Zero Emission Pathways

for Community and Council

Interpreter service
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Acknowledgement of Country
Manningham Council acknowledges the Wurundjeri Woi-wurrung people as the Traditional Owners of the land and waterways now known as Manningham.

Council pays respect to Elders past, present and emerging, and values the ongoing contribution to enrich and appreciate the cultural heritage of Manningham.

Council acknowledges and respects Australia's First Peoples as Traditional Owners of lands and waterways across Country and encourages reconciliation between all.

Statement of recognition of diverse cultures
Manningham Council values the contribution made to Manningham over the years by people of diverse backgrounds and cultures.

TRIM D24/42171 Word Version and D24/87084 for pdf version

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1 Introduction

Manningham Council has set ambitious targets to achieve net zero emissions for its corporate operations by 2028 and for the community by 2035. This technical report has been developed for Manningham as part of the Climate Emergency Response Plan (CERP) Implementation Update (August 2024). It outlines the context, strategies and actions that Manningham Council is undertaking to meet its targets. This includes a summary of current corporate and community emissions, possible pathways to net zero, and opportunities for community-wide emissions reductions.

This report also explores the potential need for carbon offsets to cover any residual Council emissions and evaluates best practices for carbon accounting and reporting. By setting a clear, actionable pathway, Manningham Council aims to lead by example, fostering a sustainable future for the community while aligning with state and federal climate goals.

While this technical report focuses on Council and community emissions, the CERP addresses the climate emergency more broadly. Along with emissions reduction, climate adaptation and advocacy are Manningham's focus areas for responding to climate change.

2 Context

As stated earlier, in January 2020, Manningham Council declared a climate emergency with zero emission targets for Council by 2028 and community by 2035. Supportive commitments by the Victorian and Australian Government, which are key to achieving these Manningham targets, are summarised below. In later sections we demonstrate how we will achieve our zero emission targets.

2.1 State and federal targets

As a signatory to the Paris Agreement, Australia must set targets and develop a plan for reducing greenhouse gas emissions to keep global average temperatures well below 2°C and pursuing efforts to not exceed 1.5°C. The Agreement explicitly recognises and engages local governments and their critical role in supporting the transformation, including setting goals and strategies aligned with climate science. In 2022, the Australian Government recommitted to achieving net zero emissions by 2050 and increased its 2030 target to 43 per cent below 2005 emissions levels. The Federal Government is now setting its 2035 interim target, which will ensure the country's trajectory towards net zero remains consistent with the outcomes of the Paris Agreement.

The Victorian Government has committed to achieving net zero emissions by 2045. To facilitate this, the State Government has established interim emissions reduction targets. By the end of 2030, the state is aiming is to reduce emissions by 45 to 50 per cent below 2005 levels, and by 75 to 80 per cent by 2035.

These state and federal targets are less ambitious than Manningham's community target of net zero by 2035. Without support and effective policy at all levels of government, the 2035 target will be difficult to achieve. This means that advocacy for State and Federal Governments to make stronger emission reduction commitments remains a key action for Council.

2.2 Local Government Act 2020

The Local Government Act 2020 presents a framework for the broad roles and responsibilities for local government. The latest amendment to the Act introduced several governance principles that create obligations for councils regarding climate change, including requirements to:

- promote the economic, social, and environmental sustainability of the municipal district, including mitigation and planning for climate change risks
- prioritise achieving the best outcomes for the municipal community, including future generations
- consider regional, state and national plans and policies during Council's strategic planning.

These governance principles place a clear responsibility on councils to ensure that decision-making is informed and seeks to minimise climate change risks across land use planning, infrastructure, transport, food and water security, and human health.

Complying with the obligations in the Act demands a comprehensive Council response, which considers emissions reduction as well as the environmental, social and financial impacts of climate change across the community.

2.3 Climate disclosure bill

In September 2024, the Australian 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 this 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 supply chain of reporting entities.

While mandatory reporting does not apply to local governments yet, many councils are preparing their reporting to align with this for two reasons:

1. Preparedness for when or if this reporting is required; and/or
2. Demonstrating leadership within their communities and supply chains

The core of the Standards is to elevate the reporting of climate risk, both physical and transition (i.e. emissions footprint and supply chain) to the same level as financial reporting. For councils, this reporting will be used for executive and councillor consideration and also aimed at providing transparency to key external stakeholders such as the community. The core information assets to develop and maintain are:

- Strategy – adaptation and mitigation risk identification and planning
- Targets – to manage and reduce exposure to these risks
- Actions – to reduce risk exposure over time
- Ongoing reporting – covering emissions reporting, delivery of actions and ongoing review of risk Council's carbon accounting.

Best practice carbon accounting for an organisation should follow the National Greenhouse and Energy Reporting (NGER) Scheme guidelines. The NGER scheme is Australia's national framework (and Act) for reporting and disseminating organisational information about greenhouse gas emissions, energy production and energy consumption. The NGER scheme provides a common national reporting platform and tool for assessing corporate emissions.

2.4 Carbon accounting – three scopes

A corporate emissions inventory includes both direct and indirect emissions produced through the delivery of Council's operations and services. Best practice carbon accounting categorises these emissions into three scopes, as follows.

Scope 1

Direct emissions from owned or controlled sources, including emissions created when Council burns fuel in an owned asset such as fleet burning diesel or petrol, or a building using natural gas.

Scope 2

Indirect emissions from the generation of purchased energy, including electricity purchased for Council-owned and operated assets.

Scope 3

All indirect emissions (not included in Scope 2) that occur in the value chain of the reporting entity including, electricity purchased for Council-owned but not occupied buildings, electricity purchased for street lighting, fuels used by waste contractors and other contractors, emissions associated with water use and emissions from the extraction and production of fuels (including diesel, petrol, natural gas and electricity).

The use of the scope system for carbon accounting ensures emissions are apportioned according to operational and decision-making responsibility and prevents double counting by different organisations.

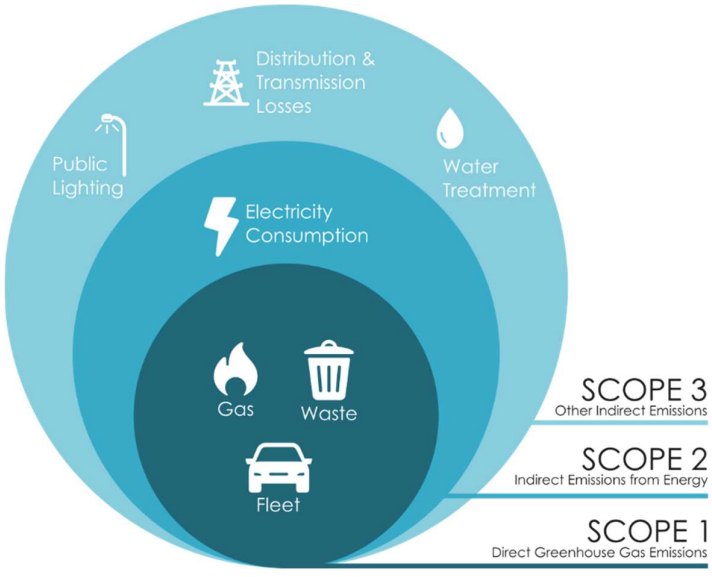

Figure 1 Scopes for carbon accounting

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3 Council's pathway to zero

Manningham Council has a target to achieve net zero emissions for Council's operations by 2028.

3.1 Council's emissions inventory

Figure 2 and Table 1 summarise Council's current emissions profile if Council had sourced all electricity from the grid instead of renewables. In reality, in 2022/23, 80 per cent of electricity was sourced from renewable energy. Figure 3 reflects Council's emissions profile with 100 per cent renewable electricity procurement.

Council's most recent EcoFootprint inventory was completed for the 2022/23 financial year. The inventory focused on scope 1 and 2 emissions, so further data sources have been used to estimate emissions from additional sources, including:

- Gas and electricity consumption at Aquarena (owned by Council but operated by others)
- Contractor fuels from waste collection trucks
- Water, waste and fugitive emissions (refrigerants).

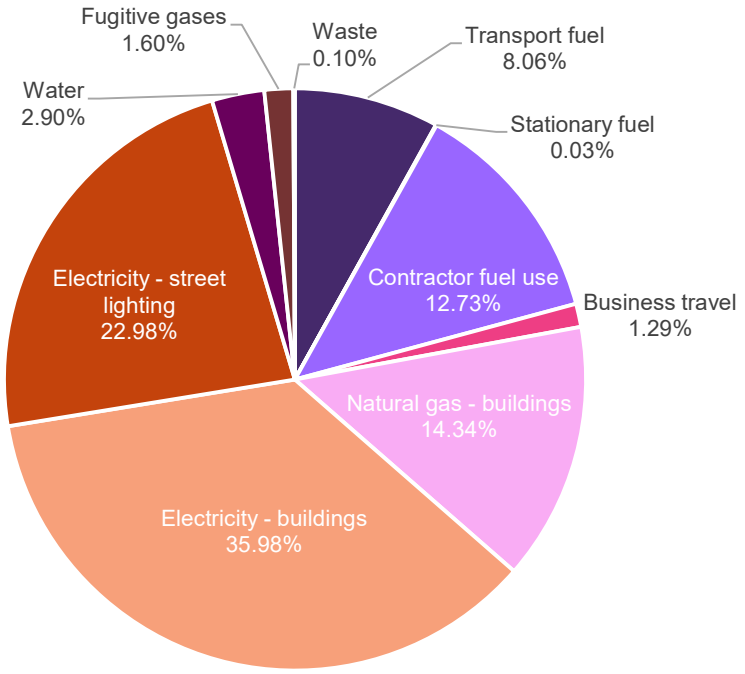

Figure 2 Manningham Council 2022/23 emissions inventory

Emissions source	Emissions (tCO_2-e)	Data source
Transport fuel	906	EcoFootprint Inventory Technical Report 2022/23
Stationary fuel	3	EcoFootprint Inventory Technical Report 2022/23
Contractor fuel use	1,432	Estimated based on Council-supplied waste collection tonnage for 2022/23
Business travel	145	2020 projection from Carbon Abatement Plan July 2014
Natural gas - buildings	1,612	Aquarena Aquatic and Leisure Centre Energy Plan February 2024 EcoFootprint Inventory Technical Report 2022/23
Electricity - buildings	4,046*	Aquarena Aquatic and Leisure Centre Energy Plan February 2024 EcoFootprint Inventory Technical Report 2022/23
Electricity – street lighting	2,584*	EcoFootprint Inventory Technical Report 2022/23
Water	326	2020 projection from Carbon Abatement Plan July 2014
Fugitive gases	180	2020 projection from Carbon Abatement Plan July 2014
Waste	11	2020 projection from Carbon Abatement Plan July 2014
Total	11,245	

Table 1 Manningham Council 2022/23 emissions inventory

Since 2021, Council has procured electricity for its facilities through the Victorian Energy Collaboration (VECO), a 100 per cent renewable energy Power Purchase Agreement (PPA). From July 2023, the Aligned Leisure Facility Management contract moved Aquarena and all sports stadiums onto the VECO contract, meaning these sites are now powered by 100 per cent renewable electricity sourced from wind farms in regional Victoria. Council's current contract for public lighting is also 100 per cent renewable through GreenPower.[1] This means that Council's electricity emissions have been reduced to zero since the 2022/23 inventory was completed, and so future emissions inventories will look similar to the source breakdown shown in Figure 3.

[1] Public lighting contract will join the VECO PPA in January 2025

Over 90 per cent of gas used in Council operations is consumed at Aquarena. Estimates for waste contractor fuel have been included in this inventory. Transport fuel is made up of petrol and diesel for passenger vehicles and the depot plant. Water emissions are due to electricity associated with water use at Council facilities, and fugitive gases are from refrigerant leakage in air conditioning systems. Stationary fuel is LPG.

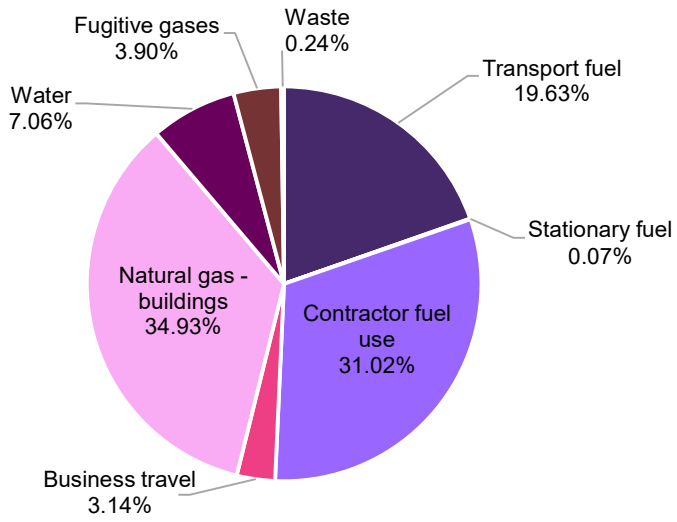

Figure 3 Expected future inventory breakdown by source

3.2 Future inventory reporting

To improve the completeness of future emissions inventories, Council should collect the following data:

- Contractor fuels by largest service providers (e.g. waste, road works)
- Concrete and asphalt
- Fugitive gases (refrigerant usage in HVAC and vehicles)
- Lubricants (oils and greases)
- Office paper
- Accommodation for staff travel
- Flights, hire cars and taxis

3.3 Council's zero emissions pathway

Council's pathway to net zero emissions over the next four years has been modelled based on the 2022/23 inventory, a business-as-usual emissions projection (based on population growth, grid decarbonisation and equipment efficiencies) and actions Council is taking to reduce emissions. This pathway is presented in Figure 4 (refer to Appendix for a description of each category in the graph).

The following emissions reducing initiatives have been modelled:

- All electricity procured through GreenPower or VECO PPA from 2023/24
- 60 per cent of passenger vehicle fleet (including hybrids) transitioned to EVs by 2028
- Aquarena electrification commences in 2025/26 (completed in 2026/27), other sites with gas electrified in 2027/28
- Waste contract requiring 10 per cent reduction in contractor fuel emissions each year, starting in 2025/26

Limitations in available technologies and budget mean that in in 2028, Council will still have some residual emissions. These are expected to be from fleet and equipment fuel, waste, water, waste contractor fuel use and refrigerants. Based on the inventory and modelling completed for this report, this will amount to around 2,200 tCO2-e that Council will need to offset to achieve net zero emissions. Note that improvements to data collection and reporting of additional emissions sources (e.g. asphalt and concrete, contractor fuel use) will likely increase these residual emissions.

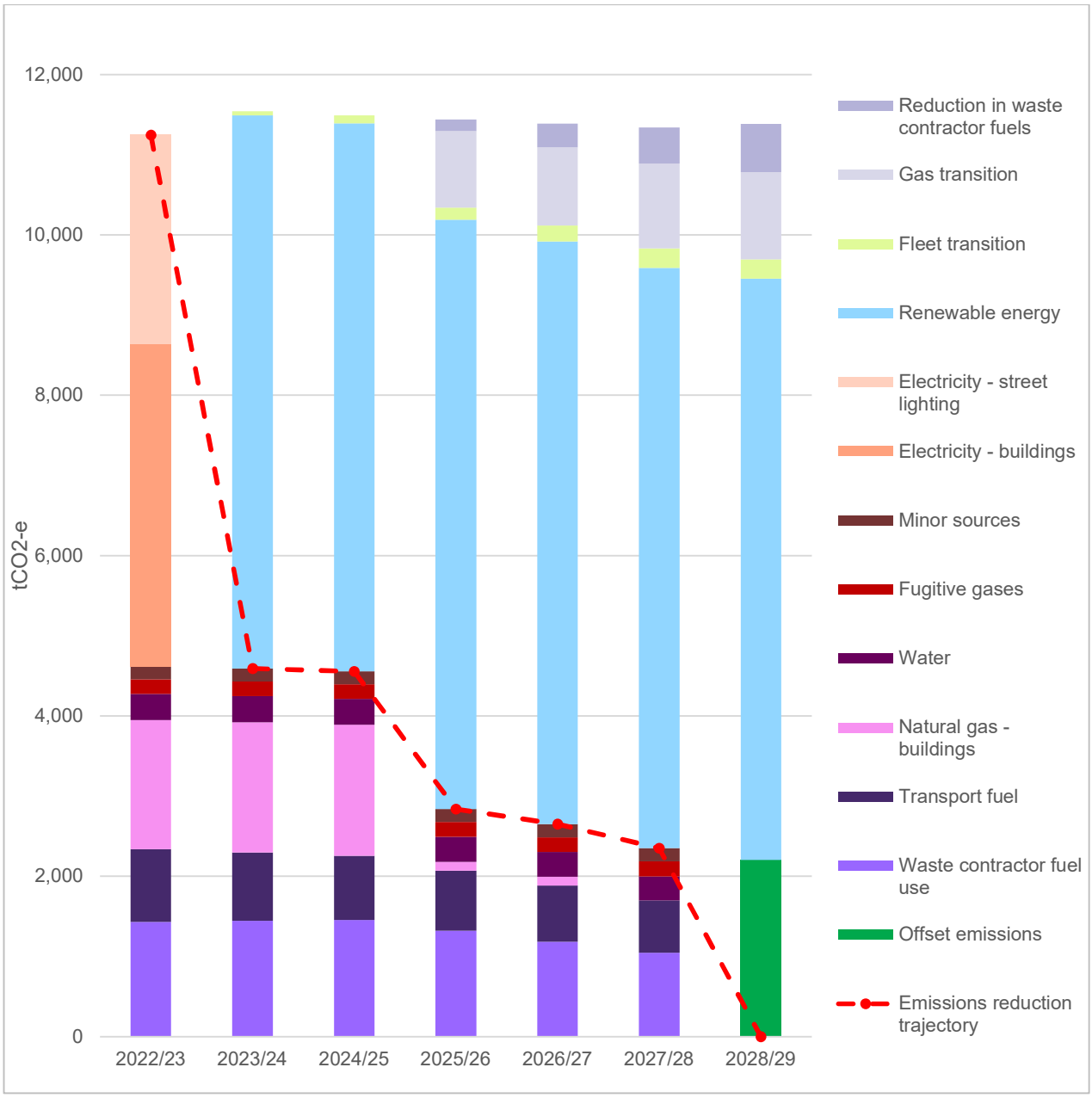

Figure 4 Pathway to net zero emissions for Council[2]

[2] Note that in 2022/23, 80% of electricity (including all street lighting) was sourced from renewable energy. To illustrate the impact of the VECO PPA on Council's emissions, equivalent grid emissions are shown here.

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4 Community pathway to zero

Manningham Council has a target to achieve net zero emissions in the community by 2035.

4.1 Community emissions profile - 2021/22

Figure 5 shows Manningham's community emissions profile for 2021/22. This is derived from Snapshot Climate, which is currently the only online tool providing estimated emissions profiles for all local government areas in Australia. The tool has been developed in accordance with the Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC) and encompasses a wide array of top-down or state-level data on emissions and their sources. Community emissions include all scope 1 and scope 2 emissions produced within the local government boundary, including from council, residential, commercial and industrial activities.

In the 2021/22 financial year, the community generated around 987,000 tonnes of CO2-e. The most significant source of emissions is from electricity consumption, making up 54 per cent of emissions, followed by transport, which makes up 21 per cent of emissions. Gas (17 per cent), Waste (4 per cent), and Industrial Processes and Product Use (IPPU) (4 per cent) make up the remainder of the emissions profile. Council's emissions contribute to less than 1 per cent of the community emissions profile.

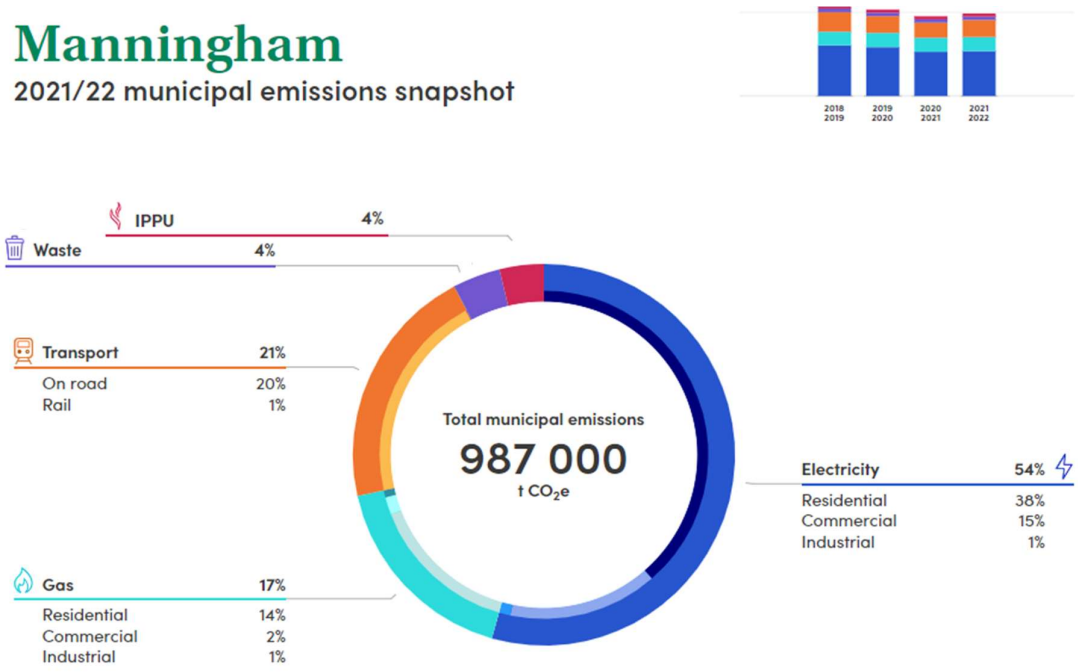

Figure 5 Manningham community emissions profile 2021/22[3]

[3] https://snapshotclimate.com.au/locality/municipality/australia/victoria/manningham/

4.2 Key emitters

Across the municipality, there are key emitters who contribute significant amounts of emissions, some of which already have plans for emissions reduction. Achieving net zero as a community by 2035 will rely heavily on large emitters charting their own pathways towards zero emissions, particularly for gas use, transport, waste and refrigerant use (IPPU).

Modelling has identified 62 organisations operating 94 facilities which emit approximately 9 per cent of total community emissions. Key emitters in the City of Manningham cover a broad range of commercial interests including health, education, and retail followed by some industrial and manufacturing.[4]

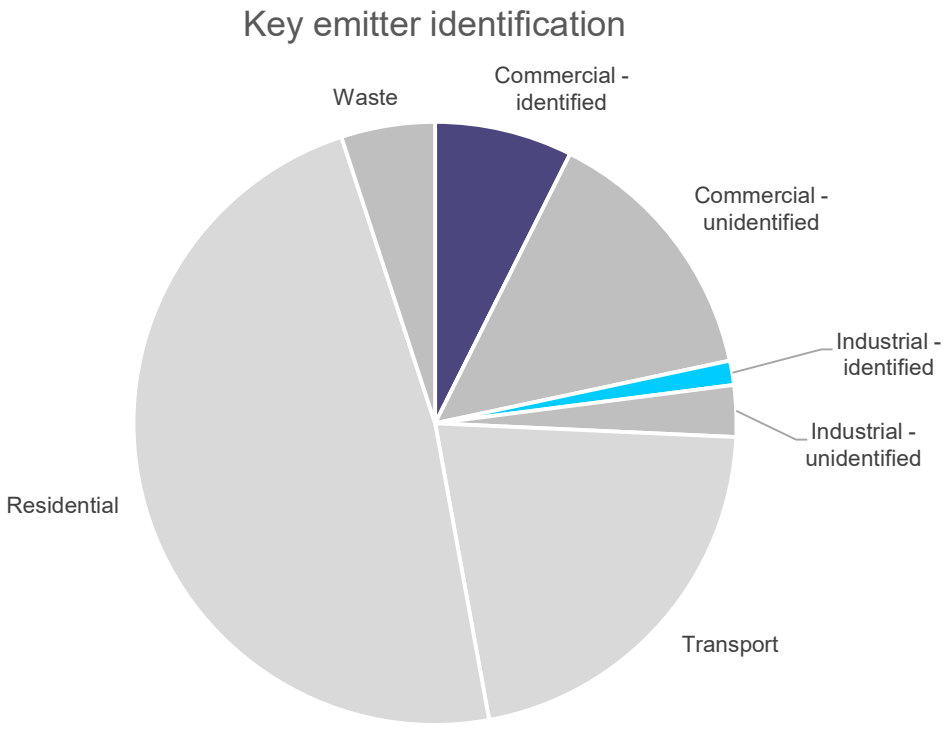

Figure 6 Key emitter summary

[4] See the City Pathway to Zero Emissions by 2035: Exploration Report – TRIM D23/56387 - prepared for Manningham Council in 2023 for more information on identified key emitters.

4.3 Community – zero emission pathways

Achieving net zero emissions for Manningham by 2035 requires ambitious action across the community. While Council will use its services, resources and advocacy to accelerate emissions reduction, residents, businesses, schools and community groups must be the driving force behind effective action.

4.4 Three potential pathways

To better understand how to achieve zero emissions for community by 2035, an analysis of three potential pathways has been undertaken. Each pathway considers the impact on community emissions as a result of different rates of uptake for key emission reduction actions. Manningham's major emissions sources are transport, residential and commercial electricity, and residential gas. Together, these sectors account for 90 per cent of Manningham's community profile.

Three possible emission reduction pathways for community emissions have been assessed, based on different rates of adoption by community members:

1. BAU: business-as-usual uptake of emissions reducing initiatives (including existing state and federal policy)
2. Moderate uptake: additional uptake of emissions reducing initiatives by 50 per cent compared to BAU
3. High uptake: maximum possible uptake of emissions reducing initiatives

The following initiatives were included in this assessment, each beginning in 2025 and analysed over ten years:

- Installation of new residential rooftop solar PV systems
- Residential gas disconnections
- Replacement of petrol or diesel passenger vehicles with electric vehicles (EVs)

The necessary annual uptake of each initiative for each scenario is outlined in Table 2, along with an estimate of the total emissions abatement impact from 2025 to 2035.

The State Government has a target for 95 per cent of grid electricity in 2035 to be supplied by renewable energy. The impact of this target on the grid emissions intensity in Manningham has been included in this modelling, meaning that business-as-usual electricity emissions approach zero in 2035 (below 0.2 tCO2-e/kWh).

The projected impact of each scenario on Manningham's community emissions profile is shown in Figure 7. This modelling emphasises the community's capacity to reduce emissions. By maximising opportunities to install rooftop solar, disconnect from the gas network and switch to EVs (high uptake scenario), Manningham's major emissions sources could be reduced to less than 170,000 tCO2-e by 2035. This would be a nearly 80 per cent reduction compared to 2022 emissions, and a 67 per cent improvement on the business-as-usual projection (BAU scenario). See Table 3 for results.

For the high uptake scenario, sources of residual emissions in 2035 include:

- Residential electricity, including an increase for electric alternatives to gas equipment
- Electricity for charging of EVs
- Remaining diesel and LPG vehicles that may not have a viable alternative by 2035
- Commercial electricity

A 100 per cent renewable energy grid would reduce these emissions even further, to close to net zero in 2035.

Initiative		BAU	Moderate uptake	High uptake
Installation of new residential rooftop solar PV systems	Additional solar PV installations per year	None	500	1,000
	Proportion of maximum PV adoption in 2035	72%	85%	100%
	Total impact over 10 years (tCO2-e abated)	N/A	280k	560k
Residential gas disconnections	Additional gas disconnections per year	None	500	1,200
	Proportion of maximum disconnections in 2035	0%	50%	100%
	Total impact over 10 years (tCO2-e abated)	N/A	1.1m	2.4m
Replacement of petrol or diesel passenger vehicles with EVs	Additional EV replacements per year	None	3,450	7,700
	Proportion of maximum EV replacements in 2035	14%	50%	95%
	Total impact over 10 years (tCO2-e abated)	N/A	1.05m	2.4m

Table 2 Summary of initiatives to reduce community emissions

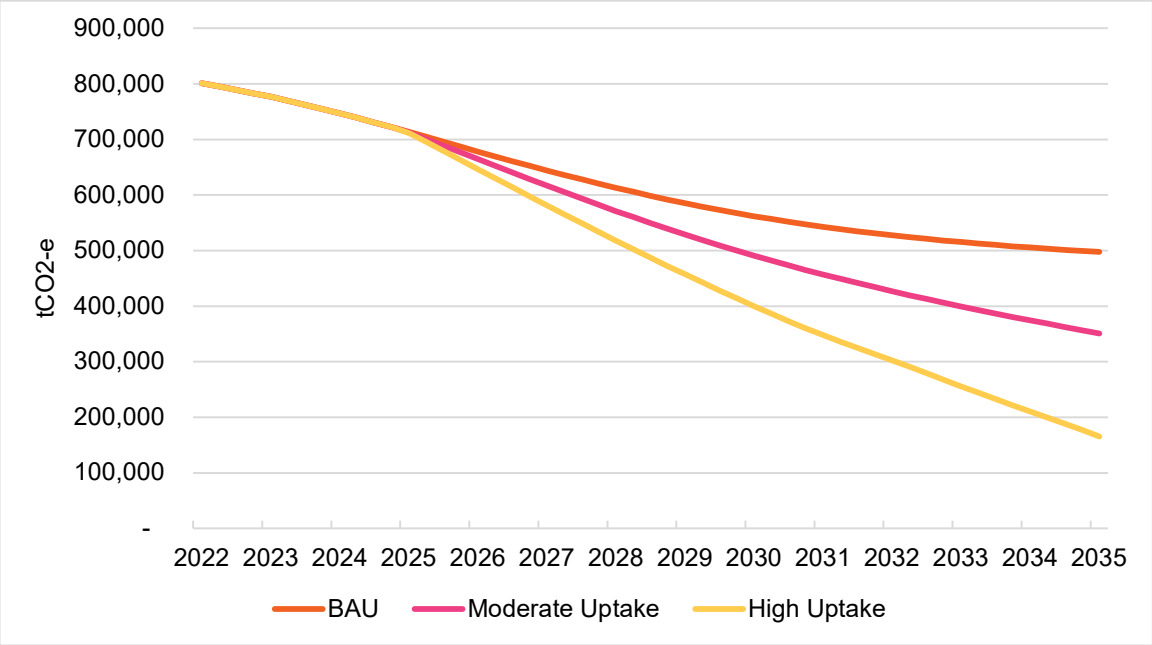

Figure 7 Community emissions scenario modelling

Modelling scenario	Estimated net emissions in 2035 (tCO_2-e)	Emissions reduction compared to 2021/22	Emissions reduction compared to BAU
BAU	497,000	37%	0%
Moderate uptake	351,000	56%	31%
High uptake	165,000	79%	67%

Table 3 Modelling results

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4.5 Monitoring uptake

Where possible, Council should monitor the uptake of emissions reduction activities in the community regularly (for example, every four years in line with the Council Plan cycle). Data sources to track this information on a municipal level vary in availability and useability. Although it is expected that data sources will become more sophisticated over time. Existing data sources to help Manningham monitor community action to reduce emissions include:

- Vehicle registration data by engine type to monitor EV registrations in the LGA
- Mode shift data from Google Environmental Insights Explorer
- Gas connection data such as total number of customers and average consumption for the LGA as supplied by distributors (currently reported intermittently)
- BESS (Built Environment Sustainability Scorecard) data on metrics around ESD standards (available through the Municipal Association of Victoria)
- BRA (Business Renewables Australia) tracks PPAs (not currently widely available)
- EV charging infrastructure maps e.g. EV charging map
- Carshare and eBike companies provide utilisation data to some councils

4.6 Action modelling details

Assumptions underpinning each of the three initiatives modelled in Table 2 are outlined below.

Installation of new residential rooftop solar PV systems

Business-as-usual starts with an estimate of current residential rooftop solar PV systems and projects BAU installation to 2035 based on current and expected future installation trends. Rooftop solar is an established and generally understood technology with many suppliers, and reasonable return on investment. The BAU projection estimates 72 per cent of viable roofs in Manningham will have solar installed by 2035.

Maximum PV adoption estimates the maximum potential of each dwelling type to install solar. It is assumed that 90 per cent of separate houses, 70 per cent of semi-detached dwellings, and 20 per cent of apartments have the capacity to install solar. The high uptake scenario does not consider the impact of additional solar PV systems beyond this estimated maximum possible adoption.

Planned grid decarbonisation means that the impact of increasing solar PV uptake in scenarios 2 and 3 becomes decreasingly significant over time.

Residential gas disconnections

Business-as-usual assumes no residential gas disconnections.

Maximum disconnections estimates the total number of residential gas connections in Manningham. It assumes 90 per cent of separate houses, 80 per cent of semi-detached dwellings and 30 per cent of apartments currently have gas connections.

Residual emissions following disconnection of all residential gas come from electricity assumed to replace gas usage for cooking, heating, hot water etc.

Replacement of petrol or diesel passenger vehicles with EVs

Business-as-usual starts with an estimate of current EVs in Manningham and projects BAU replacements to 2035 based on current and expected future installation trends. Electric passenger vehicles are an emerging technology, and while current overall uptake is low, the rate of uptake is increasing quickly. The BAU projection estimates 14 per cent of petrol and diesel passenger vehicles will be replaced with EVs by 2035.

Maximum EV replacements estimates the total number of vehicles that have a viable electric alternative. Vehicles without viable alternatives include all LPG vehicles and diesel light commercial.

Residual emissions come from vehicles without viable alternatives and electricity required to charge EVs.

5 Council's role

The climate emergency requires urgent action to reduce emissions by individuals, households, businesses, industry, and all levels of government. The roles and actions that each stakeholder must undertake depends on their decision-making responsibility and the influence they have within the community. For example, households and businesses can choose to add rooftop solar PV to their homes or offices but have little influence over the amount of renewable energy supplying the grid. Similarly, while local governments have direct control over their operations and assets, they do not have control over decisions made by residents and businesses within their municipality or actions taken at the State or Federal level.

Achieving net zero emissions will only be possible if everyone contributes by undertaking action across their spheres of control, influence and concern.

As the closest level of government to the community, local governments have an important role in influencing and supporting the local community to act on climate change. Council's function in strategic planning for the built environment is also crucial for driving more sustainable development. In addition, Council can advocate to the State and Federal Government on behalf of their community.

Broadly speaking, councils can undertake the following types of interventions to support emissions reductions within their community:

Develop and implement strategic plans, policies and regulations
For example, modifying the planning scheme to require energy efficient all-electric buildings or developing community-level strategies with a focus on emissions reduction.

Provide loans, incentives or grants
Free parking for EVs or subsidies for solar PV.

Install or facilitate the installation of community infrastructure
Public electric vehicle fast chargers within the municipality.

Facilitate action by groups of key stakeholders
Supporting businesses to procure 100 per cent renewable energy through Business Power Purchase Agreements or support community members interested in community batteries.

Provide community information and education
Webinars on improving energy efficiency in your home or the benefits of transitioning off gas.

Advocate for greater climate action by State or Federal Governments
Advocating to the State Government to make amendments to the planning scheme to increase minimum energy efficiency standards or advocating to the Federal Government to reduce taxes on EV purchases.

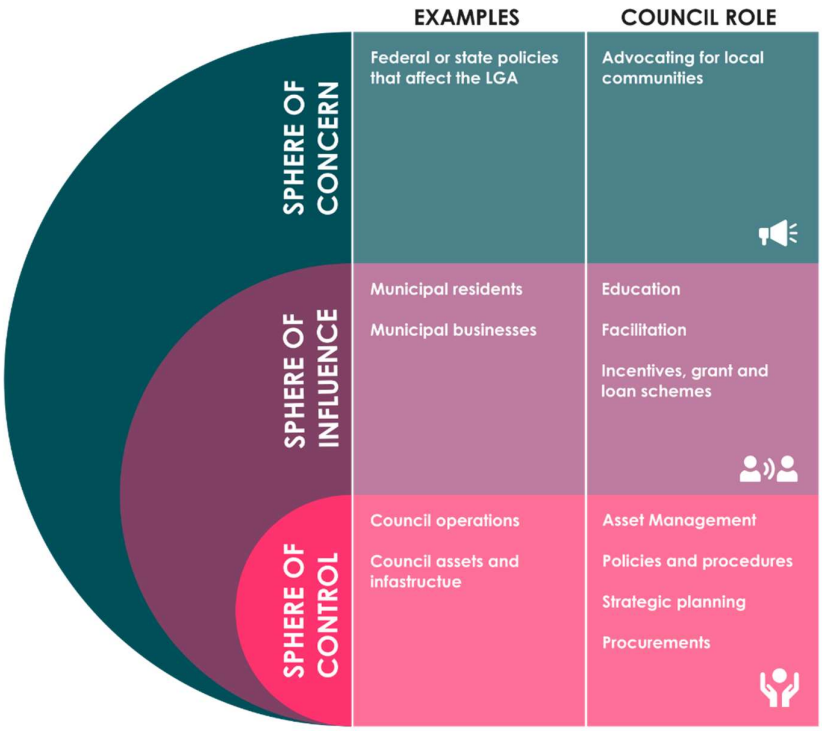

Figure 8 Council roles and responsibilities

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6 Carbon offsets

Manningham Council will likely need to procure carbon offsets to cover any residual emissions that cannot be eliminated or diverted to the carbon neutral VECO PPA. Based on analysing Council's projected emissions reduction pathway, around 2,200 tCO2-e worth of offsets will be required to achieve net zero corporate emissions by 2028. This quantity will depend on actions Council takes between now and 2028, as well as the emissions boundary determined for Council's inventory that year.

A range of carbon offset certifications are recognised by the Australian Government's Climate Active Program (see Table 4 below). International credits start at around $1.25 per tCO2-e, which translates to a cost of only around $2,750 to offset the projected residual emissions in 2028. However, such credits may be of low quality and leave Council open to accusations of greenwashing. Australian Carbon Credit Units (ACCUs) would be expected to cost around $66,000 based on the current spot price, although could amount to over $165,000.

In 2022, 95 per cent of carbon credits ever used in the Climate Active program were international credits.[5] However, there is a perception among some commentators that ACCUs may be more rigorous.[6] It is recommended that Manningham adopts a policy of procuring high-quality carbon credits, where genuine carbon avoidance or sequestration has been demonstrated. Council should also consider the co-benefits of different carbon offset options, for example:

- Indigenous owned and managed sequestration (including regeneration, soil management, cultural burning)
- Biodiversity enhancement and habitat protection
- Air and water quality improvements
- Social and cultural benefits
- Fostering local economic development

Manningham Council is a member of the Northern Alliance for Greenhouse Action (NAGA)[7]. A 2023 report, *Rethinking Carbon Offsets – exploring opportunities for NAGA councils*,[8] recommended NAGA develop a carbon offset buyer working group to share knowledge on offset policies, evaluation frameworks and measuring integrity, and explore joint procurement opportunities. The report also recommends partnering to develop a local carbon and biodiversity project. Other bodies such as the Catchment Management Authority could also participate to identify potential projects that can deliver both carbon and biodiversity outcomes.

This kind of collaboration could follow the model being trialled in the Barwon South West region, where a group of councils and catchment management authorities are working together to support projects offsetting emissions locally.[9] The project involves matching council areas with high emissions reduction targets with those with high carbon offset potential. It supports local community groups and private landholders to undertake natural resource management projects and supports a local revegetation industry by leveraging funding into local projects. In addition to

[5] https://www.climatechangeauthority.gov.au/publications/2022-review-international-offsets
[6] https://www.corrs.com.au/insights/australian-carbon-credit-units-an-untapped-financial-product-and-asset
[7] https://www.naga.org.au
[8] https://drive.google.com/file/d/1UqTD9xfi3SHYNAu17VeRG9xBcK7KdDn6/view
[9] You can read more about this project here: https://media.ruralcouncilsvictoria.org.au/wp-content/uploads/2022/10/27124525/RCV_Climate-Change-Toolkit.pdf

helping to meet carbon neutrality targets of councils, this program is also improving regional natural resource management outcomes, including improved water quality, soil health and habitat connectivity, as well as adapting to climate change.

6.1 Offset types

It is generally understood that there are three common offset types:

- Carbon avoidance projects, which prevent carbon that would otherwise have been released into the atmosphere, e.g. building a wind farm to lower reliance on fossil fuels, or energy efficiency projects.
- Carbon reduction projects, which reduce the amount of carbon dioxide that is released into the atmosphere, e.g. carbon capture and storage technologies and methane flaring.
- Carbon sequestration projects, which remove carbon from the atmosphere. Broadly speaking, these are split into two categories: natural carbon removals, like tree planting which sequesters carbon as the trees grow, and technological carbon removals, such as direct air capture. However, today there are no commercial proven or viable forms of direct air capture.

Many experts see carbon reduction and sequestration through natural carbon removal as the strongest form of offsetting. Natural carbon removal does not depend on understanding a contestable BAU emissions scenario, and therefore, is more likely to meet the condition of additionality (refer to next section).

6.2 Carbon offsetting principles

The carbon offsets market is complex, and offsets vary in quality. A recent report by the Australian Academy of Science asserted that Australia's carbon credits (ACCUs) are "largely a sham," and that many projects for which carbon credits are being claimed would have occurred even without the granting of credits.[10] Similar accusations have been levelled at some international offsets[11], and it can be difficult to identify quality credits.

In purchasing carbon offsets, Council should consider the following:

Additionality
The reductions achieved by a project need to be 'additional' to what would have happened if the project had not been carried out (i.e. continued as BAU). For instance, if a project is independently viable, say through the sale of electricity, or from government funding, regulation or other policies, then it should not be used as an offset project, as it would have been undertaken regardless of an investment secured through carbon markets. Many carbon offset standards require proof of additionality. Where additionality remains unclear, Council should ask questions to ensure that the projects they are investing in offer a significant emissions abatement opportunity.

Council should also be mindful of project types that are more likely to have greater additionality, such as carbon removal and sequestration activities.

[10] Summarised at: https://www.theguardian.com/australia-news/2022/nov/22/flaws-in-australias-carbon-credits-schemes-undermine-transparency-new-report-finds
[11] See https://www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe for more information

Unit or certificate / Scheme / Level	Cost per tCO_2e Nov 2023[12]	Notes
Australian Carbon Credit Unit (ACCU)[13] / Emissions Reduction Fund / National	Spot price of AUD$30.90. Pricing varies depending on project. Particular projects can reach up to AUD$75 and above.	Projects may achieve a range of other environmental, economic, social and cultural benefits. Methodologies for the issue of ACCUs are conservative and only suited to a narrow group of activities.
Verified Carbon Unit (VCU)[14] / Verified Carbon Standard / International	From around AUD$4.50.	World's largest GHG crediting program with a registry of projects in AFOLU, chemical industry, construction, energy demand, fugitive emissions, manufacturing, transport and waste projects.
Verified Emissions Reductions (VER)[15] / Gold Standard / International	USD$10-$45 (AUD$15-$70) for current projects on Gold Standard website, but older vintage credits can be purchased from brokers (e.g. AUD $4.50)[16].	Support various emissions reduction projects worldwide, including renewable energy, clean water, biogas and biomass projects in developing countries.
Certified Emissions Reduction (CER)[17] / United Nations Framework Convention on Climate Change / International	From approx. USD$0.85-$25 (AUD$1.25-$40).	Based on Clean Development Mechanism projects in developing countries. Originally the mechanism was designed to support industrialised countries to meet a part of their emission reduction targets under the Kyoto Protocol. In the last few years, CERs have been used to meet voluntary commitments by corporates as well, including some large corporates in Australia. The Climate Council recommends that these offsets be phased out of Climate Active.[18]

Table 4 Details of offset types recognised by Climate Active

[12] As with other financial markets, carbon markets are prone to fluctuation
[13] https://www.cleanenergyregulator.gov.au/OSR/ANREU/types-of-emissions-units/australian-carbon-credit-units
[14] https://verra.org/programs/verified-carbon-standard/verified-carbon-units-vcus/
[15] https://www.goldstandard.org/
[16] https://online.tasmanenvironmental.com.au/product/renewable-energy-transition-turkey-ver/
[17] https://offset.climateneutralnow.org/AllProjects
[18] https://www.climatechangeauthority.gov.au/publications/2022-review-international-offsets

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(6.2 Carbon offsetting principles cont'd from page 20)

Accuracy
Offsets should be accurately quantified. Most carbon offset standards require evidence of quantification.

Permanent
Measures should be taken to ensure that the emissions won't be released into the atmosphere at a later date, e.g. fire prevention plans should be implemented to reduce the risks of forests being damaged by fire and releasing the stored carbon.

Avoiding double counting
Most carbon offset standards verify this.

Not associated with social or environmental harm
For example, Westpac was recently found to be purchasing offsets linked to the tobacco industry.[19]

Co-benefits
Well-designed carbon offset projects can have important social, cultural, economic and broader environmental co-benefits. While all projects have co-benefits, some project developers may prefer to work with community members to respond to local needs while others may focus on the business opportunities. This will inevitably influence the strength and variety of benefits that go beyond a program's carbon removal potential.

Alignment with Council values and priorities
For example, purchasing offsets that support indigenous communities to align with Council's Reconciliation Action Plan.

Transparency
To avoid accusations of greenwashing, it is best to be transparent about the types of offsets that are being purchased.

Provenance
If acquiring through a broker, Council should ask for details of the vetting process that has been undertaken to ensure high-quality offsets.

6.3 Price forecasts

There is a great deal of uncertainty around forecasting the price of offsets, as can be seen in Figure 9 and Figure 10.

For international offsets, Bloomberg predicts little change in the cost of offsets between now and 2030 under a voluntary market scenario, where nothing fundamentally changes about the offset market (companies are able to buy all types of offsets). Under the removal scenario, where companies can only buy removal offsets to achieve net zero goals, the cost of offsets more than doubles by 2030 and then sees an even steeper increase. The bifurcation scenario has the market

[19] https://www.afr.com/rear-window/westpac-s-carbon-neutrality-a-little-smoky-20210721-p58bs6#:~:text=That's%20right%2C%20in%20a%20year,of%2C%20and%20depopulating%20it%20too.

splitting in two, with a smaller market for expensive high-quality credits seeing large price increases and a larger market for low-quality offsets with an approximately stable price.

For ACCUs, EY predicts the cost will decrease slightly between now and 2026 and then increase sharply to a high of around AUD$75/tCO2e just before 2035. On the other hand, the National Australia Bank predicts an increase in price by 2025[20].

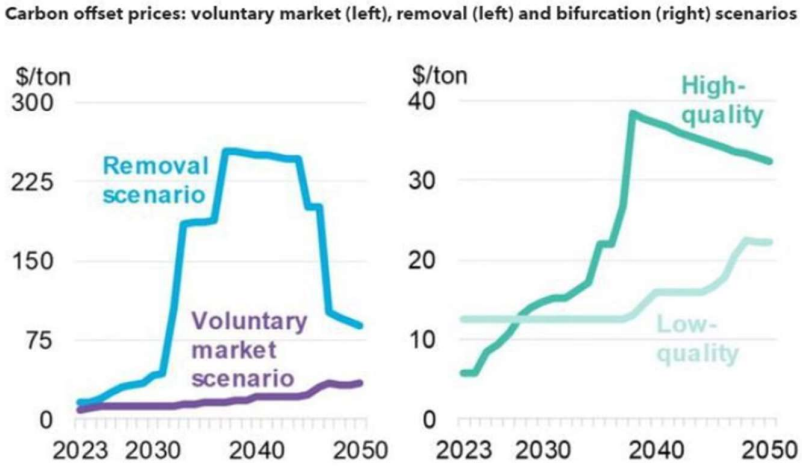

Figure 9 International offset price forecast. Source: Bloomberg, 2023[21]

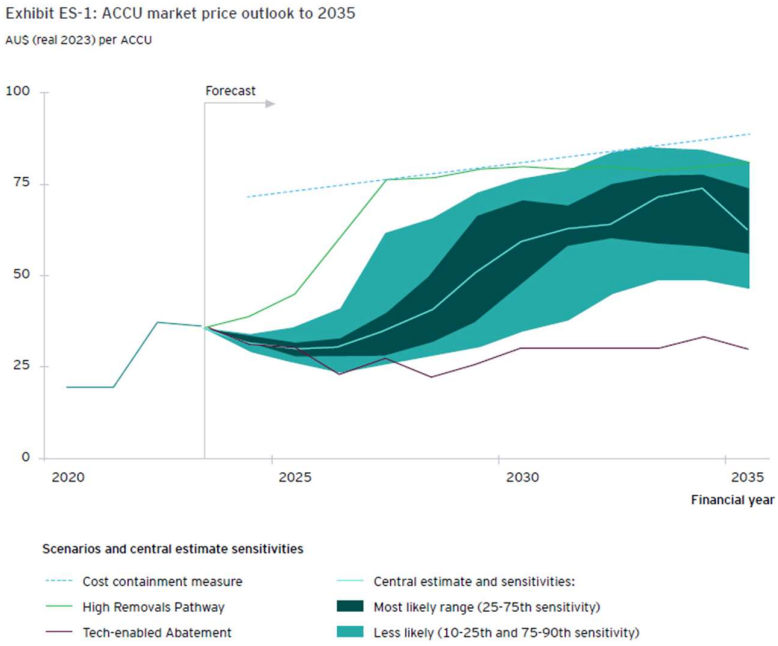

Figure 10 ACCU price forecast. Source: EY, 2023[22]

[20] https://business.nab.com.au/nab-carbon-research-accu-prices-set-tp-57768/
[21] https://www.bloomberg.com/professional/blog/long-term-carbon-offsets-outlook-2023/
[22] https://assets.ey.com/content/dam/ey-sites/ey-com/en_au/noindex/ey-carbon-markets-outlook-thought-leadership-report-11-sept-2023.pdf

Appendix

A.1 Definitions of terms used in Figure 4

Definitions of terms used in Figure 4 Pathway to net zero emissions for Council categories.

Category	Type	Description
Reduction in waste contractor fuels	Emissions reduction	Emissions reduced by requiring 10% reduction in contractor fuel emissions each year.
Gas transition	Emissions reduction	Emissions reduced by electrifying gas equipment at Aquarena and other Council facilities.
Fleet transition	Emissions reduction	Emissions reduced by transitioning passenger fleet to electric.
Renewable energy	Emissions reduction	Emissions reduced by procuring 100% renewable energy.
Offset emissions	Emissions reduction	Emissions reduced through purchase of carbon offsets.
Emissions reduction trajectory	N/A	Line showing possible net emissions following emissions reduction actions.
Electricity - street lighting	Emissions source	Emissions from electricity used by street lights.
Electricity - buildings	Emissions source	Emissions from electricity used by Council buildings.
Minor sources	Emissions source	Emissions from business travel, waste disposal at Council facilities and stationary fuel (LPG).
Fugitive gases	Emissions source	Emissions from refrigerant leakage in air conditioning systems.
Water	Emissions source	Emissions from electricity associated with water use at Council facilities.
Natural gas - buildings	Emissions source	Emissions from gas used by Council buildings.
Transport fuel	Emissions source	Emissions from petrol and diesel for passenger vehicles and Depot plant.
Waste contractor fuel use	Emissions source	Emissions from fuel used by waste contractors.

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