Aboriginal Shire Councils

Emissions Reduction Action Plan

Prepared for
Aboriginal Shires Council

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About Ironbark Sustainability
For nearly two decades, Ironbark Sustainability has worked with councils and their communities to reduce greenhouse emissions, tackle climate change and implement sustainability projects and programs. We bring together a wealth of technical and financial analysis, maintenance and implementation experience in the areas of building energy and water efficiency, climate action and strategy development, public lighting and data management. We pride ourselves on supporting our clients to achieve real action on sustainability.

Our Mission
The Ironbark mission is to achieve real action on sustainability for councils and their communities.

Ironbark is a certified B Corporation. We have been independently assessed as meeting the highest standards of verified social and environmental performance, public transparency, and legal accountability to balance profit and purpose.

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Executive Summary

This Emissions Reduction Action Plan (ERAP) is designed to help FNQROC Aboriginal Shire Councils (ASCs or Council); Hope Vale, Wujal Wujal and Yarrabah, understand their emissions, ways to reduce them in the short to long-term and meet any future goals or net zero targets. By striving to reduce their carbon footprint within ASCs operations and understand their community's emissions impact, ASCs is working towards adapting to a changing climate and mitigating the risks associated with inaction. This Plan follows on from the work being undertaken by FNQROC Climate Resilience Technical Committee, to build a low-carbon future, increase resilience and preserve the natural environment. ASCs are also part of the Reef Guardian Councils aimed at reducing the threats climate change poses to the Great Barrier Reef.

This Plan proposes practical actions for ASCs to demonstrate leadership within the community while reducing their emissions. The actions suggested will help guide ASCs to reduce emissions in the short, medium and long-term, in line with national and state targets. Table 1 provides a summary of actions each Council can consider within the next decade to reduce emissions, detailing the actions, with estimated costs, abatement potential and project timeframes.

Table 1: Summary of recommended GHG Emission Reduction Actions for FNQROC Aboriginal Shire Councils (Hope Vale, Wujal Wujal and Yarrabah).

GHG Emissions Reduction Action Plan for FNQROC Aboriginal Shire Councils (Hope Vale, Wujal Wujal and Yarrabah)				
Action	**Description**	**Lifetime Cost#**	**Abatement ***	**Timeframe+**
Energy Audits and Efficiency Upgrades	Implementation of energy efficiency measures (lighting upgrades, building management systems, HVAC upgrades) that will reduce energy consumption at key facilities.	$	Medium	Short
Environmentally Sustainable Design (ESD) Policy	Policies for buildings, equipment and infrastructure that embed sustainability principles into the design, construction and procurement of council assets.	$	Medium	Short
100% Renewable PPA	Transition to 100% renewable energy PPA	$	High	Short
Behind the Meter Solar	Solar panels installed at facilities, providing both zero emissions energy and significant financial benefits by reducing purchase of grid electricity.	$$	Medium	Medium
Battery Storage	Batteries work with solar systems, allowing energy generated during the day to be stored and used at night or on overcast days.	$$$	Medium	Long
Streetlighting	Upgrade streetlights to LEDs with smart lighting capabilities	$$	High	Short
Passenger Vehicle Transition	The electrification of passenger fleet, including installation of vehicle charging infrastructure.	$$	Low	Medium
Plant Equipment	Replace any plant equipment with electric alternatives	$$	Medium	Medium
FOGO	Provide FOGO at council-operated buildings (Wujal Wujal and YASC only)	$	Medium	Medium

	Recycling and FOGO	Provide recycling and FOGO bins for residential waste (Hope Vale only)	$$	Medium	Medium
	Water and Sewer	Reduce emissions associated with wastewater treatment plants and pumping stations	$$$	High	Medium
	Landfill Gas Flaring	Investigate landfill gas flaring at Hope Vale Landfill	$$$	High	Long
	Utility Vehicle Transition	The electrification of utility fleet, including installation of vehicle charging infrastructure.	$$$	High	Long
	Heavy Vehicle Transition	The electrification of heavy vehicle fleet, including installation of vehicle charging infrastructure.	$$	Medium	Long
	Sustainable Infrastructure Policy	Develop a policy to provide lower emissions materials used in road and footpath projects	$$	Low	Long
	Scope 3 emissions	Work with suppliers to reduce scope 3 emissions	$$	High	Long
	Open Space Lighting	Transition sportsground, parks & reserves and car park lighting to LED	$$	Medium	Long

[#] Lifetime cost includes expected returns on investment, $ (<$5,000), $$ ($5,000-$15,000), $$$ (>$15,000)

**Total Emissions tCO_2-e abated, Low (<500 tCO_2-e), Medium (500 – 1,000 tCO_2-e), High (> 1,000 tCO_2-e)*

[+] Timeframes: Short (<5 years), Medium (5 - 10 years), Long (10+ years)

1. Introduction

The Hope Vale Aboriginal Shire Council, Wujal Wujal Aboriginal Shire Council and Yarrabah Aboriginal Shire Council (ASCs or Council) are committed to understanding their emission sources across both corporate operations and the wider community by actively exploring opportunities and identifying the resources required to meet state government's reduction targets. A key motivations behind this effort is to strengthen their advocacy for necessary support and funding, as well as to contribute meaningfully to the development of any behaviour change campaigns.

This Emissions Reduction Action Plan builds upon the emissions inventory completed by Ironbark this year, offering insights into the types of actions and projects ASCs can begin exploring.

As ASCs is influenced by national, federal and state policies, Section 2 outlines the direction each level of government is taking to reduce emissions and meet their net zero target and how ASCs can utilise these frameworks to meet their own goals and targets.

Section 3 outlines ASC's roles and responsibilities in emissions reduction, as well as the role community members can play in reducing emissions.

Section 4 provides a brief overview of each Council's emissions inventory and community profile, and outlines actions the community can take to reduce emissions.

Section 5 outlines potential emissions reduction actions that ASCs can explore and consider implementing over the next decade to begin effectively reducing emissions within their operations. Priority should be given to actions that are low cost, easy to implement with a high emissions abatement, particularly those at the top of the emissions reduction hierarchy shown in Figure 1. Longer-term actions, such as transitioning heavy vehicle fleet to EVs, will require detailed planning and may become more viable with technological advancements.

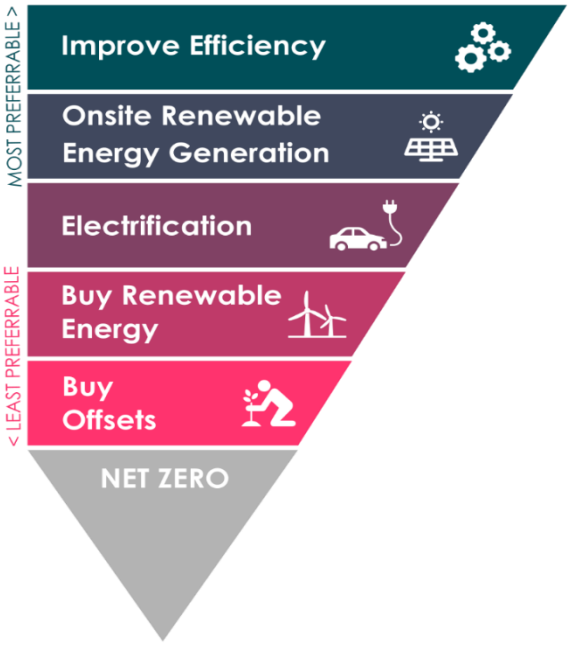


Figure 1: Emissions reduction hierarchy

The Plan identifies opportunities within the following key areas of ASC's operations:

- Energy efficiency improvements in buildings and facilities
- Onsite renewable energy generations
- Low emissions technology upgrades in fleet
- Renewable energy supply agreements; and
- Minimising emissions due to waste

While the focus is on climate change mitigation within ASC's operational control, many actions will also help ASCs adapt to and build resilience against climate impacts. Regular reviews and updates of this document will ensure actions remain informed by the latest information and technologies, accelerating ASCs emissions reduction journey.

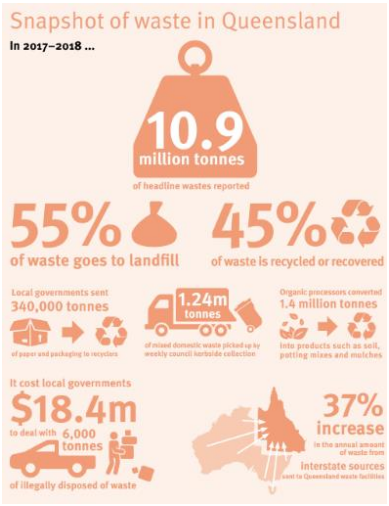
2. State Policy and Target

The Queensland Government has set a net zero target by 2050, with interim targets of 30% below 2005 levels by 2030 and 75% below 2005 levels by 2035.[1] It also has renewable energy targets of 50% by 2030, 70% by 2032 and 80% by 2035. These targets were legislated in April 2024 as part of the Clean Economy Jobs Act 2024 and the planned pathway to meeting the targets is outlined in the Queensland's 2035 Clean Economy Pathway: 75% by 2035 report. In particular, the Government is:

- Targeting electricity emissions through the Queensland Energy and Jobs Plan, including creating a $62 billion Super Grid and dramatically expanding solar and wind power supported by two world-class pumped hydro facilities
- Encouraging the protection of vegetation and vegetation regrowth through the Vegetation Management Framework and $500 million Land Restoration Fund
- Supporting Queensland's highest emitting facilities to bring forward investment in projects that will drive down emissions
- Addressing transport emissions through a focus on zero emission technologies and vehicle modes, new and emerging technologies and alternative fuels via the Zero Emissions Vehicles Strategy and Action Plan

In addition, the state government has a Waste Management and Resource Recovery Strategy.

The vision of this strategy is to become a zero-waste society, where waste is avoided, reused and recycled to the greatest extent possible. Strategic investment in diverse and innovative resource recovery technologies and markets will produce high-value products and generate economic benefits for the state.



Targets for the waste management strategy:

- 25% reduction in household waste
- 90% of waste is recovered and diverted from landfill, and
- 75% recycling rates across all waste types

This strategy has also informed and will be monitored and evaluated alongside the Queensland Organics Strategy and Action Plan 2022-2032.

The target of this strategy and action plan is to:

- Halve the amount of food waste generated
- Divert 80% of the organic material generated from landfill, and
- Achieve a minimum organic recycling rate of 70%

For international and federal policy see Appendix A.

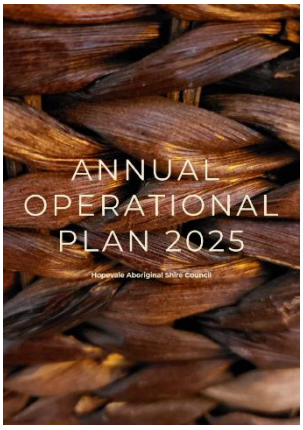
[1] https://www.energyandclimate.qld.gov.au/climate/action-plan

2.1 Strategies and Policies Underpinning Emissions Reduction

As part of FNQROC, a Climate Resilience Technical Committee was established to collaboratively address risks and develop opportunities for a climate-resilient and low-carbon future. The focus is on climate mitigation, transition and adaptation opportunities that deliver social, environmental and economic benefits.

In addition, all three ASCs are part of the Reef Guardian Councils which work to provide effective management and protection of the Great Barrier Reef and coordinates efforts between local governments, industries and the communities they serve. In 2018 the Reef developed a mid-term review of the 2050 Long-Term Sustainability Plan to address the pressing issues and threats the Reef faces today and to accelerate actions to mitigate the effect of climate change on the Reef.

The ASCs have a number of plans and policies which have been developed to guide each council in starting their journey to reduce emissions within their own operations as well as within the community.



Those plans and objectives are outlined below, which have been reviewed to help shape this action plan.

Hope Vale Shire Council

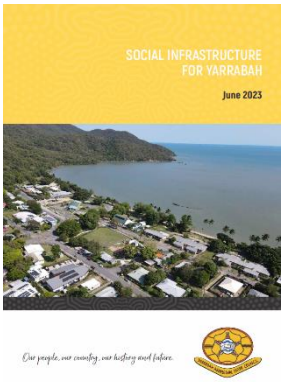
- Annual Operational Plan 2025, Environmental Sustainability: to enrich the environmental assets within the shire boundary ensuring a well managed and preserved natural environment for future generations.
- Corporate Plan 2018-2025, Goal 3: Environmental Sustainability
- FNQROC Regional Resource Recovery Plan

Wujal Wujal Shire Council

- 2024-2025 Operational Plan

Yarrabah Shire Council

- Annual Report 2022-2023
- Social Infrastructure for Yarrabah June 2023
- Yarrabah Microgrid Feasibility Study
- Rivers to Reef Climate Resilience Alliance Action Plan



3. Roles and Responsibilities

This action plan provides recommendations ASCs can take in the short to long-term to reduce emissions and adapt to climate change. The intention of this plan is to provide ASCs with tangible actions that can be implemented to reduce emissions in thir own operations. Initiatives aimed at supporting the community to reduce their emissions are also recommended, but the objective of the plan mainly falls to actions within each Council's corporate boundary.

Addressing climate change involves broader societal and structural changes beyond a council's direct control and will require contributions from various stakeholders, including residents, businesses, industry, and all levels of government. By working together, ASCs can protect both current and future generations from the impacts of climate change.

3.1 Council's Role

Councils can play a supporting role in helping the community understand and reduce their emissions, especially vulnerable and disadvantaged groups.

Local government has a responsibility to sustainable development and management of its own assets and infrastructure under the Local Government Act 2009.[2] Councils have a role in working with other partners and the community to improve the shared understanding of climate-related risks and co-design solutions that build the resilience of communities, assets, and infrastructure.

This section emphasises key areas within Council's sphere of responsibility, influence and advocacy that can significantly reduce emissions associated with their own assets as well as throughout the community.

Figure 2 represents Council's three spheres of responsibility for reducing emissions and building the community's resilience to climate change.

"**Directly responsible**" refers to the areas in which Council has direct authority and decision-making power. This includes managing resources, and infrastructure under its organisational operations.

Figure 2: Council's Spheres of Responsibility

[2] https://www.yarrabah.qld.gov.au/council/

Council's sphere of "**influence"** involves Council's ability to shape and guide actions of others within the community, for example through education and facilitation of programs. Council can play a pivotal role in this aspect by leveraging its leadership, local insights and established networks to motivate and facilitate climate action within the community.

"**Advocacy**" relates to Council's role in representing and championing the interests, concerns, and rights of the Aboriginal Shire community, advocating to state and federal governments and other bodies on behalf of the community to influence decisions that extend beyond its control.

Influence and Advocacy actions will typically require collaboration and partnerships with community groups, other local governments and government bodies for their successful implementation. Education, facilitation, and outreach programs must consider the diverse community within the local government area, ensuring equal access regardless of cultural background, language, gender, socio-economic, life stage, ability, or geographic location.

3.2 The Community's Role

Each member of the Aboriginal Shire community has a critical role to play in reducing emissions and adapting to climate change. Whilst this plan primarily focuses on the responsibilities of Council to implement actions, some opportunities are designed to be inclusive, mutually advantageous, and scalable both at the community and individual level.

A checklist of 'What the Community Can Do' is provided in Section 4.2.4 of this plan. This includes actions an individual can take to reduce their climate impacts and in turn help reduce emissions within their community.

4. Emissions Summary

4.1 Corporate Emissions Inventory

Ironbark Sustainability developed a baseline emissions inventory for the three ASCs earlier in 2025. These inventories serve as a foundation for reducing emissions and achieving any goals or targets set by the council in future years. For the full inventory report, refer to each Council's individual report.

4.1.1 Hope Vale Aboriginal Shire Council

Council's total emissions for the FY2022/23 have been calculated as 1,771 tonnes of CO_2 equivalent (tCO_2-e). Figure 3 shows the GHG emissions profile summary for Hope Vale Aboriginal Shire Council by source.

Major emissions sources include:

- **Electricity consumption** (34%; 610 tCO_2-e) including buildings, water & waste, street lighting, open space lighting | **Scopes 2 and 3**
- **Waste disposal to landfill** (63%; 1,091 tCO_2-e) | **Scope 1**
- **Water and wastewater** (1%; 20 tCO_2-e) | **Scope 1**
- **Transport fuels** (2%; 50 tCO_2-e) | **Scope 1 and 3**

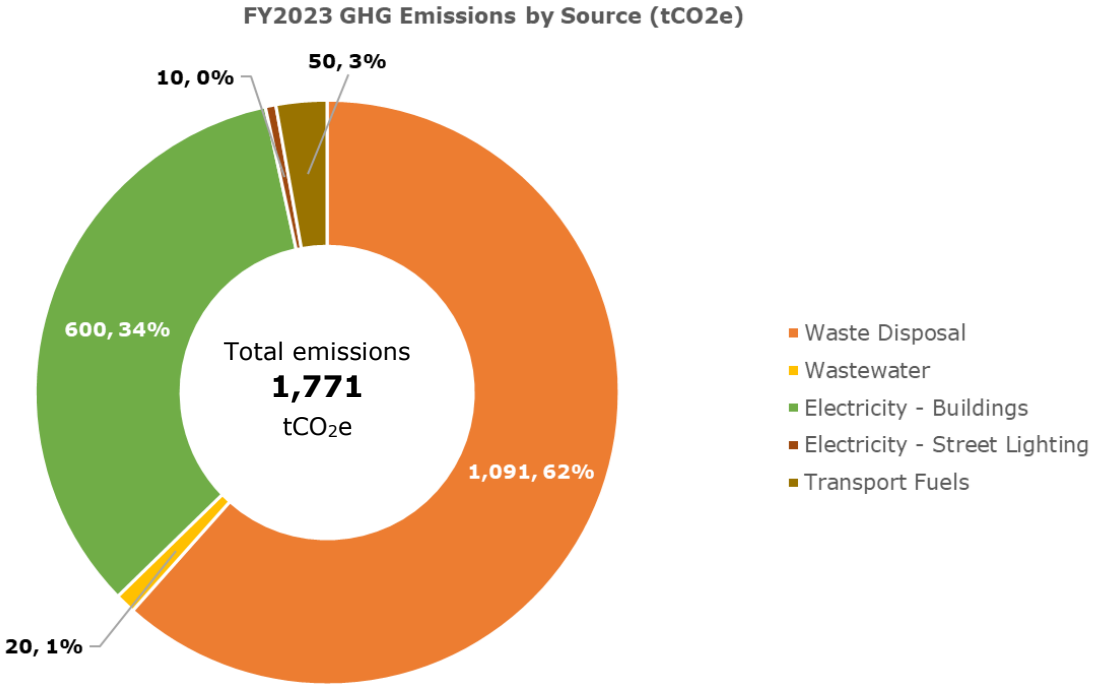


Figure 3: Hope Vale Aboriginal Shire Council emissions inventory FY2022/23

Actions in this plan are recommended based on the emission sources identified in the inventory. If any significant emission sources, such as asphalt and concrete, were not captured, actions can still be proposed to begin addressing them once accurate data is recorded in future inventories.

4.1.2 Wujal Wujal Aboriginal Shire Council

Council's total emissions for the FY2022/23 have been calculated as 32 tonnes of CO_2 equivalent (tCO_2-e). Figure 4 shows the GHG emissions profile summary for Wujal Wujal Aboriginal Shire Council by source.

Major emissions sources include:

- **Electricity consumption** (69%; 22 tCO_2-e) including buildings, water & waste, street lighting, open space lighting | **Scopes 2 and 3**
- **Water and wastewater** (19%; 6 tCO_2-e) | **Scope 1**
- **Transport fuels** (11%; 4 tCO_2-e) | **Scope 1 and 3**
- **Corporate Waste** (1%; < 1 tCO_2-e) | **Scope 1**

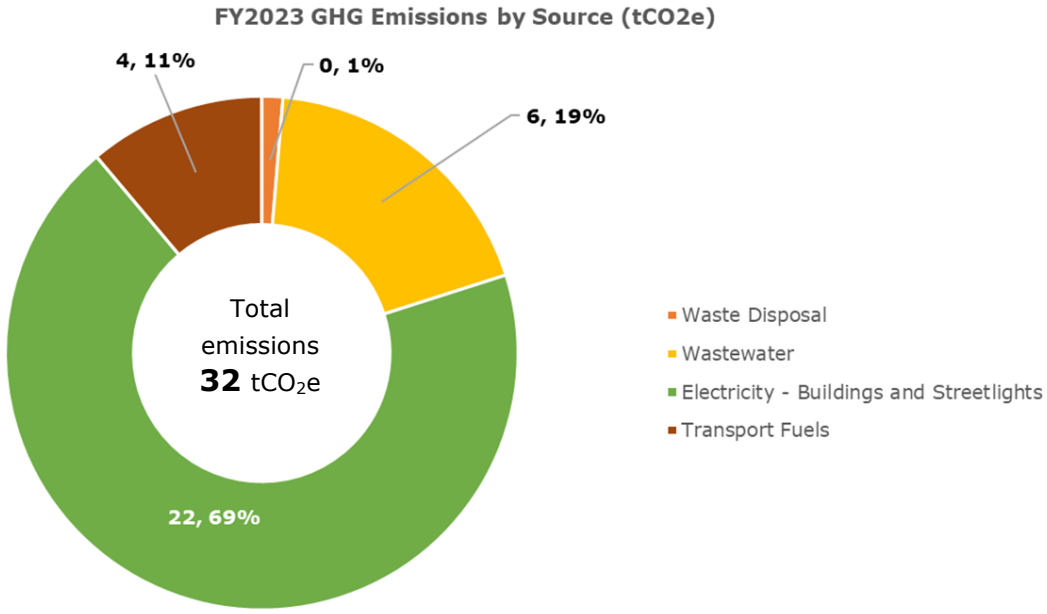


Figure 4: Wujal Wujal Aboriginal Shire Council emissions inventory FY2022/23

Actions in this plan are recommended based on the emission sources identified in the inventory. If any significant emission sources, such as asphalt and concrete, were not captured, actions can still be proposed to begin addressing them once accurate data is recorded in future inventories.

4.1.3 Yarrabah Aboriginal Shire Council

Council's total emissions for the FY2022/23 have been calculated as 268 tonnes of CO_2 equivalent (tCO_2-e). Figure 5 shows the GHG emissions profile summary for Yarrabah Aboriginal Shire Council by source.

Major emissions sources include:

- **Electricity consumption** (73%; 208 tCO_2-e) including buildings, water & waste, street lighting, open space lighting | **Scopes 2 and 3**
- **Corporate Waste** (1%; 2 tCO_2-e) | **Scope 1**
- **Water and wastewater** (19%; 52 tCO_2-e) | **Scope 1**
- **Transport fuels** (6%; 19 tCO_2-e) | **Scope 1 and 3**

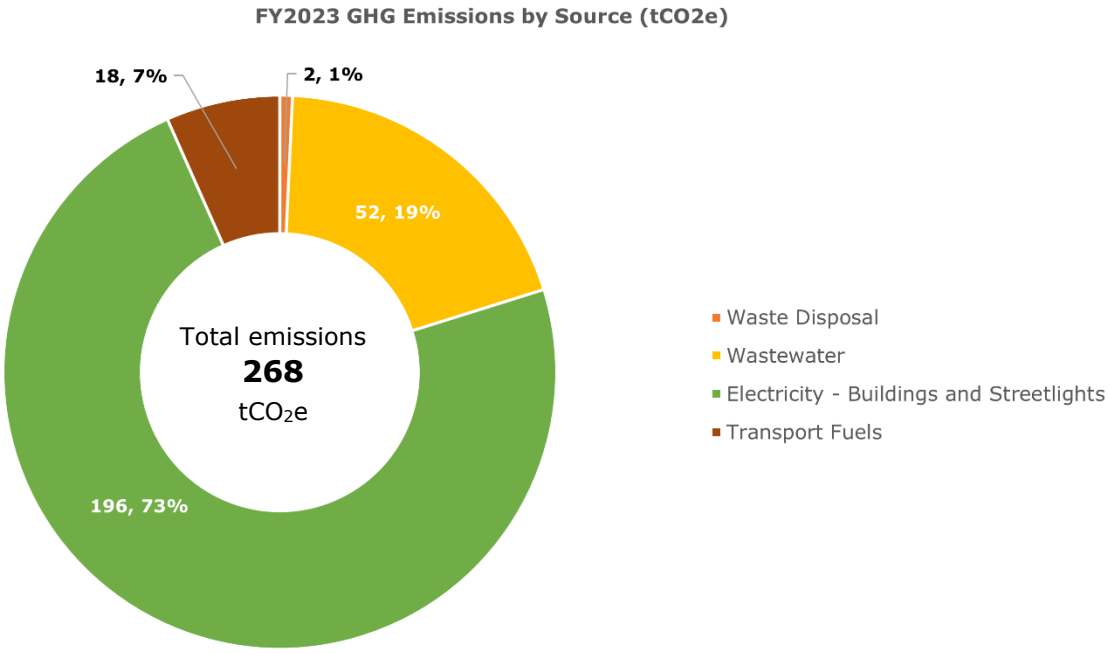


Figure 5: Yarrabah Aboriginal Shire Council emissions inventory FY2022/23

Actions in this plan are recommended based on the emission sources identified in the inventory. If any significant emission sources, such as asphalt and concrete, were not captured, actions can still be proposed to begin addressing them once accurate data is record in future inventories.

4.2 Community Emissions Summary (Snapshot Climate)

Snapshot Climate is Ironbark Sustainability's emissions profile tool which helps councils to understand emissions at the municipality scale. This tool was designed to help decision makers understand how emissions impact their communities and support informed decision on how to reduce them.

The emissions data is collated from a range of publicly available datasets, including the National Greenhouse and Energy Reporting Scheme (NGERs), the Safeguard Registry and the Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC).

If a particular dataset is unavailable, it likely means that the corresponding emission sources are either not publicly accessible or do not exist. For example, in small councils where natural gas is not used, gas emissions will not be included in the Snapshot profile.

4.2.1 Hope Vale Aboriginal Shire Council

Hope Vale's community emissions profile includes all emissions produced within the local government boundary including from residential, commercial and industrial activities (Figure 6).[3] Electricity and transport emissions were the only two emission sources captured in local and state level datasets. In FY2022/23, the community generated 34,000 t CO_2-e, with the most significant source of emissions from industrial electricity (47%), followed by transport emissions at 41% (vehicles, freight and bus).

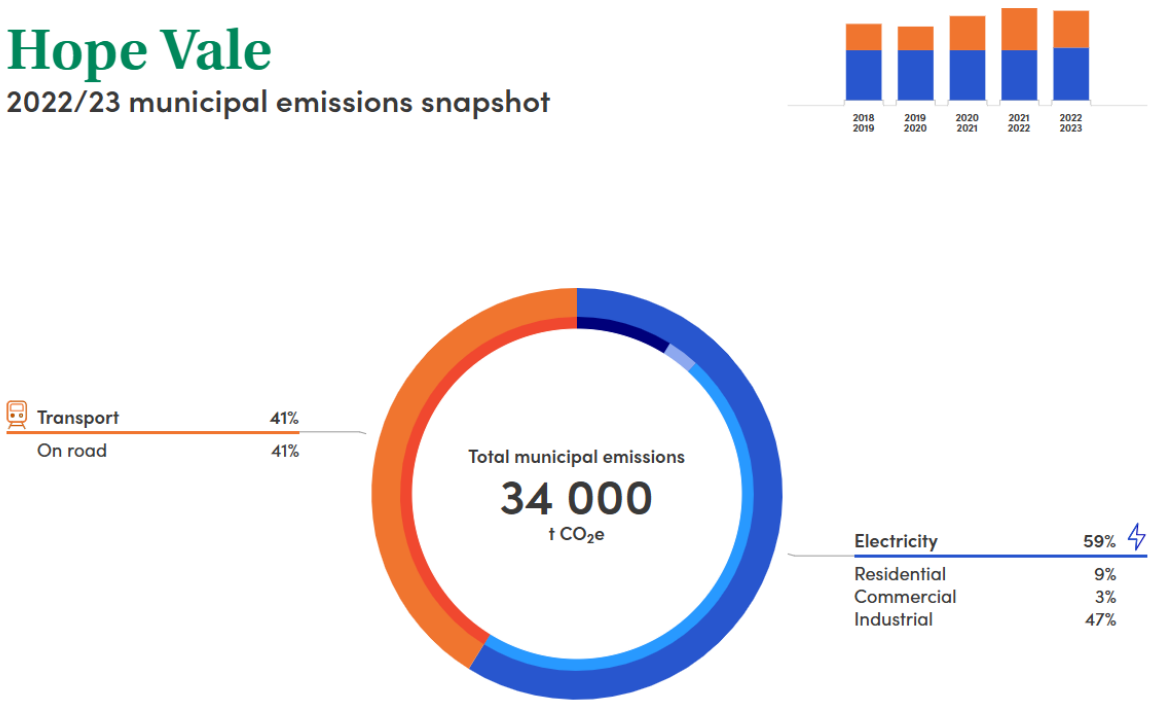


Figure 6: Hope Vale Aboriginal Shire Council's community emissions FY022/23

[3] Based on Snapshot climate data tool in accordance with the Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC). The tool encompasses a wide array of top down or state level data on emissions and their sources. https://snapshotclimate.com.au/

4.2.2 Wujal Wujal Aboriginal Shire Council

Wujal Wujal's community emissions profile in FY2022/23 only includes emissions from transport (1,000 t CO_2-e), Figure 7. Other emission sources like electricity cannot be accounted for as the local population (under 300) is too small to account for, or electricity data is not available for the region. Transport emissions only account for passenger vehicle usage as captured by Google's Environmental Insights Explorer, so this number may be underestimated. Although these community emissions are under-reported, the community can still make progress in reducing its reliance on fossil fuel sources (like diesel generators) and reducing the amount of waste going to landfill.

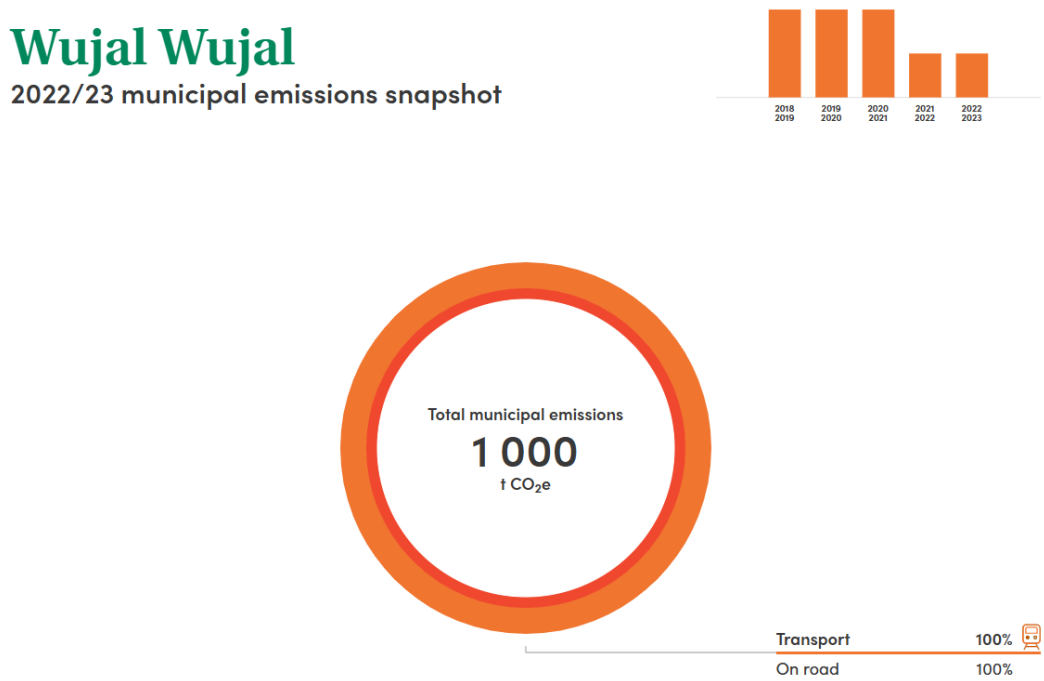


Figure 7: Wujal Wujal Aboriginal Shire Council community emissions FY2022/23

4.2.3 Yarrabah Aboriginal Shire Council

Yarrabah community's emissions include emissions from within the local government boundary from residential and commercial activities. In FY2022/23, the community generated 14,000 tCO_2-e, with the most significant source of emissions from electricity (57%), Figure 8. Residential electricity was the highest sector at 36%, followed by automotive transportation at 36%, commercial electricity at 21% and waste at 7%. Other modes of transportation was not recorded.

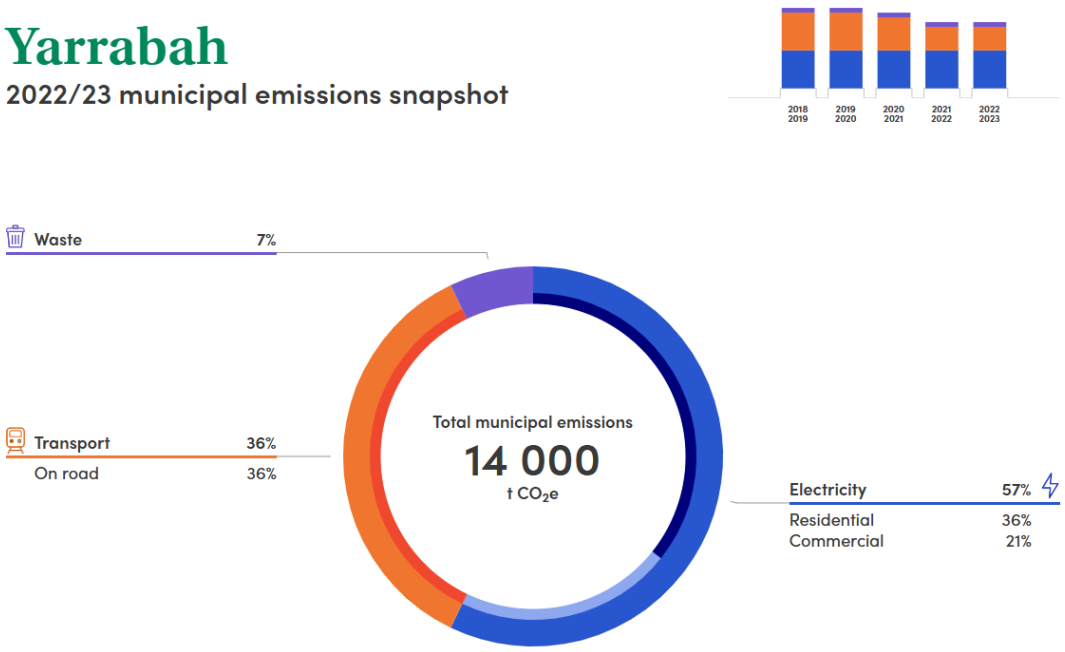


Figure 8: Yarrabah Aboriginal Shire Council community emissions FY2022/23

4.2.4 What the Community Can Do

To achieve meaningful emissions reductions, it is essential for each Council's community to take action, both individually and collectively, to contribute to a healthier local environment. Actions an individual or group can take to reduce their climate impacts and in turn help reduce the community emissions within each Council include:

- Opt for energy-efficient appliances
- Install rooftop solar and opt for 100% GreenPower
- Investigate bulk buys of solar, batteries, and renewable energy purchase agreements for your community
- Transition your home and business to electric heating, cooking, and hot water systems, reducing reliance on fossil fuels
- Support local businesses practicing sustainability
- Make simple changes for a more sustainable home, like using energy-efficient LED light bulbs, sealing draughts, and setting timers
- Choose low-emission vehicles where possible (electric vehicles, e-bikes, smaller cars)
- Use sustainable transport options available like buses, cycling, walking, or carpooling
- Advocate for better public transport, cycling paths, and the availability of EV charging network
- Divert organic waste from landfill and support circular packaging initiatives

- Push for sustainable urban planning and climate-resilient building codes
- Maintain and plant vegetation, especially canopy trees, to combat the urban heat island effect
- Support vulnerable community members during heatwaves
- Reduce water consumption
- Develop personal emergency plans for cyclones, floods and other major storms
- Stay updated on fire prevention and risk minimisation
- Engage with and support your neighbours and community
- Use Council resources and participate in community events
- Community groups can lead climate change education and develop response plans for extreme weather
- Collaborate to address water security challenges
- Collaborate to protect and restore vegetation and biodiversity
- Advocate against deforestation and for the revegetation of degraded land
- Consume more locally-sourced, sustainable, and plant-based food

5. Corporate Emissions Reduction Actions

In order to reduce emissions, ASCs will need to undertake several projects and programs over the coming decade. This plan has used the emissions reduction hierarchy shown in Figure 9 to prioritise actions for implementation in the short term.

The emissions reduction opportunities that are expected to be the most impactful and cost effective based on the baseline emissions inventory have been identified within this Action Plan. Most of the opportunities presented can be implemented within the next five to 10 years, however some will require further technology advancement and cost reduction before they are feasible or financially viable to deliver.

The actions described in this Plan have been identified for implementation based on typical impact and return on investment. ASCs will need to complete a detailed business case or conduct feasibility studies before implementing any of the opportunities identified.

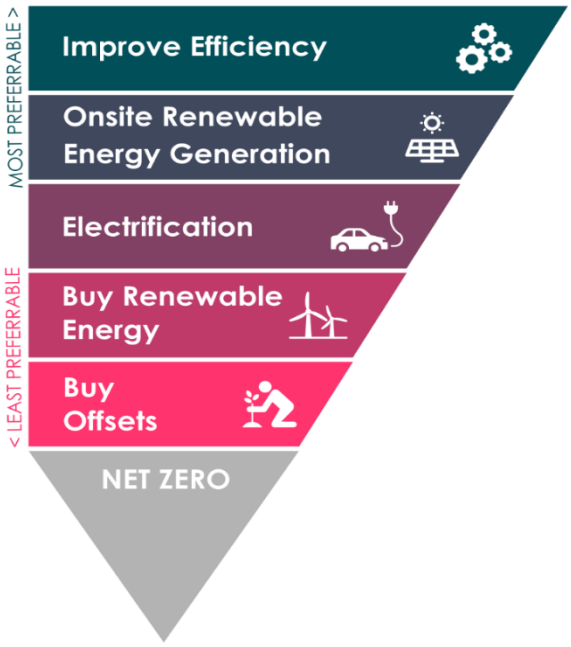


Figure 9: Greenhouse emissions reduction hierarchy

These actions have been broken up between actions which can be implemented in the short-term (<5 years), medium-term (5-10 years), and long-term (>10 years). If an action is only applicable to one or two councils (e.g. landfill waste), this has been clearly indicated. Otherwise, all actions are recommended for all three Councils.

While this action plan doesn't include specific costings for each action, Appendix B provides cost estimates for each type of emission reducing project, giving ASCs a clearer understanding of the costs associated with different actions.

5.1 Actions to Commence in the short-term

This first section presents actions to be considered within the next five years, prioritised based on the emissions reduction hierarchy, expected impact and return on investment.

5.1.1 ASCs Building Energy Efficiency

Energy efficiency is at the top of the emissions reduction hierarchy and typically the first actions most councils look at implementing. This involves actions that are generally low cost and offer a high level of abatement potential.

5.1.1.1 Energy Audits and Efficiency Upgrades

Energy Efficiency at Large Facilities

A systematic process for energy efficiency improvements would include repeating a pattern of conducting audits, implementing efficiency upgrades, monitoring and reporting on the outcomes over a 3-5 year period for a defined list of ASC's largest energy consuming facilities (sites which use >25,000 kWh/year). This would be embedded in any Asset Management Plan and maintenance schedules.

Emissions from buildings for Hope Vale, Wujal Wujal and Yarrabah account for 34%, 69% and 73%, respectively of the total inventory.[4] Conducting audits and implementing efficiency actions can result in a reduction of emissions between 5%-10%, which highlights a high emissions abatement potential for ASC's larger emission sources.

It's recommended ASCs begin with conducting detailed Type 2 audits over the next two years to understand each building's energy profile. For these sites, actions resulting from audits could include:

- Lighting upgrades to LEDs and smart controls
- Replacements of gas hot water systems with heat pumps
- Building management systems (BMS)
- Building fabric improvements including insulation and draft sealing
- Heating and cooling improvements including optimisation of fans and controls, and
- Replacement of appliances more than ten years old

There may also be financial benefits to bulk replacement of systems across multiple assets.

There are further facility management improvements that can be employed that when implemented can help reduce emissions, such as:

- Energy bill validation
- NABERs ratings at large assets
- Energy and water sub-metering, and
- Green leasing agreements

[4] Streetlighting are included in Wujal Wujal and Yarrabah building emissions as there wasn't any way to distinguish between buildings in streetlighting in the asset lists. However, streetlighting emissions account for a small portion of the building emissions, sometimes less than 1%.

Energy Efficiency at Medium and Small Sized Facilities

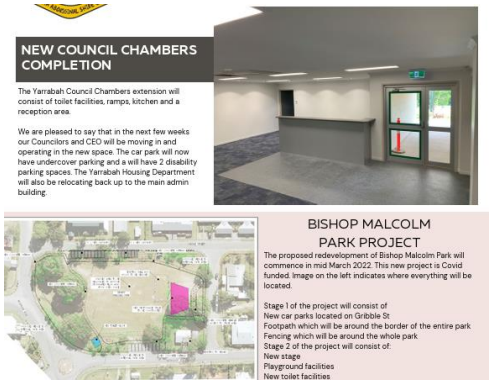
The remaining buildings which consume less than 25,000 kWh/year would benefit from a basic stock take audit. This is for sites with basic equipment, but relatively high consumption, where a simple 'stock take' of existing energy technology and passive thermal opportunities should be conducted. This approach identifies all potential energy efficiency improvements and their associated costs without detailing site-specific savings. Given the predictability of certain upgrades, such as lighting technology, motion sensors, or air conditioning and hot water system improvements, a broad assessment is sufficient, avoiding the need for detailed reports at each individual site.

A stock take can either be conducted in-house or by another service provider. These facilities can be assessed less frequently, with an assessment process every 6-10 years being appropriate.

5.1.1.2 Environmentally Sustainable Design (ESD) Policy

ESD Policy for New Buildings and Renovations

Ensuring that energy efficiency is considered at the design stage of any new building or major renovation is crucial. This can be achieved through the implementation of an ESD Policy. An ESD Policy can be developed for each ASC or as a regional policy in collaboration with FNQROC. A regional approach would allow all councils to align with shared guidelines, promoting consistency and potentially simplifying the development process through collective input and stronger regional buy-in.



New Council Chambers at Yarrabah ASC

Features of these policies include requirements for improvements in energy and water efficiency, indoor environment quality (IEQ), sustainable transport options, waste management and ecological impact. This in turn promises a myriad of health, social and economic advantages.

On average there's potential to reduce up to 70% of buildings electricity, produce 60% less emissions, use up to 50% less potable water and recycle 95% of waste.

A strong and robust ESD policy has the potential to greatly impact ASC's financial and carbon emissions footprint. These policies are common and widespread and would be relatively straight forward to produce. A greater challenge is ensuring the policy is adhered to and reported on within relevant projects. Regular review to identify and integrate improvements in sustainable practices and technology is also crucial to the success of such policies.

Additionally, incorporating technical equipment specifications into an ESD policy will ensure that efficient equipment is selected for replacement. Establishing these specifications might also eliminate the need for audits at smaller assets that consume less than 25,000 kWh/year.

5.1.2 Renewable Energy PPA

As identified in the inventory reports, electricity emissions are ASC's highest emitting source, indicating that participating in a 100% renewable energy electricity contract such as a Power Purchase Agreement (PPA) will have a significant impact on ASC's emissions.

A 100% renewable energy PPA is one of the most cost-effective and impactful ways to decarbonise electricity. A PPA is a contract between an electricity buyer (ASCs) and a seller (e.g. Ergon Energy) which ensures that a certain amount of energy is generated from renewable sources, such as large-scale solar or wind farms, with an added benefit of locking in contract certainty for a nominated period, typically 3-5 years. The cost of renewables in a PPA is typically cost neutral, making them a cost-effective solution to electricity emissions reduction. This is now a common method for procuring electricity for local governments.

It is recommended that ASCs pursue a 100% renewable energy PPA collectively through FNQROC, rather than negotiating individually. This collaborative approach could offer greater bargaining power and streamlined implementation. It's been advised that FNQROC on behalf of FNQ Climate Resilience Technical Committee will be looking into this option.

In other states, many councils have successfully secured PPAs by participating in larger consortia of councils, for example through the Victorian Energy Collaboration (VECO),[5] which covers 51 councils, the Western Australia Local Government Association's PPA,[6] which covers 48 councils and the Southern Sydney Regional Organisation of Councils (SSROC) signed in 2022 securing 100% renewable energy for 25 councils from three solar farms.[7]

5.1.3 Behind the Meter Solar

Maximising the behind the meter solar generation potential across buildings can reduce electricity drawn from the grid, leading to large financial savings.

Behind the meter solar can have a payback period of as little as 3 to 4 years depending on the size of the system and the electricity usage profile of the site. Yarrabah Shire Council is leading the way in installed solar PV with 12 sites totalling 128kVA. Hope Vale and Wujal Wujal have solar, but sites and system size is unknown.

The biggest barrier to installing more solar is the upfront cost, but funding options like the Community Emissions Upgrade

[5] https://www.veco.org.au/
[6] https://walga.asn.au/media-and-resources/media-releases
[7] https://reneweconomy.com.au/25-sydney-councils-ink-massive-renewables-ppa-with-three-nsw-solar-farms/

Fund, [8] and the Australian Government investment in the Reef Guardians[9] can reduce the upfront costs and provide a better return on investment. CEUF has just opened the second round of applications, and the Reef Guardians funding is still open and accepting applications for carbon emission reduction projects.[10]

There are, however, a number of factors that will limit the behind the meter solar potential at different sites:

i. Distribution of electricity usage across the day

Sites that use a large amount of electricity during daylight hours are better suited to behind the meter solar. The greatest cost savings are realised when a site directly consumes the electricity it produces, resulting in shorter returns on investment. Sites using the bulk of electricity in non-daylight hours will still be required to import the majority of electricity from the grid unless battery systems are installed. There will be a much longer ROI for systems at these sites.

ii. Available roof space or land to install solar panels.

The availability of roof space or land to install panels will also limit the size of system that can be installed. This will have an impact on large consuming sites and may limit the potential for battery systems if a site cannot produce sufficient surplus electricity during the day for charging. Behind the meter solar at large sites with energy consumption above the available solar panel 'real estate' capacity can still provide a strong ROI but will only be able to supply a portion of the site's total energy usage.

iii. Electrification of fleet

Determining a site's solar potential should also consider expected increases in the electricity load following the electrification of fleet and the addition of EV charging points as ASC's fleet transitions to electric alternatives.

iv. Site specific issues.

There are a number of site-specific issues that may limit or prevent behind the meter solar panel installations. This can include orientation of roofs, shading from neighbouring buildings or trees, heritage listings, structural issues or switchboard and loading capacity constraints. Detailed site assessments are required to identify and determine the potential impact of these issues.

5.1.3.1 Batteries

Using batteries in combination with solar systems enable the storage of surplus electricity generated during peak sunlight hours to be consumed during non-daylight hours or at times of the day when solar is not generating sufficient electricity to meet onsite demand. The ability to

[8] https://www.dcceew.gov.au/energy/programs/community-energy-upgrades-fund
[9] https://www.dcceew.gov.au/about/news/boost-for-reef-guardians#:~:text=The%20Australian%20Government%20is%20investing,better%20managing%20the%20Reef%20region.
[10] Wujal Wujal and Yarrabah have already received funding for some projects under the Reef Guardian, so will need to confirm these councils can apply for more projects.

shift solar electricity self-consumption across the day will allow more sites to become increasingly self-sufficient and improve the viability of solar systems on previously marginal sites, such as sites with low electricity usage during the day and high usage at night. Batteries may also allow for the installation of larger systems on some sites.

Presently, the greatest barrier to the uptake of batteries remains the cost. The current payback period for most batteries is over 10 years. Batteries such as the Tesla Powerwall 2 or LGES battery are sold with a 10-year warranty but are estimated to last up to 15 with only a small decline in performance. Even assuming a 15-year lifecycle, there would currently only be a minimal return on investment on a solar battery, if any at all.

The price of batteries has rapidly declined over the last 10 years. While the rate of decline has slowed over the last four years, further price declines are still expected over the next 4 to 5, improving their financial viability. Solar Choice cites between $1,000 to $1,300 per kWh for battery storage as a key marker for battery affordability.

5.1.3.2 Batteries to Support Electricity Security

While the current ROI on batteries makes them only marginally viable from a financial perspective, ASCs may still seek to install batteries at key council sites and facilities to improve energy security. Solar plus battery combinations can be used to create uninterrupted power sources for critical infrastructure, including emergency evacuation centres, rural fire service, to replace polluting diesel generators and remove an additional asset that requires management and maintenance.

Batteries used in combination with solar panels can also replace diesel generators at sites without grid connection. Through careful design, batteries can be used to match solar generated supply with demand throughout the year. This can provide security of energy supply, reducing reliance on fuel supply networks.

5.1.3.3 Renewable Energy Certificates

Installing solar systems can generate further financial benefits through the creation of Renewable Energy Certificates. For systems under 100 kW, small-scale technology certificates (STCs) are created upfront for the estimated generation over the life of the system. The system installer will typically sell these STC's on the owner's behalf and return this money as a rebate on the purchase cost of the system. The STC must be registered with the CER within 12 months of installation or it won't qualify.

For solar systems sized 100 kW or more, large-scale generation certificates (LGCs) are created based on actual metered generation across the life of the system (1MWh of generation equals 1 LGC). LGCs are registered and accounted for on the Renewable Energy Certification (REC) register administrated by the Clean Energy Regulator.

There are two options to consider; the first being to sell LGCs associated with a solar system and re-invest those funds into a Revolving Energy Fund for other energy efficiency projects. Once the LGCs are sold on the market, emissions reductions associated with this renewable energy can't be used to Council's reduce emissions.

Another option is to retire the LGCs to offset electricity emissions to be in line with the net zero target of 2050.

There are some subtle differences around how STCs and LGCs are handled which are outlined below:

Small-scale Technology Certificates (STC)

STCs are like an upfront subsidy for renewable energy systems that are under 100 kW. They are deemed upfront upon installation and are usually converted to cash then given as a rebate (or discount) by the installer. If STCs are sold, the carbon reduction and renewable energy generation associated with the energy generated can be claimed but only if it is self-consumed (behind the meter). Exported renewable energy generation cannot be treated as a carbon credit if the STCs are sold.

Large-scale Generation Certificates (LGC)

If a renewable energy system is 100 kW or larger, then its eligible for one LGC for every megawatt hour the system generates. LGCs are not deemed upfront and Council would need to keep track of the renewable energy generation on an annual basis to be able to create and then sell LGCs. If the LGCs are sold, the carbon reduction and renewable energy generation associated with the energy generated cannot be claimed. However, if the LGCs are sold, it will generate income.

5.1.4 Streetlighting

Emissions from streetlighting were included in the total emissions for all three councils, however, only Hope Vale separated these from building and facilities emissions. For Wujal Wujal and Yarrabah, the first step would be to identify and report streetlighting emissions separately to gain a more accurate understanding of this source.

Electricity consumption by street lights can be reduced through bulk replacement of these lights, with LEDs is a cost-effective way to significantly reduce emissions.

ASCs should investigate replacing their street lighting with energy-efficient LED street lights. Council's Distribution Network Service Provider (DNSP), Ergon Energy, has approved a range of technologies for this purpose and allows councils to accelerate replacements. LED lights use less energy and have reduced maintenance requirements.

5.1.5 Smart lighting

The concept of a "Smart City" or "Smart Network" is one that is eliciting great interest from communities worldwide. Smart street lights can be a particularly useful component within a smart city because they are:

1. Positioned high on poles, enabling clear and efficient transmission of data.
2. Already connected to a power source, facilitating easy connection to smart network communication devices.
3. Able to serve a dual purpose within smart cities, either acting as relays or nodes in a smart grid network or forming a standalone street lighting control network that independently manages and optimises lighting operations.

These communication devices are being installed in street lighting networks today across the country. In Queensland, local council are advocating for Ergon to integrate smart systems into LED bulk replacements.

A bulk replacement program is a prime opportunity to enable smart city capability in the region's street lighting network. ASCs can ensure that best practice design planning is included within a project so that in the future it is ready to take advantage of the significant energy and management benefits of smart lighting. This will need to be incorporated into the planning of the first stages of the project, prior to installation. It is crucial that ASCs engages with Ergon as part of any bulk replacement program.

Projects in Australia have demonstrated energy savings of 25% to 40% through:

- **Trimming** allows incremental dimming which optimises lighting design and minimises over-lighting
- **Dimming** allows lighting levels to be reduced during low-traffic periods
  Constant light output settings maintain consistent lighting levels over a street light's lifespan, preventing unnecessary over-lighting

5.2 Actions to commence in the medium-term

5.2.1 Fleet Transition

Transport fuels contribute 2% for Hope Vale Aboriginal Shire Council, 11% for Wujal Wujal Aboriginal Shire Council and 6% for Yarrabah Aboriginal Shire Council of the total emissions for each council. These figures are estimates due to incomplete data at the time the inventory was developed. As ASCs improves their data collection, this emissions source may change in the future.

Typical solutions for reducing transport fuel costs, such as reducing the size of ASC's fleet, reducing vehicle usage and purchasing more fuel-efficient vehicles will help to lower emissions, but do not deliver the step change required to mitigate climate change. Electrification of ASC's fleet is a key action to achieve this and to reduce emissions most cost effectively.

Due to varying zero emissions fleet and plant technology maturity, costs and availability among different vehicle types, an immediate full transition of fleet isn't feasible. Instead, a phased approach is necessary, allowing gradual integration of zero emissions fleet, which includes Electric Vehicles (EVs) as technology advances, costs decrease, and suitable models become accessible. This method also provides sufficient time for policy adjustments and installation of essential charging infrastructure to facilitate the transition.

Given this context, its recommended to undertake the following actions over the medium-term to work towards transitioning ASC's full fleet:

- Develop a detailed Fleet Transition Strategy
- Begin transition of passenger vehicles and charging stations

5.2.1.1 Fleet Transition Planning

The transition to EVs will require a raft of changes across ASCs, from staff cultural change and changes to internal corporate policies, to the installation of charging infrastructure and the development of new maintenance capacity to service EV fleets. In addition, some sites may need to be upgraded to be able to support the power demand required for EV charging points. As the first step, ASCs should explore developing a detailed fleet transition plan. The plan will consider the phasing and timing of the transition of different vehicle classes to ensure the transition is as efficient as possible, as availability of certain vehicles will require different transition times and once prices approach parity with internal combustion engine vehicles (ICEV) equivalents.

A well-developed transition plan will help set a trajectory for the timely and cost-effective transition to EVs by identifying relevant points when the transition of different vehicle classes makes economic and technical sense and ensuring the appropriate supporting infrastructure and policy settings are in place to enable the transition. The plan should consider ways to improve staff familiarity with EVs and charging stations and provide incentives for early adopters, while also including actions to improve fuel efficiency within the existing petrol/diesel fleet prior to transition. It may also need to review lease back or salary sacrificing schemes to ensure inclusion of electric vehicles as an option for staff.

5.2.1.2 Passenger Vehicle Transition

There is a wide range of EV passenger vehicles available in Australia. The Electric Vehicle Council has listed 58 EV models available in Australia, with an updated list expected to increase later in 2025.[11] While the upfront capital costs of EV passenger vehicles are currently higher than the equivalent ICEV, price parity is projected to be achieved in Australia between 2025 and 2030[12]. In addition, operating and maintenance costs for electric vehicles are lower than for ICEVs. Table 2 shows a comparison between the fuel usage costs of a standard electric and ICE passenger vehicles. A recent study has also found that EVs are on average 30% cheaper to service over the first three years[13] while other assessments already put EVs at price parity with ICEVs when considering total lifetime costs.[14]

[11] Retrieved from https://electricvehiclecouncil.com.au/evs-available/3/
[12] Graham, P. and Havas, L. May 2021, Electric Vehicle Projections, CSIRO, https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/inputs-assumptions-methodologies/2021/csiro-ev-forecast-report.pdf
[13] https://www.businessinsider.com/electric-car-cost-less-service-maintenance-than-gas-cars-study-2021-10?r=AU&IR=T
[14] https://thedriven.io/2020/07/23/lifetime-cost-of-electric-cars-already-lower-than-comparable-ice-vehicles/

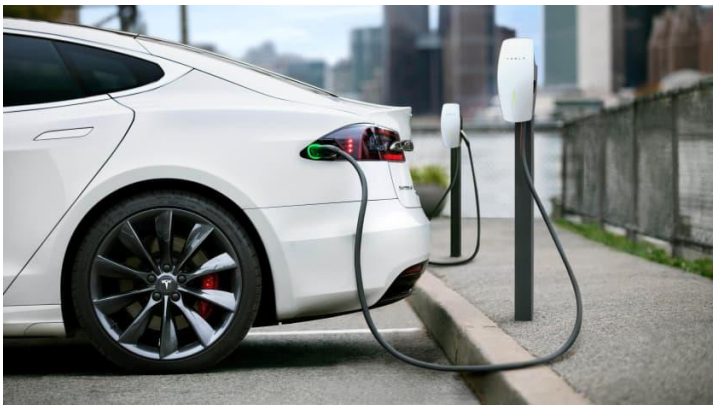
Table 2: Comparison of electric and ICE vehicle running costs

Vehicle	Energy use per 100km	Energy Cost	Approximate fuel cost per 100 km
Kia Niro EV	16.8 kWh	$0.30 per kWh[15]	$5.04
Kia Niro Hybrid	4.0 L (ULP)	$1.82 per L[16]	$7.28
Ford Ranger	7.6 L (diesel)	$1.91 per L[17]	$14.52

Given that the capital costs of passenger electric vehicles are expected to be equal to or within 10% of ICE vehicles by 2026, ASCs should consider beginning a trial with a small number of electric passenger vehicles. This transition should continue, aligning with ASCs budgets and as the cost of EVs further reduce in the coming years.

5.2.1.3 Charging Station Installation

The installation of adequate charging stations to support passenger vehicle transition will require upfront capital expenditure. Charging infrastructure ranges in cost from $7,000 for a basic two car type 2 charging station to $29,000 or $60,000 for a two car 25kW or 50kW DC rapid charging stations, respectively (including installation). If the rollout of charging stations is phased in line with the uptake of new EVs, the capital costs can be spread over the full transition period. Depending on where the charging stations will be located, the building will likely require electrical upgrades to meet the increased power demands of chargin of an EV fleet. The cost to do this will vary at each site, depending on the extent of infrastrucutre requirements, but could range from a few thousand dollars to $100,000.



State and Federal grant funding may also be available to subsidise the capital cost of charging infrastructure for ASCs, in particular the CEUF.

[15] Average cost of retail prices for FNQROC councils
[16] https://www.globalpetrolprices.com/Australia/Queensland/gasoline_prices/ April 2025
[17] https://www.globalpetrolprices.com/Australia/Queensland/diesel_prices/ April 2025

5.2.1.4 Plant Equipment

Without detailed information on each council's fleet equipment, it's difficult to recommend specific actions. However, based on our work with other councils, fuel used by landscaping equipment can account for 10% to 20% of total fuel emissions. Examples of equipment that may be included are mowers, tractors, trailers, backhoes and sweepers, among others.

A list of electric equivalents is provided in Table 3. Note that some of these options may still be cost prohibitive compared to non-electric counterparts.

As part of the vehicle transition plan, ASCs should undertake the following steps to transition plant vehicles and machinery:

- Conduct a detailed analysis of current equipment needs, fuel usage and costs to compare with electrical equipment specifications on fuel usage data (as a minimum) to understand operating costs and the business case before purchasing electric replacements
- Adopt electric alternative machinery such as forklifts, small excavators and material handlers, where there are affordable and good quality options;[18] and
- For other light and heavy plant options (including some of those outlined Table 3 that are still in prototype phase with certain market or engineering limitations (such as tractors, rollers and bobcats), continue to monitor the market and conduct feasibility studies and trials before adopting across the portfolio.

[18] Machinery such as forklifts, small excavators and material handlers have been supported by demand in applications where noise and environmental pollution from traditional diesel engines become an occupational risk, such as in instances of indoor use. The availability of these machines in Australia makes the replacement of these vehicles straight forward.

Table 3: Electric replacements for general construction and plant machinery

Vehicle type	EV replacement make and model	Australian availability	Approx. Cost	Other details
Aerator	N/A	N/A	N/A	
ATV	Crossfire E1	Yes	$18,000	Range: 5 hours Battery size: 2080ah
Bobcat loader	Bobcat T7X	N/A	N/A	Range: 4 hours Battery size: 62kWh
Bucket broom	N/A	N/A	N/A	
Bunker rake	Baroness SP160EB	N/A	N/A	Range: 4–7 hours Battery size: 2.5kWh
Compactor	N/A	N/A	N/A	
Crane loader	N/A	N/A	N/A	
1.8T excavator	JCB 19C-IE	Yes	$143,000	Range: 4 hours Battery size: 20kWh
3-5T Forklift	Komatsu FB30	Yes	$39,000- $77,000	Battery size: up to 725ah
Front end loader	Avant e5-25	Yes	$83,000	Range: 6 hours Battery size: 27kWh
Greens roller	Tru Turf RE50	Yes	$46,000	Range: 36 greens Battery size: 1.5kwh Lithium
Kerb machine	N/A	N/A	N/A	
Lawn mower - large	N/A	N/A	N/A	
Lawn mower – small to medium	EcoTeq Evo Ecoteq Rival	Yes[#]	$93,500 $71,500	Range: 8 hours
Lawn mower - small	Toro eTRiFlex 3370	Yes	$92,400	
Loader	Avant e5-25; No replacements for the larger models	Yes/No	$16,000	
Posi Track Loader	Bobcat T7X	Not yet	N/A	Range: 4 hours Battery size: 62kWh
Pavement sweeper*	Ecoteq Ecosweep360	Yes	$177,000	Range: 8 hours
Roller	Ammann eARX26-2	Prototype stage only	N/A	Range: 18 hours Battery size: 31.5kWh
Trencher	N/A	N/A	N/A	
Turf sweeper	N/A	N/A	N/A	
Tractor	N/A	N/A	N/A	
Wheeled excavator	Sennebogen	Yes	Various	Various

[#]Some councils have trialled an EcoTeq mower with mixed success. Maintenance is easy, capital cost was steep and current model didn't cut through long grass effectively.

5.2.2 Landfill and Corporate Waste Emissions

5.2.2.1 Recycling and FOGO Diversion (Hope Vale Aboriginal Shire Council)

Waste from the Hope Vale landfill is the highest emission source at 62%. As a first step, Hope Vale should conduct a waste audit to assess the composition of landfill waste, including the proportions of municipal solid waste (MSW), construction & demolition (C&D) waste and commercial and industrial (C&I) waste. This will support Council in planning the introduction of recycling and food organics, garden organics bins to help reduce waste related emissions.

If FOGO bins were provided to households, Hope Vale could divert up to 35% of food waste and up to 16% of garden waste. If recycling bins were provided to households emissions could be reduced by up to 13%.

In order to achieve these emissions savings, Hope Vale would need to educate its residents about what goes into the FOGO stream, and recycling bins, by producing a range of resources like videos, flyers, stickers and magnets which will help reduce contamination in the organics bin and improve the quality of recycled compost products.

A main challenge for this will be the cost. The State Government enacted a waste levy, which commenced on 1 July 2019 for all landfill operators.[19] The levy aims to:

- Reduce the amount of waste going to landfill
- Encourage waste avoidance
- Provide a source of funding to enable better resource recovery practices
- Provide certainty and security of feedstocks for advanced technology, and
- Facilitate industry investment in resource recovery infrastructure

If council implements FOGO and recycling collection, there will be a cost per household per year. However, reinvestment of the waste levy revenue into waste management and resource recovery project means that Hope Vale does not incur a net cost for disposal of MSW. This means there would be no financial savings associated with reduced levy fees for minimising household waste to landfill.

[19] https://www.qld.gov.au/environment/circular-economy-waste-reduction/disposal-levy/about/overview

5.2.2.2 Corporate Waste Emissions (Wujal Wujal Aboriginal Shire Council and Yarrabah Aboriginal Shire Council)

Wujal Wujal and Yarrabah Aboriginal Shire Councils don't own or operate a landfill. Council corporate waste generates 1% of total emissions for both Councils. Although emissions from waste are low, it is still worth considering reducing waste by adding Food Organics Garden Organics (FOGO) bins to council-operated buildings that currently lack them.

Providing FOGO bins at council-operated buildings, which are community facing, demonstrates Council's commitment to reducing waste emissions. This initiative can also serve as a valuable opportunity to educate the community and encourage residents and businesses to reduce their own emissions.

5.2.3 Water and Sewer

ASCs currently operates their own wastewater treatment plants and associated pumping stations. Emissions associated with water and sewage treatment come from three main sources:

- Electricity usage during water and wastewater treatment and distribution (scope 2 and 3),
- Release of Methane (CH_4) and Nitrous Oxide (N_20) emissions from biosolids during wastewater treatment (Scope 1),
- The consumption of fuels within the operations of water and wastewater treatment, for example the use of diesel generators (Scope 1).

The easiest emissions reduction opportunities to achieve for water and sewerage treatment are those focused on reducing consumption of grid supplied electricity through:

- Energy efficiency actions,
- Optimisation of equipment such as pumps and blowers,
- Installation of behind the meter renewable energy, and

Other opportunities include:

- Reducing/eliminating stormwater inflow to the sewer system
- Flaring methane emitted from anaerobic sewerage treatment,
- Using methane from anaerobic sewerage treatment to generate electricity (biogas), and
- Modifying sewerage treatment to favour processes that do not produce methane, for example aerobic processes

Councils should therefore focus efforts on improving the efficiency of equipment and systems at their wastewater plants.

5.3 Actions to Commence in the long-term

ASCs should consider further opportunities for emissions reduction beyond 10 years as costs decrease and more advanced technology becomes available. Additionally, actions have been included in this section on the recommendations to better capture all emission sources in future inventories. While these future actions are worth pursuing, they should only be considered after implementing actions that offer a better return on investment.

5.3.1 Landfill gas flaring (Hope Vale Aboriginal Shire Council)

As emissions from waste are a significant contributor to Council's inventory, with legacy emissions from the landfill playing a large role as they can last for 20-30 years after a landfill site is closed. As an initial step, it is recommended to conduct a gas audit at the Hope Vale landfill to assess the amount of gas being released.

To reduce emissions, it is suggested that Council captures methane from landfill and undertake flaring, either on-site or off-site with a biogas company. Gas flaring converts methane into a less potent greenhouse gas, carbon dioxide.

Costs can vary significantly, as flaring is very site specific depending on whether it occurs on-site or off-site. However, by implementing this action, Council could reduce emissions by up to 30%.

5.3.2 Utility and Heavy Vehicle Fleet Transition

Although the type of vehicles in Council's fleet is unknown, based on other council data, it's likely there are a few utility and heavy vehicles. Replacing ICE vehicles with EVs can lead to significant reductions in greenhouse gas emissions and overall operational costs over the vehicle's lifetime. With advancements in EV technology, vehicles will soon be able to travel over 500 km on a single charge, enabling council to effectively cover its vast regional landscape.

5.3.2.1 Utility Vehicle Transition

There are limited EV replacement options available within the Australian market for utility vehicles (utes), but this is expected to change in the coming years. In overseas markets there are a number of utes and pick-up trucks already available, with the launch of many more planned.

The range of options around EVs are steadily increasing year on year, while prices are falling. Once EV utes have entered the Australian market, a similar approach to the phased transition of passenger vehicles could be undertaken to transition the utility fleet. As with passenger vehicles, sufficient EV charging stations will need to be planned and budgeted within the capital works plan. Phasing the installation out over the full transition period will help to reduce the impact of the additional capital expenditure.

5.3.2.2 Heavy Vehicle Transition

The remaining emission sources weren't captured in the FY2022/23 inventory. When ASCs can better collect emissions from these sources, these actions should be considered.

Heavy vehicles include contractor fuels from waste trucks. Despite the trucks being owned by a third party, they still fall under ASC's responsibility.

The electrification of heavy vehicle fleets is trailing that of passenger and utility vehicles in Australia, with the technology largely only used in trial programs with local governments. High costs in the order of two or three times that of equivalent diesel vehicles are the primary barrier to electric truck take up, although fuel and maintenance savings could deliver payback within the life of the vehicle depending on usage.

Joint-council EV waste truck trial with the City of Adelaide, City of Port Adelaide Enfield, City of Charles Sturt, City of Marion and Cleanaway in 2021

Another low carbon alternative fuel source to diesel is hydrogen gas. Whilst the technology for hydrogen powered vehicles is even less mature than EVs, government investment in local hydrogen production has ignited interest in hydrogen technology development in Australia.

It should be noted that **hydrogen only reduces greenhouse gas emissions if it is made using renewable energy** to power the process, typically referred to as green hydrogen. The alternatives, grey and blue hydrogen, are produced using coal-powered electricity or natural gas so are not zero-emissions fuel sources.

Fleet transition to hydrogen-fuelled vehicles would be similar to that for EVs but would require consideration of refuelling and distribution infrastructure. As the economy more broadly transitions away from natural gas and towards hydrogen, this will become more straightforward.

In 2022, the Australian Government introduced the Driving the Nation fund, allocating $500 million to support more affordable and cleaner transportation, which includes charging infrastructure. This initiative is co-funded by the Australia Renewable Energy Agency (ARENA) and expands upon the previous 'Future Fuels Fund' established in 2020.[20] This program is now closed, but in November 2024 ARENA opened the focus area – Trucks, Charging and Innovation – allocating $100 million aimed to support demonstration and deployment of heavy vehicles, charging solutions and other innovation supporting uptake of BEVs. The focus area includes:

- Demonstration and deployment of heavy BEVs
- Deployment of charging solutions to accelerate the adoption of heavy BEVs
- Supporting other innovation to accelerate the uptake of BEVs.

Local Governments are eligible to apply for this funding individually or through regional initiatives.

[20] Retrieved from https://arena.gov.au/funding/driving-the-nation-program/

5.3.3 Sustainable Infrastructure Policy

The majority of emissions from capital works for roads, sewer and water infrastructure are as a result of either the project (materials, plant and equipment during the works as well as any clearing of vegetation) or the ongoing operating costs associated with the project (such as electricity used for water pumping).

Local governments are responsible for a wide range of hard surface infrastructure construction repair and specification, including:

- Roads
- Footpaths and driveway cross overs
- Shared paths
- Car parks
- Drainage and water infrastructure, and
- Outdoor sporting courts such as tennis, netball, basketball and skating

Concrete and asphalt are high-intensity emissions materials, accounting for a large proportion of an infrastructure project's construction carbon footprint. Given extensive council investment in infrastructure capital works and maintenance, these projects have significant environmental impacts. There are many ways to reduce emissions whilst simultaneously reducing local waste problems, for example using rubber, glass and crushed concrete instead of virgin materials.

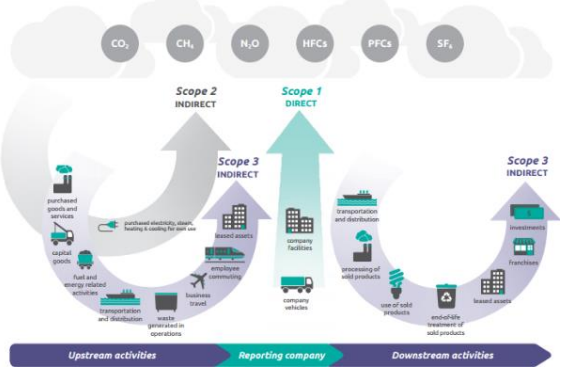
Actions to reduce emissions may involve a change in design, altering processes or using different materials. Updates to infrastructure guidelines and processes can consider the following requirements, in-line with relevant Australian Standards:

- Use of low emission recycled priority materials (e.g. glass, plastic, rubber) and recycled civil materials (e.g. soil, rock, crushed concrete, recycled asphalt pavement) in council infrastructure projects. Of particular importance from an emissions perspective is the substitution of Portland cement for slag or flay ash in concrete
- Use of low emission processes (such as warm mix asphalt)
- Training of engineers and designers as well as road construction and maintenance crews to identify the potential site issues and best practices to adopt
- Review of road, path, sewer and water systems design to identify design changes that can reduce the use of materials. This may also be an opportunity to review the volume of hard surfacing and opportunities to introduce more permeable and green space within relevant streetscapes (especially residential roads and key precincts)

5.3.4 Other Scope 3 emissions

Another opportunity is to address emissions within ASC's supply chain.

The Federal government has recently mandated that companies disclose their climate-related risks and governance in their annual reporting. This requires companies to prove they have governance in place to mitigate risks posed by climate change, including reporting on emissions within their operational controls as well as in their value chain.



Although it is not currently mandatory for local government to report on these emissions, it's worth considering this proactively as it may become required in the near future. Additionally, some of ASC's suppliers within their supply chain may meet this threshold currently and will have to begin reporting on it this year.

To be at the forefront of this mandatory reporting, ASCs could integrate emissions reporting into their current procurement policy for major suppliers.

5.3.5 Open Space Lighting

Open space lighting can produce a considerable amount of emissions, which mainly come from ASC's assets; reserves & parks, car parks and sportsgrounds lights. Emissions stemming from sporting facilities, such as football or cricket ovals, arise primarily from the utilisation of floodlights during nighttime and weekend events, ranging anywhere between 40-60% of a facility's total consumption. Exploring the viability of upgrading sportsgrounds, parks, and reserve lights is advisable. The potential return on investment could be greater, considering the substantial expense of these large floodlights and the significant labour costs associated with their installation.

6. Large-scale Emission Reduction and Carbon Drawdown

Far North Queensland has abundant solar and natural resources which means it is well placed to capitalise on the economic development opportunities presented by the national transition to a low carbon economy such as: large-scale renewable energy projects; new technologies and fuel sources, such as green hydrogen; and carbon drawdown projects that actively remove carbon dioxide from the atmosphere.

Table 4 outlines opportunities for ASCs and their eligibility under the Australian Government's Emissions Reduction Fund (ERF) to generate Australian Carbon Credit Units (ACCUs). The ACCUs are administered by the independent statutory authority the Clean Energy Finance Corporate (CEFC) to encourage GHG emissions abatement. One ACCU represents 1 tCO_2-e that would have otherwise been released into the atmosphere. Any carbon offset units generated by these projects that are not retired to offset emissions for ASCs can be sold on the carbon market for additional revenue and potentially reinvested in other climate projects. Refer to Section 7 for more information on offsetting.

These projects may be led by other stakeholders, with financing options including grants, CEFC loans, external investors, or community funds.

Table 4. Opportunities for renewable energy and carbon drawdown

Opportunity	Description	Eligibility under the ERF
Emission reduction: **Large-scale local renewable energy generation**	Renewable energy generation located within ASCs on council or private land. Could be established in partnership with community, financed through grants and investors, with income generated by selling electricity to community	Can be used to offset grid electricity consumption by creating large-scale generation certificates (LGCs)[21]
Emission reduction: **Green hydrogen production**	Green hydrogen is a clean energy source that only emits water vapour and leaves no residue in the air, unlike coal and oil. Green hydrogen is considered a promising alternative fuel for transitioning away from fossil fuels, particularly for heavy fleet and plant operations. However, its production is energy-intensive, and it only serves as a low or zero-emissions fuel if powered by renewable energy sources. Given Far North Queensland's significant solar potential, the area is well-suited for large-scale green hydrogen production	Could be used to generate ACCUs if produced with renewable energy generation that qualifies under the established methods recognised by the Clean Energy Regulator[22]
Carbon drawdown: **Reforestation and afforestation**	Permanent planting of forest trees on previously agricultural land to remove carbon from the	Can generate ACCUs if trees are planted to achieve forest cover and have a 20%

[21] Clean Energy Regulator, 2022. Large-scale generation certificates, https://www.cleanenergyregulator.gov.au/RET/Scheme-participants-and-industry/Power-stations/Large-scale-generation-certificates
[22] https://cer.gov.au/

	atmosphere as trees grow and sequester it in their biomass and in the soil. Significant areas need to be vegetated for emissions to be substantially reduced. Sequestering 1,000 tCO_2-e would require the planting of approximately 100-200 hectares of mixed story vegetation per year.	crown cover at a tree height of at least two metres across an area of at least 0.2 hectares[23]
Carbon drawdown: **Biochar production**	Burning biomass in low-oxygen environments creates biochar, a stable form of carbon that can be buried in soil, thus storing the carbon drawn down from the atmosphere. Biochar facilities use pyrolysis to convert biomass into a stable, carbon-rich form of charcoal that can be added to soil increase its long-term carbon content. Biochar can be sold to local landowners to improve soil fertility, water holding capacity and crop productivity[24]	Not currently eligible under the ERF. Recognised under international carbon credit schemes

Table 5 outlines the actions ASCs can take to maximise large-scale emissions reduction and carbon drawdown opportunities. The table provides ASC's role, timeframe for action to be completed and benefit fully realised across ASCs, emissions impact and cost.

Table 5: Actions to Maximise Low Carbon Opportunities Across each Council area

Action	Council Role	Timeframe for completion	Impact/ Reach	Cost
Advocate for the development of large-scale renewable energy projects and the enhancement of electricity transmission, local energy storage, and distribution infrastructure for ASCs.	Advocacy	5-10 years	High	$
Explore opportunities to participate in state, regional or privately-led initiatives to assess the feasibility of Green Hydrogen production in the region. This initiative could not only aid in reducing reliance on fossil fuels in transport but also create local jobs and further diversify ASC's economy.	Influence	10+ years	High	$
Investigate current and emerging solutions to capture and sequester greenhouse gas emissions through ASCs land-use practices and disseminate findings to the community on appropriate opportunities.	Influence	10+ years	Medium	$
Monitor waste to energy regional facility opportunities to divert non-organic waste from landfill and use as an additional energy source **(Hope Vale only)**	Influence	10+ years	High	$$$

[23] Clean Energy Regulator, 2024, Reforestation and afforestation method, https://cer.gov.au/schemes/australian-carbon-credit-unit-scheme/accu-scheme-methods/reforestation-and-afforestation

[24] Department of Primary Industries and Regional Development, 2022. Carbon farming: applying biochar to increase soil carbon, https://www.agric.wa.gov.au/soil-carbon/carbon-farming-applying-biochar-increase-soil-carbon

$ = cost generally includes staff time and/or training and workshop facilitation. Typically less than $100,000

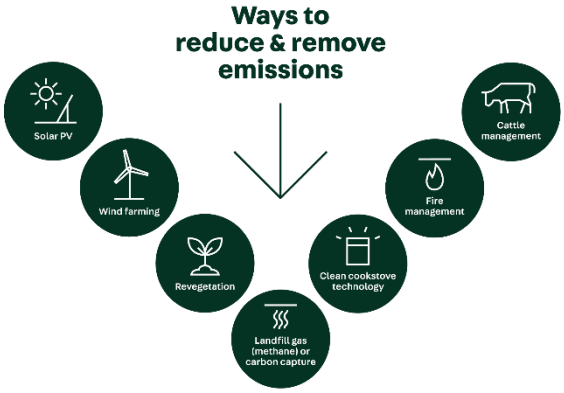
$$$: cost involves major capital works or dedicated staff to navigate complex implementation processes. Typically more than $200,000

Medium impact: annual emissions reduction potential of the action in 2035 is expected to be between 1,000 and 5,000 tCO2-e per year, or the adaptation intervention targets a sub-sector of the community or a Council operations

High impact: annual emissions reduction potential of the action in 2035 is expected to be more than 5,000 tCO2-e per year, or the adaptation intervention has a community-wide or a Council operations-wide focus

7. Carbon Offsets

Carbon offsets can be purchased by local government to reduce the remaining emissions needed in order to reach any goals or net zero targets. Typically, one credit allows the emission of one tonne of 'carbon dioxide equivalent' (a combined measure of the warming potential of various greenhouse gases). As shown in the emissions reduction hierarchy in Section 1, this is the least preferable method, but it is an option for achieving net zero.



Carbon sequestration involves the removal and storage of carbon dioxide from the atmosphere in carbon sinks, such as forests, woody plants or soils. Certain carbon sequestration projects can create carbon credits, which can bs used to offset greenhouse gas emissions.

7.1 Australian Carbon Credit Units (ACCUs)

Australian Carbon Credit Units (ACCUs) are an Australian based carbon credit that are awarded to eligible energy efficiency and carbon sequestration projects that result in a reduction of Greenhouse Gas (GHG) emissions. One ACCU represents the avoidance or removal of one tonne of carbon dioxide equivalent (tCO_2-e).

Under the Federal government's Emission Reduction Fund (ERF), organisations and individuals can generate ACCUs for emissions reductions. The ACCUs can be sold to the Commonwealth or they can be sold on the voluntary market and are eligible as offset units.

Any individual or business can participate in the ACCU scheme, including industry, business, First Nations people and landholders. Projects to reduce emissions such as improving energy efficiency, avoiding emissions of methane and nitrous oxide, or converting methane to less damaging greenhouse gasses are eligible. In addition, storing carbon or avoiding emissions from agricultural activities are eligible, including:

- Reforestation
- Revegetation
- Savanna burning
- Managing beef cattle herds
- Restoring blue carbon ecosystems
- Restoring rangelands
- Improving soil carbon
- Protecting native forest or vegetation at risk of clearing

In addition, ACCUs can be earned from other projects that benefit the environment, economy, social or cultural, but not necessarily reducing carbon. Some of these can include:

- Improving water quality, reducing soil erosion and reducing salinity through revegetation activities

- Improving farm resilience and sustainability by diversifying land use
- Improving farm productivity by replenishing soil's carbon content
- Valuing traditional knowledge of fire management, providing economic opportunities for First Nations communities and reducing late season wildfire damage in savanna areas
- Increasing biodiversity and expanding habitats for native species
- Lowering emissions and reducing energy costs for Australian businesses

Generating ACCUs from Carbon Sequestration

Trees and vegetation in environments provide significant community benefits including regulating water flow, improvements to water quality, filtering pollutants and reducing the impacts of high temperature. In addition, there are a wide range of ecosystem benefits for other flora and fauna from vegetation.

Carbon credits may be generated by organisations and individuals adopting new farming and land restoration practices and technologies.[25] From an emissions perspective, there is direct benefit in protecting and planting vegetation but there are rules for crediting emissions[26] and significant areas need to be vegetated for emissions to be substantially reduced. Sequestering 1,000 tCO_2-e would require the planting of approximately 100-200 hectares of mixed story vegetation per year.

7.2 Verified Carbon Unit (VCU)

The Verified Carbon Standard (VCS) is an international carbon offsetting program that generates verified carbon units (VCUs), supporting projects aimed at reducing or removing greenhouse gas (GHG) emissions from the atmosphere. Each VCU represents one tonne of carbon dioxide equivalent, and projects undergo a stringent validation and verification process within Verra's Registry.

The registry can encompass a wide range of projects, including those in the chemical industry, construction, energy demand, fugitive emissions, manufacturing, transport, and waste sectors. The price per offset varies significantly based on project type, source, geography, and vintage, but it typically falls below that of an Australian Carbon Credit Unit (ACCU).

However, VCUs may not be as reliable for projects focused solely on reducing carbon emissions. Therefore, it's advisable to prioritise purchasing carbon offsets through ACCUs initially.

[25] The Land Restoration Fund buys premium carbon credits from carbon farming projects that produce ACCUs plus demonstrated additional environmental, economic, social and First Nations co-benefits. As a result, the LRF may pay more for the ACCUs generated from carbon farming projects than the ERF which is required by legislation to purchase lowest cost abatement. For more detail see https://www.qld.gov.au/environment/climate/climate-change/land-restoration-fund/about/australian-market

[26] https://www.dcceew.gov.au/climate-change/emissions-reduction/emissions-reduction-fund/methods/reforestation-and-afforestation-20

8. Monitoring and Reporting

8.1 Annual Emissions Tracking and Data Management

ASCs should continue to track emission on an annual basis.

Accurate and comprehensive data collection is essential for informed decision-making related to energy use, emissions reduction, and operational costs.

Improving emissions data collection and addressing data gaps will ensure future inventories accurately represent ASC's emissions. The more emissions sources reported, the better ASCs will understand their impacts, leading to greater opportunities for measurable reductions as ASCs works towards reducing emissions.

See below some recommended steps to ensure ASC's inventories are best practice:

- Continue to conduct annual inventories
- Determine what emissions sources to include and collect data accordingly
- Develop a data management plan: Develop a robust data management plan to set the framework for future emissions monitoring and reporting. This includes the following actions.
    - Identify what data needs to be collected or improved to undertake future inventories (e.g., upload all bills to Azility reporting platform and ensure billing asset names align with asset register)
    - Identify what data management systems and/or platforms to use to store emissions data
    - Identify what greenhouse reporting tools to use to report on emissions.
    - Identify what other items should be monitored. For example, set up an alert system for unusually high energy (electricity, gas, fuel, etc) and water spends and developing a tracking system for highest-consuming sites / vehicles.
    - Link billing data back to the relevant service manager to engage them on energy use and potential efficiency opportunities
    - Better understand the fuel usage

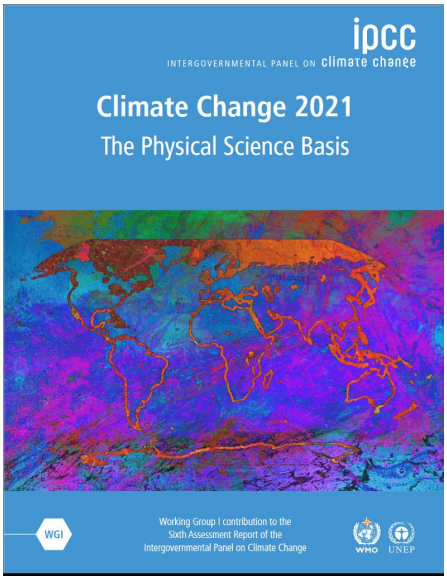
For further information refer to the inventory reports.

8.2 Next Steps

This action plan gives ASCs an understanding of how to reduce emissions from their baseline emissions inventory as well as how to reduce emissions from future emission sources. It's recommended that the next step involve developing a more detailed action plan, including cost-analysis, emissions abatement modelling, and a clear emissions reduction pathway to better understand the trajectory of each Council's emissions. If a comprehensive action plan is not feasible at this stage, undertaking business cases or feasibility studies for the short-term actions outlined in Section 5.1 would be a valuable starting point for ASC's emissions reduction journey.

Appendix A: International and Federal Policy

International Agreements



The Paris Agreement, adopted in December 2015 at the United Nations Climate Change Conference of Parties (COP21), stands as a legally binding international treaty on climate change. Ratified by 196 countries, its primary objective is to curb global warming, aiming to limit the temperature increase to below 2°C and striving for efforts to cap it at 1.5°C above pre-industrial levels.[27] Widely recognised as a significant step forward in the global effort to address climate change, the Paris Agreement signifies a robust political commitment by nations to collaboratively address this pressing issue. The most recent conference, COP29, held in November 2024 in Azerbaijan, recognised that securing finance for climate action was a key goal for the coming year. The conference focused on the next round of national climate plans, or NDCs, currently being developed to ensure strategies and targets are economy-wide and on track to 1.5 degrees of warming.

The Intergovernmental Panel on Climate Change (IPCC) is a significant organisation established by the United Nations to assess the scientific knowledge on climate change. Tasked with compiling, evaluating and summarising the latest scientific literature, the IPCC produces comprehensive assessment reports utilised by policymakers worldwide to inform their decision-making on climate change mitigation, adaptation and net zero strategies.

In 2021 and 2022, the IPCC released its Sixth Assessment Report (AR6), showing that climate change is already being observed in every region of the world. The report emphasised that human activities have caused approximately 1.1°C of warming since 1850-1900, underscoring the imminent risk of reaching 1.5°C of global temperature rise. Urgent and decisive action to reduce emissions in the next two decades is deemed crucial to prevent surpassing this threshold.[28]

[27] United Nations, 2015, Paris Agreement, https://unfccc.int/sites/default/files/english_paris_agreement.pdf
[28] IPCC article 9 August 2021, *Climate change widespread, rapid, and intensifying*: https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/

United Nations' Sustainable Development Goals

In 2015, the UN set 17 Sustainable Development Goals (SDGs) as a comprehensive framework to providing peace and prosperity for people and the planet, both now and into the future. The target to achieve these goals was set for 2030. The 193 countries that pledged commitment to this target, recognising that ending poverty is intertwined with efforts to enhance health and education, reduce inequality and stimulate economic growth, all while addressing climate change and working to preserve our oceans and forests. Australia is one of the 193 countries which have committed to the goals. It will require all stakeholders, state governments, local governments and businesses to take action for Australia to meet the 2030 target. By aligning this Strategy with the goals, Council aims to work towards building a more sustainable, equitable and resilient community, capable of adapting to the effects of climate change.

Figure 10: United Nations' Sustainable Development Goals (SDGs)

Federal Policy and Target

As a signatory to the Paris Agreement, Australia must set targets and develop a plan for reducing greenhouse gas (GHG) emissions. The Agreement explicitly recognises and engages local and subnational governments and their critical role in supporting the transformation, including setting goals and strategies aligned with the science. In 2022, the Australian government recommitted to achieving net-zero emission by 2050 and increased its 2030 target to 43% below 2005 emissions level. This 2030 target is in line with the lower end of the Australia Climate Change Authority's recommended range of between 40-60% reduction in emission by 2030. Under the terms of the Paris Agreement, countries must update their Nationally Determined Contribution (NDC) every five years. Australia is currently in the process of updating its NDC which will include the 2035 target. This update will hold the government accountable to more ambitious action, aiming to keep global average temperature well below 2°C and pursuing efforts to keep it to 1.5°C. Re-establishing an interim target will inform the pathways to net zero by 2050 and provide insights into potential progress made to-date.

Climate Disclosure Bill 2024

In September 2024, the Australia Parliament passed the *Treasury Laws Amendment (Financial Market Infrastructure and Other Measures) Bill 2024*. This bill is part of a broader legislative effort aimed at increasing transparency and accountability regarding climate-related financial risks and opportunities for large businesses and financial institutions.

In accordance with the new law, from January 1, 2025, larger companies must disclose information on their greenhouse gas emissions (including scope 1, 2 and scope 3 emissions), governance, strategy, risk management, and targets related to climate change. The reporting requirements align with international standards, specifically the frameworks developed by the International Sustainability Standards Board (ISSB) and the Task Force on Climate-Related Financial Disclosures (TCFD). Over the following two years, more entities will be required to report. This legislation will have a flow on effect to smaller companies that fall within the value chain of reporting entities. Local governments aren't required to report under this bill, but may fall within the value chain of reporting entities.

Appendix B: Cost Assumptions

Solar PV:

- Average $ per kW of solar PV in Queensland: $1,160
- Maintenance cost of $15/year/kW

Energy Efficiency: Buildings

- Estimated costs of assessments are as follows:
    - Mechanical engineer report - $8,000
    - Detailed energy audit - $5,000
    - Basic equipment inventory audit - $0 – as these are being incorporated into existing building condition audits

ESD Policy:

- Costs will be based on ASC's capital works expenditure for new builds and renewals. A 3% increase to capital works budget per project has been used to estimate costs to achieve a 40% and 20% operational savings for major and minor buildings respectively based on a range of different external reports[29].
- Costs of developing a policy are $20,000

Fleet Transition

- Current cost of small ICE passenger vehicle: $39,990
- Current cost of small electric vehicle: $46,990
- Current cost of medium ICE vehicle: $42,260
- Current cost of medium electric vehicle: $56,770
- Current cost of large ICE vehicle: $32,995 – $57,090
- Current cost of large electric vehicle: $67,500 – $98,700
- Current cost of ICE large diesel van: $53,156
- Current cost of electric van: $89,990
- Current cost of ICE petrol ute: $57,490
- Current cost of ICE diesel ute: $67,990
- Current cost of electric ute: $184,900
- Cost of Type 2 electric vehicle charger: $7,000 for two vehicles
- All passenger and light commercial vehicles to be charged by Type 2 chargers

[29] The Value of Green Star: A decade of environmental benefits by the Green Building Council of Australia (2013), Green Building Council of Australia (GBGA), Annual report (2019), Green Star Financial Transparency Research Paper (2016); The Value of Green Star A Decade of Environmental Benefits (2013); and Pitt & Sherry, Harrington, 2013, *Environmentally Efficient Design Planning Policies* Cities of Banyule, Moreland, Port Phillip, Stonnington, Whitehorse and Yarra, Expert Evidence – Benefit Cost Analysis and Ironbark Sustainability, 2019, ESD Policy for Council Buildings Background Paper, Blue Mountains City Council and Blacktown City Council.

Appendix C: Glossary

Business-as-usual (BAU): BAU refers to the normal trajectory of emissions and/or the uptake of actions that impact or respond to global warming. This is what is expected to occur without additional action to reduce emissions.

Biodiversity: This is the biological variety and variability of all forms of life on earth. This includes the individual plants and animals that form our ecosystems, and the variation of these ecosystems.

Carbon credits: An instrument that represents ownership of one metric tonne of carbon dioxide equivalent that can be traded, sold, or retired. If a company is regulated under a cap-and-trade system, they most likely have an allowance of credits they can use toward their cap. If they use fewer emissions (credits) than they are allocated, they can trade, sell, hold, or do whatever they like with the credit. Please also see relevant information under carbon offsets below.

Carbon offsets: Offset units are used to compensate for emissions an organisation produces and to bring their carbon footprint down to zero. Offset units are generated by projects that reduce, remove or capture emissions from the atmosphere such as reforestation, renewable energy, or energy efficiency. Carbon credits and carbon offsets both represent the emission of a certain amount of carbon into the atmosphere. But carbon credits represent the right to emit that carbon, whereas carbon offsets represent the production of a certain amount of sustainable energy to counterbalance the use of fossil fuels. So a carbon offset derived from a third-party certified project usually generates a carbon credit.

In Australia, the Australian Government oversees the **Emissions Reduction Fund** to incentivise emission reduction and carbon storage. Under the scheme, those who adopt approved ERF methods can earn **Australian Carbon Credit Units** (ACCUs). The ACCUs are overseen by the Australian Government and administered by the independent statutory authority the **Clean Energy Finance Corporate** (CEFC) to encourage GHG emissions abatement. One ACCU represents 1tCO2-e that would have otherwise been released into the atmosphere.

Carbon drawdown: Refers to any process that actively removes carbon dioxide (CO_2) from the atmosphere. The goal of drawdown methods is to reduce the concentration of atmospheric CO_2, effectively lowering greenhouse gases that contribute to climate change. Examples of carbon drawdown:

- Reforestation and Afforestation: Planting trees (reforestation) or establishing forests on land not previously forested (afforestation) pulls CO_2 out of the atmosphere as trees grow, making it a drawdown method.
- Direct Air Capture (DAC): Technologies that capture CO_2 directly from the air, which can then be stored or used in various applications.
- Biochar Production: Burning biomass in low-oxygen environments creates biochar, a stable form of carbon that can be buried in soil, thus storing the carbon drawn down from the atmosphere.

Carbon sequestration: The long-term storage of CO_2 to prevent its release into the atmosphere. This can involve capturing emissions at their source or drawing CO_2 from the atmosphere and storing it in soils, plants, geological formations, or oceans.

Examples:

- Soil Sequestration: Storing carbon in soil through practices like no-till farming.
- Geologic Sequestration: Injecting captured CO_2 into underground rock formations.
- Ecosystem Restoration: Wetlands and mangroves naturally absorb and store carbon.

Circular economy: A system in which all resources are highly valued and remain in the system through reuse, re-purposing, and recycling. A circular economy tends to focus on local production.

Corporate emissions: Corporate emissions are Council's emissions that originate from sources within Council's operational control and are linked to Council's operations.

Community emissions: Community emissions are the total sum of emissions produced by a city, region, or municipality. This includes emissions associated with all sectors present within a community such as transport, waste, agriculture, industry, commercial and residential. Community emissions are distinguished from a council's corporate emissions.

CO_2-e: Also known as 'carbon dioxide equivalent', this is a measure used to quantify the emissions associated with various greenhouse gases on the basis of their global warming potential. CO_2-e is a measure that was created to make the effects of different greenhouse gases comparable because every gas has a different global warming potential.

Emissions abatement: The reduction of the amount of greenhouse gases that are produced when fossil fuels are burned or harvested. This reduction occurs due to the actions of our community and goes beyond a business-as-usual scenario.

Emissions reduction: Reducing the amount of greenhouse gases emitted into the atmosphere from human activities.

Energy efficiency: Using less energy to perform the same task. For example, energy efficient appliances such as refrigerators or air conditioners can perform the exact same function while using less electricity, which means greenhouse gas emissions and money can be saved.

Environmentally Sustainable Design (ESD): Design of buildings and infrastructure that meets the needs of owners, occupants and the environment through high performance, energy, and resource efficiency. ESD aims to reduce impacts on the environment in the construction and use of buildings and improve the comfort of the inhabitants.

Greenhouse gas (GHG) emissions: These are emissions released by the process of consuming fossil fuels and the production of materials. Through the process of the greenhouse effect, these gases remain in our atmosphere and trap the sun's heat, increasing the temperature of the earth. Greenhouse gases refer to the seven gases that have direct effects on climate change: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3).

Intergovernmental Panel on Climate Change (IPCC): This body was established by the United Nations to provide policymakers with regular scientific assessments on climate change and its implications and future risks. As an authoritative global body, the IPCC also suggests various adaptation and mitigation options to reduce the impacts of climate change.

Mitigation: Climate change mitigation reduces or eliminates the causes of climate change. This includes actions that reduce emissions, such as improving the energy efficiency of buildings or

switching to electric vehicles and include efforts to capture and sequester carbon from the atmosphere.

Net zero emissions: Refers to achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions extracted from the atmosphere. Net zero emissions includes all greenhouse gases (methane, nitrous oxide, and others), not just carbon dioxide. This usually involves the purchase of carbon credits.

Power Purchase Agreement (PPA): An agreement between an independent power generator and a purchaser for the supply and sale of energy. Usually, this will be between a large organisation, such as a council or a company, and a renewable energy electricity supplier such as a local wind farm. PPAs ensure that all the electricity purchased comes from a specific source at an agreed price.

Renewable energy: This energy is collected from renewable sources that are naturally replenished or infinite. These sources include sunlight, wind, movement of water and geothermal heat. Energy can be harnessed from these on a small (residential), medium (community) or large (commercial) scale to provide energy that does not produce any emissions during generation.

Smart Lighting: An intelligent lighting system that utilises advanced technologies, such as sensors, connectivity, and automation, to enhance the efficiency, functionality, and sustainability of street lighting infrastructure.

Solar PV: Solar photovoltaics are rooftop solar panels that produce electricity from solar energy (the sun) directly.