissions	Net cost of abatement
Waste diversion	**$47 / t CO_2-e**
Household FOGO composting	$54 / t CO_2-e
Paper recycling & decontamination	-$32 / t CO_2-e
Kerbside glass recycling & decontamination	$112 / t CO_2-e
Plastics recycling & decontamination	$79 / t CO_2-e
Fleet transition	**-$51 / t CO_2-e**
Abatement on contractor fuel	**$0 / t CO_2-e**
Abatement on other sources	**$40 / t CO_2-e**
Solar PV	**-$244 / t CO_2-e**
PPA	**$1 / t CO_2-e**
Energy efficiency	**-$10 / t CO_2-e**
Streetlighting LED conversion	**-$294 / t CO_2-e**
Energex-owned	-$508 / t CO_2-e
Council-owned	-$329 / t CO_2-e
Water efficiency and conservation	**-$18 / t CO_2-e**
Refrigerant switching	**$37 / t CO_2-e**
Abatement on construction materials	**$2 / t CO_2-e**

The table reveals that some measures, such as waste diversion and refrigerant switching, have a positive net cost per tonne of CO_2-e abated, indicating that even though they require a significant initial investment, the long-term savings do not fully cover the costs. Nonetheless, these actions might still be justified by their overall impact on emissions reduction and broader community benefits.

Conversely, initiatives such as solar PV installations and streetlighting conversions show negative net costs per tonne, indicating that they not only abate emissions but also generate savings over time.

Ultimately, while lower marginal abatement costs are economically attractive, it is essential to consider and implement an integrated mix of strategies to achieve the overarching climate objective of net zero emissions and carbon neutrality. Acting on negative cost measures first can enable cashflow to support more costly measures in the future.



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