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ITEM 6 EMISSIONS REDUCTION TARGET - GLOBAL COVENANT OF MAYORS

Wollongong City Council is one of 26 Councils in Australia to commit to carbon reduction through the Global Covenant of Mayors for Climate and Energy (GCoM). Under the GCoM initiative, Council is required to adopt a science-derived emissions reduction target on behalf of our community

Council has completed an inventory of local government area (LGA) wide emissions, with the majority of emissions being derived from the industrial sector. The inventory has determined that the Wollongong Local Government Area has a carbon budget of 49 Mt CO_2-e, which it must stay within in order to avoid the impact of catastrophic climate change. It should be noted that Council is submitting this target on behalf of the community, for the benefit of the entire community and that Council is not solely responsible for the implementation of actions to achieve this target.

If the Wollongong community continues to emit carbon at the current our carbon budget (49 Mt CO_2-e) will be exhausted in just over 18 years. The emissions reduction target suggested in this report will extend our carbon budget until 2050, after which a net zero emission target is proposed.

On 12 August 2019, Council resolved to declare a State of Climate Emergency. The proposed emissions reduction target will strongly support Council's Climate Emergency declaration.

Following adoption of a target and under the auspice of the GCoM framework, Council is required to develop an action plan to reduce emissions through a robust investigation and consultation process. The action plan will include a range of actions to reduce Council's emissions. Given the emissions source profile, it is envisaged that Council will be taking on a significant supporting role in terms of advocacy, stewardship, education and engagement to assist the community, businesses and industry to yield the highest possible emissions reduction outcome for Wollongong.

RECOMMENDATION

1 A science-derived emissions reduction target of net zero emissions by 2050 be submitted to the Global Covenant of Mayors secretariat. Noting that Council is submitting this target on behalf of the community, for the benefit of the entire community and that Council is not solely responsible for the implementation of actions to achieve this target.

2 An Emissions Reduction Action Plan be developed to assist all sectors of the community achieve the emissions reduction target for the Wollongong local government area.

REPORT AUTHORISATIONS

Report of: David Green, Manager City Strategy (Acting)
Authorised by: Chris Stewart, Director Planning and Environment - Future City and Neighbourhoods (Acting)

ATTACHMENTS

1 City of Wollongong Science Derived Targets for Greenhouse Gas Emissions - Report
2 Australian GCoM Councils Targets

BACKGROUND

In August 2017, Council became a signatory to the GCoM, following a Council resolution on 17 July 2017. The GCoM is an international alliance of cities and local governments with a shared long-term vision of promoting and supporting voluntary action to combat climate change and move to a low emission, resilient society. The GCoM merges the Compact of Mayors and the EU based Covenant of Mayors, with 9,209 cities around the world having committed to date.

The GCoM commits Council to undertake certain actions within three years of joining, to respond to the risks and opportunities presented by climate change. The GCoM provides a structured framework for

compliance. The required commitments, target dates and current status according to the GCoM are outlined in Table 1 below.

Table 1 - GCoM compliance framework for Wollongong

Commitment	Target date	Status
Register commitment	August 2017	Completed
Complete an emissions inventory	August 2018	Completed
Complete a climate change hazards assessment	August 2018	Completed
Adopt a science-derived emissions reduction target for the LGA	August 2019	Subject of this report
Complete a climate change vulnerability assessment	August 2019	Work commenced
Develop climate change mitigation (emissions reduction) plan	August 2020	To be developed
Develop climate change adaptation plan	August 2020	To be developed

Emissions Inventory

The LGA wide emissions inventory showed that 78% of emissions within Wollongong are derived from stationary energy generation, which includes both electricity and gas (refer to Figure 1). When emissions are examined by source, 72% of emissions are from the industrial sector and 20% from the residential sector (Figure 2). Wollongong is a unique city in terms of our emissions profile; industrial emissions are significantly higher than the NSW and National averages (which are 35% and 52% respectively), whilst transport emissions are lower than the NSW average of 21%.

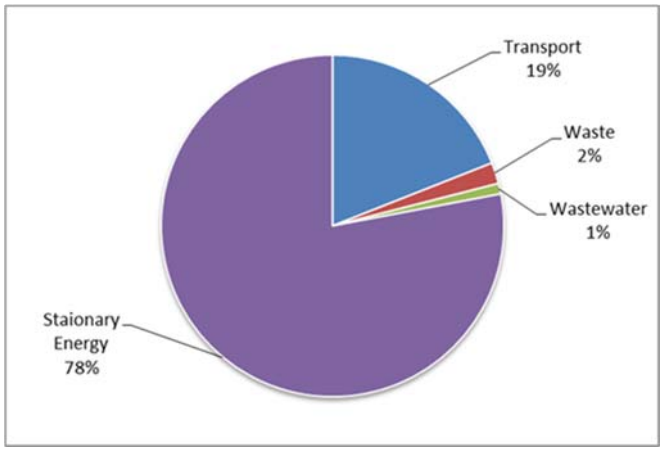


Figure 1 – Wollongong emissions by source type

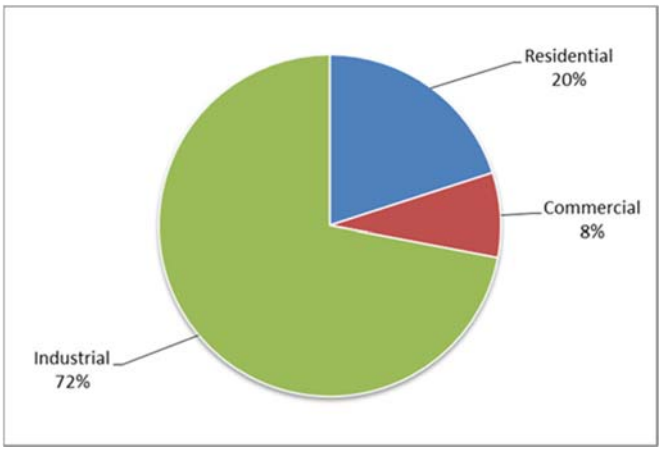


Figure 2 – Wollongong emissions by sector

Emissions from Council operations equate to less than 5% of community wide emissions. The majority of Council's emissions (88%) are generated at Whytes Gully landfill.

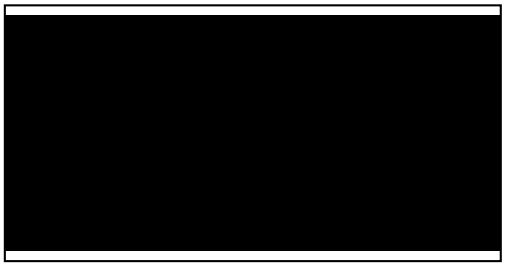
Carbon Budget

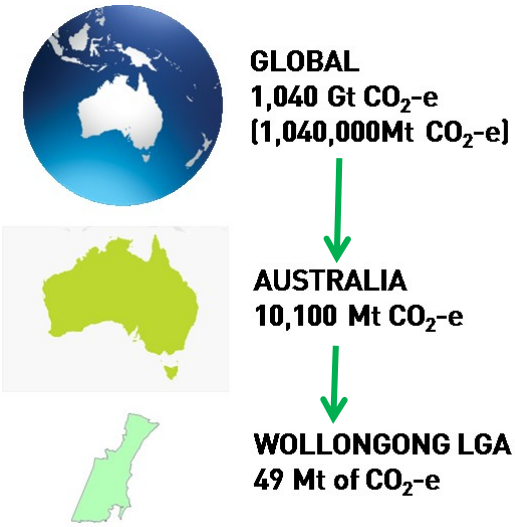
Under the Paris Accord a global carbon budget of 1040 Gt CO_2-e was determined by the Intergovernmental Panel on Climate Change (IPCC). This is based on the amount of carbon emissions that can be produced globally (indefinitely) to keep global temperature less than 2°C above pre-industrial levels. This is the level that has been determined to avoid catastrophic climate change.

Carbon budgets were then determined for countries across the world based on populations, socio-economic factors and projections. Wollongong's carbon budget of 49 Mt CO_2-e has been determined based on the carbon budget allocation for Australia (refer to Figure 3 and full report Attachment 1), as the limit that we cannot exceed for Wollongong to play its role in avoiding catastrophic climate change.

If the Wollongong community continues to emit at the rate that it is today – business as usual – our carbon budget (49 Mt CO_2-e) will be exhausted in just over 18 years. This assumes that no actions will be undertaken, however, implementing actions to reduce emissions will 'buy' more time in terms of use of the allocated budget.

If the Wollongong community continues to emit at the rate that it is today – business as usual – our carbon budget (49 Mt CO_2-e) will be exhausted in just over 18 years. This assumes that no actions will be undertaken, however, implementing actions to reduce emissions will 'buy' more time in terms of use of the allocated budget.





It has been suggested that the global carbon budget has been significantly reduced since it was determined in 2016. There is a meeting of the IPCC in September 2019 and updated figures will be released following the meeting.

Catastrophic climate change is predicted to result in devastating cumulative effects that will be experienced across the globe as well as locally. These local impacts include:

- Increasing temperatures
- Increase in the number of extreme hot days (>35 °C)
- Decrease in number of cold nights (<2 °C)
- Decrease in winter rainfall
- Increase in summer and autumn rainfall
- Increase in bushfire risk
- Sea level rise and coastal inundation.

Local and broader impacts will include:

- Health issues, particularly in vulnerable communities, with people unable to escape or tolerate extreme temperatures
- Increased costs to households from energy use associated with cooling
- Damage to infrastructure as a result of extreme weather events and sea level rise
- Displaced communities and populations in low-lying areas
- Species loss as a result of changes in breeding patterns and inability to adapt to new climates
- Decreased access to water/food/shelter
- Invasion of weed/pest species
- Sea grass loss.

PROPOSAL

There are currently 26 Councils across Australia that are signatories to GCoM. All GCoM Councils are required to submit a science-derived community emissions reduction target. The target must be calculated according to specific protocols derived from the IPCC carbon budget framework by an accredited consultant.

Wollongong Council's Science-Derived Target for Greenhouse Gas Emissions report has been prepared in accordance with the GCoM framework by an accredited person (Attachment 1).

Council is recommended to set a science-derived emissions reduction target that will:

- Incorporate an initial reduction target to extend the carbon budget to 2050,
- Beyond 2050 the target will be adjusted to net zero emissions

The initial reduction target equates to a linear reduction of approximately 2.7% or 74,251 tonnes per year. By 2050 a net zero community emissions target is proposed on behalf of and for the benefit of the Wollongong community. The proposed emissions reduction target is expressed in Table 2 below:

Table 2 – Wollongong's carbon budget and proposed community emissions reduction target

Carbon Budget (t CO_2^{-e})	**49,200,000**
Pre 2050 target	
Rate of reduction (pa)	2.7%
Annual reduction (t CO_2^{-e})	74,251
Post 2050 target	
Annual reduction (t CO_2^{-e})	Net zero emissions

Council has an important role in reducing emissions from its operations and will need to prepare an action plan focused on emission reductions associated with these operations.

As identified above, the industrial and residential sectors are responsible for the vast majority of Wollongong's emissions. In order to leverage actions, which yield the highest emission reductions, Council will need to work in partnership with major industry, business and the community. In this regard Council is likely to be responsible for actions associated with advocacy, stewardship, education and engagement for emissions reduction for these sectors.

A list of the carbon emission targets proposed by other Australian GCoM Councils is provided as Attachment 2. It should be noted that the net zero emissions target set for Wollongong is consistent with the target for the City of Sydney and City of Adelaide.

CONSULTATION AND COMMUNICATION

Workshops were held with staff and Councillors in November and December 2018. On 5 August 2019, an additional Councillor briefing session was held.

PLANNING AND POLICY IMPACT

This report contributes to the delivery of Wollongong 2028 Goal 1 – 'We value and protect our natural environment', Goal 2 – 'We have an innovative and sustainable economy', Goal 6 – 'We have sustainable, affordable and accessible transport'. It specifically delivers on the following objectives -

Objective 1.1 - Our natural environment, waterways and terrestrial areas are protected, managed and improved

Objective 1.2 – We practice sustainable living and reduce our ecological footprint

Objective 2.2 – The regions industry base is diversified

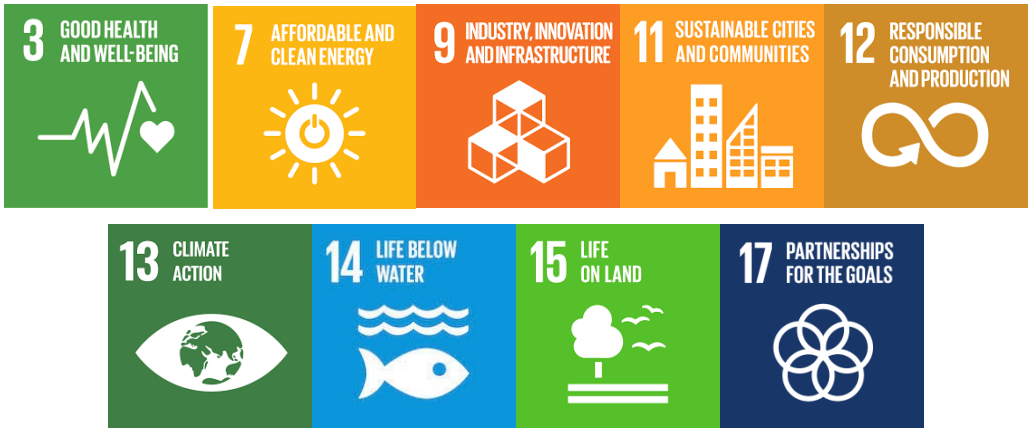
It specifically delivers on the following Strategies and Actions -

Community Strategic Plan	Delivery Program 2018-2021	Operational Plan 2018-19
Strategy	3 Year Action	Operational Plan Actions
1.2.1 Reduce our ecological footprint, working together to minimise the impacts of climate change and reduce waste going to landfill	1.2.1.1 Develop and implement a range of programs that encourage community participation in reducing Wollongong's ecological footprint	1.2.1.1.1 Coordinate community environmental programs including: Rise and Shine, Clean Up Australia Day, World Environment Day, National Recycling Week, International Composting Week and other waste education activities
	1.2.1.3 Methods to reduce emissions are investigated and utilized.	1.2.1.3.3 Participate in the Global Covenant of Mayors and set emissions reduction targets for the LGA
		1.2.1.3.4 Monitor and report on organizational water, energy and greenhouse gas emissions trends
1.2.2 Government and community work together to mitigate the impacts of climate change on our environment and future generations	1.2.2.1 Our community is proactively engaged in a range of initiatives that improve the sustainability of our environments	1.2.2.1.3 Develop a project and work with partners to further explore the United Nations Sustainable Development Goals and how they align to the community's goals with funding to be considered through the business proposal process
		1.2.2.1.4 Implement resourced priority actions from the Environmental Sustainability Strategy 2014-22
2.2.1 Further diversify the region's economy through a focus on new and disruptive industries and green technology	2.2.1.1 The development of renewable energy products and services is supported	2.2.1.1.1 Seek out opportunities to incorporate green technologies in Council's projects and contracts

Reducing greenhouse emissions is also a priority in the Environmental Sustainability Strategy 2014-2022 -

- Focus Area 2 - Reducing our ecological footprint - Reducing emissions from Council operations
- Focus Area 5 - Demonstrating Sustainable Leadership and Governance – Complying with Global Covenant of Mayors requirements, which includes setting emissions reduction targets and developing an action plan to achieve the target.

The adoption of an emissions reduction target will support the achievement of the following United Nations Sustainable Development Goals -



Ecological Sustainability

Compliance with the GCoM requirements will mean that Wollongong is contributing to avert catastrophic climate change. Without action Wollongong is likely to experience a range of impacts including increase in extremely hot days, drought, bushfire, sea level rise, extreme weather events and flooding inundation. These impacts will significantly affect vulnerable communities, infrastructure and asset viability and management, biodiversity and water availability. Setting an emissions reduction target for Wollongong will support Council's August 2019 Climate Emergency Declaration.

RISK ASSESSMENT

There will be significant environmental and social risks associated with not addressing climate change.

Council is the owner of a significant assets that will also be affected by the impacts of climate change including roads, bridges, coastal infrastructure, buildings and facilities.

There is will also be a reputational risk if Council does not adopt an emissions reduction target following the recent Climate Emergency declaration. Council will also be non-compliant with GCoM requirements.

FINANCIAL IMPLICATIONS

Whilst there is nil cost associated with adopting an emissions reduction target, the cost of implementing actions to reduce emissions is yet to be determined. Council is only directly responsible for 5% of community emissions and therefore the role of Council is mainly one of advocacy, stewardship, education and engagement. Actions will need to be reviewed to leverage the largest reductions in emissions.

CONCLUSION

Adoption of a community emissions reduction target is a requirement for the GCoM. Based on the Paris Accord and GCoM protocols it is proposed that Council, on behalf of and for the benefit of the Wollongong community, set a science-derived emissions reduction target of net zero community emissions by 2050. Noting that achieving the target is not the sole responsibly of Council. Should Council resolve to adopt a target, Council staff will proceed to action the subsequent commitments associated with the GCoM, which includes the development of an emissions reduction plan in consultation with key stakeholders. The endorsement of an emissions reduction target will also show significant support for the recent August Climate Emergency declaration.

Ironbark Sustainability

City of Wollongong

Science-Derived Targets for Greenhouse Gas Emissions

Prepared for
Wollongong City Council

Version	Author	Date	Description of changes
V0a	Hannah Snape	20/05/2019	First draft
V0b	Alexi Lynch	25/05/2019	Review
V1a	Hannah Snape	31/05/2019	Final report for Council
V1b	Hannah Snape	30/09/2019	Revised report for Council

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About Ironbark Sustainability
Ironbark Sustainability is a specialist consultancy that works with government and business around Australia by assisting them to reduce energy and water usage through sustainable asset and data management and on-the-ground implementation.

Ironbark has been operating since 2005 and brings together a wealth of technical and financial analysis, maintenance and implementation experience in the areas of building energy and water efficiency, public lighting and data management. We pride ourselves on supporting our clients to achieve real action regarding the sustainable management of their operations.

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

Ironbark are 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.

Ironbark

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1. Background

At the United Nations Framework Convention for Climate Change (UNFCCC) Paris Conference in 2015, the Australian Government signed an international agreement between 195 countries to keep any temperature rise "well below 2°C", and to drive efforts to keep warming below 1.5°C higher than pre-industrial levels. This Paris Agreement, entered into force on 4 November 2016, 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.

Climate science tells us that warming beyond 1.5°C threshold is likely to have increasingly severe social, economic and environmental impacts, especially on a water scarce continent like Australia. As of October 2018, the IPCC announced that there were no longer any scenarios for remaining within this temperature increase-range without the use of carbon removal technologies.

In becoming a signatory to the Paris Agreement, Australia now has a limited, established carbon budget within which to operate in order to meet its commitment. The development of science-derived targets for councils enables us to understand the scale of action that is required at a municipal level to stay within this budget.

An emissions reduction target for an organisation, entity or community is considered "science-derived" or "science-based" when it is aligned with the broader emissions reduction required to keep global temperature increase below 2°C compared to preindustrial temperatures, as described in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

1.1 Role of Targets

In considering science-derived targets for reducing greenhouse gas (GHG) emissions at the community level, it is useful to explore their role and application. In application with carbon mitigation strategies, there are three key types of target:

1. Aspirational – a 'call to action'

The *Aspirational Target* is set according to political or other considerations and will typically involve something memorable or easy to communicate. It may not consider if this target is necessary, or what is needed to achieve the target. The primary motivation for this target is to establish a common rallying point and encourage all stakeholders to get motivated. An example of this type of target is, "We will achieve 20% carbon emissions reduction by 2020"

2. Top down – what needs to be achieved (Science-Derived Targets)

The *Science-Derived Target* is determined from an external requirement (in this instance, the recommendations of the IPCC to avoid catastrophic climate change). It may be better thought of as a limit, rather than a target. It is independent of political or other considerations and does not consider how difficult (or otherwise) the target will be to achieve. The primary motivation

for this target is to avoid some negative outcome. An example of this type of target from other fields is, "Do not descend below 8,000m otherwise the submarine will implode".

3. Bottom up – what we can achieve (Action-plan Based)

The *Action-plan Based Target* is one that is constructed from what can be achieved from the actions being considered in a council's action plan. It can be ambitious; however, its scope is directly derived from planned actions. An example of this type of target is, "Our factory will produce 10,000 widgets this quarter".

2. Methodology

2.1 Global Carbon Budget

The IPCC, the leading authority on current climate change scientific knowledge, has developed long-term emission scenarios which show a range of potential emissions trajectories and impacts based on highly detailed and rigorous modelling. These scenarios indicate the maximum total emissions allowable to limit the increase in global average temperatures to 2°C, which is considered the threshold for avoiding dangerous climate change. The IPCC reports that for climate stabilisation to occur (2°C), industrialised countries need to reduce their greenhouse gas emissions by approximately 85% by 2050.

Based on the above, the world's "carbon budget" is the total volume of greenhouse gases that can be emitted while providing a degree of confidence that temperature rise will be limited to a relatively safe and manageable 2°C. The accepted global carbon budget established by the IPCC is 1,701 Gt CO_2-e for the period 2000-2050.

2.2 National Carbon Budget

There is no international agreement on the division of the global carbon budget between countries. In apportioning a national carbon budget, there are a number of approaches. The Australian Climate Change Authority (CCA) has used an approach that they consider fair and equitable. This approach ensures that:

- developing countries are initially allowed an increased per-capita carbon budget to allow for additional emissions whilst they grow their economy; and,
- high per-capita emitters (such as Australia) are allowed time to adjust to their reduced carbon budget, rather than setting them up to fail with an allowance that is considerably lower than their current emissions.

Based on this methodology, CCA recommended a national carbon budget of 10.1 Gt CO_2-e for the period 2013-2050. As at September 2018, 7.26 Gt CO_2-e of this budget remains.

Australia's current targets for reducing greenhouse gas emissions are 26-28% reductions on 2005 levels by 2030. In its 2015 reports to the Minister for the Environment on Australia's future greenhouse gas emissions reduction targets, the CCA recommends Australia commit to the following science-based targets:

- a 2025 target of 30% below 2000 levels; and
- further reductions by 2030 of between 40 and 60% below 2000 levels.

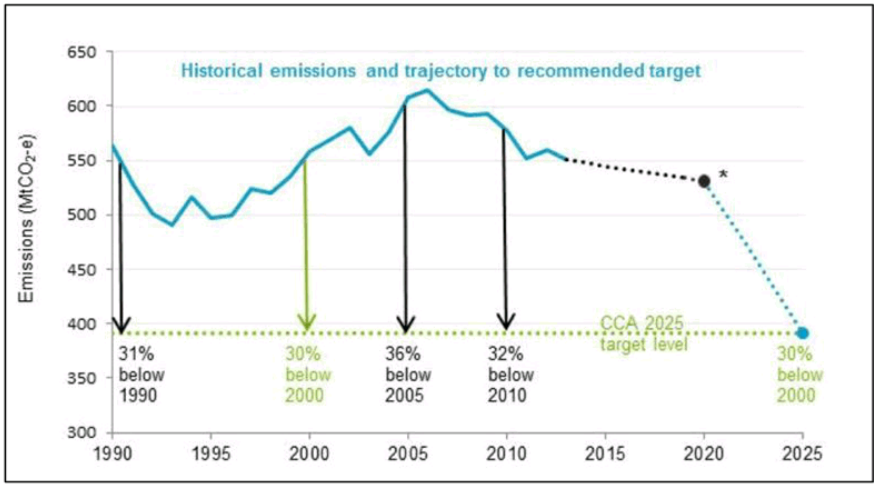

Figure 1: Historical emissions and trajectory to recommended target

Source: CCA 2015, Final Report on Australia's Future Emissions Reduction Targets, https://goo.gl/s4CYvb

2.3 Municipal Carbon Budget

In determining a municipal budget for greenhouse gas emissions, there are again a number of methodologies that can be employed. Most simply, it is possible to divide the national carbon budget according to population so that a municipality with a bigger population would be given a larger budget than a smaller municipality. However, this neglects a number of important factors that influence a municipality's ability to reduce emissions.

In developing a science-based target for Wollongong, Ironbark has applied the following considerations:

1. Australia's current carbon budget at September 2018 is calculated as 7.26 Gt CO_2 -e. This is the CCA's national carbon budget minus all emissions that have occurred since the budget was derived, per the National Greenhouse Gas Inventory.
2. The carbon budget is adjusted to account for the sources considered in Wollongong's community emissions profile (stationary energy, transport, agriculture, solid waste and wastewater). This is done by applying the proportions of each sector from the most recent National Greenhouse Gas Inventory.
    - This means that sectors which have not yet been modelled (land use change and forestry, industrial processes and product use) are not included in the budget, but can easily be added as the data become available.
3. This adjusted national carbon budget is then scaled down to the municipal-level based on the percentage of emissions for the included sector that occurred in Wollongong according to the most recent data.

2.4 Scaling the Budget

Once a total carbon budget for Wollongong was calculated, further scaling factors are applied. This is to ensure the allocation of budgets across Australian municipalities is fair and provides the greatest chance of success.

2.4.1 SEIFA Scaling

The municipal carbon budget is scaled to account for socio-economic differences using the Socio-Economic Index for Areas (SEIFA) as follows:

- Municipalities with a higher than average SEIFA score are allocated a larger share of the national carbon budget.
- Municipalities with a lower than average SEIFA score are allocated a smaller share of the national carbon budget.
- This allows us to account for the fact that councils with a highly disadvantaged community are expected to find it more difficult to reduce emissions.

2.4.2 Scaling for Growth

The municipal carbon budget is then scaled to account for projected population growth as follows:

- Municipalities with a higher than average growth rate are allocated a larger share of the national carbon budget.
- Municipalities with a lower growth rate are allocated a smaller share of the national carbon budget.
- This accounts for the fact that councils experiencing higher growth rates are expected to find it more difficult to reduce emissions.

3. Targets

3.1 Science-Derived Target for Wollongong

In October 2018 Wollongong's science-derived target was calculated by Ironbark. The outcomes are in Table 1.

Table 1: Scaled science-derived target for Wollongong, as calculated in October 2018

Remaining budget for Wollongong (kt CO_2-e)	49,185
Remaining years without change (years)	18.2
Required linear annual reduction (t CO2-e)	74,251
Required linear rate of reduction (p.a.)	2.7%

The *Remaining budget* for Wollongong is 49,815 kt CO2-e.

The *Remaining years without change* (18.2 years) calculates how long this carbon budget would last, based on the emissions released in the 2017/18 financial year.

The *Required annual reduction* and *Required rate of reduction* shows that Wollongong's emissions need to reduce by 74 kt CO2-e (2.7%) per year until 2050, if the carbon budget is to be used in a linear fashion over this time period. To give an idea of the scale of action required, Sunshine Coast Council's 15MW solar farm has saved just under 30 kt CO2-e in the 1.5 years since its installation.

When re-calculated in 2019, the remaining budget in tCO_2-e had changed. This is due to reductions in the overall budget available based on emissions released nationally drawing from the Australian carbon budget. It is also because of changes to data sources, data sets and methodologies. Ironbark is committed to ensuring methods are regularly updated to remain in line with best practice and to utilise the more relevant, accurate and transparent data available. These changes applied to all muncipalities.

Whilst the numbers for the carbon budget are quite different, the remaining years without change and % reduction required are similar. This is because the updates that have been applied to the calculation of the science-derived target also apply to the calculation of the Wollongong community emissions profile.

4. Next Steps

4.1 How to Use a Science-derived Target

The methodology that Ironbark uses to develop science-derived targets has been designed to allow all municipalities the greatest possibility of success. Whilst the targets are challenging, they are targets that *must* be met in order to avoid catastrophic climate change and represent the true scale of action that is required within each community. This target should not be considered aspirational, rather it should be considered essential to avoiding the negative effects on Wollongong's community, environment and economy.

Whilst understanding the necessity of meeting this target, it is also important to understand Council's level of accountability. Reducing greenhouse gas emissions must be a whole of community effort and actions taken by state and federal governments and emissions intensive industries will be key in ensuring Australia stays within its national carbon budget. Council may advocate for and support these actions or engage in collaborative planning with key stakeholders, but ultimately is not solely responsible for meeting the full municipal emissions target.

In engaging with stakeholders, it is important that the communication of the science-derived target is undertaken strategically. Whilst aspirational targets have been used to educate and motivate for many years, the science-derived target can be most useful as a tool for climate planning and understanding relevant carbon budgets and timeframes.

4.2 Monitoring a Science-derived Target

Historically, success in achieving action towards targets may have been measured by the reduction of a municipal greenhouse gas profile. However, this is not the approach that we currently recommend, due to the potential fluctuation of the emissions profile related to factors entirely outside of Council's influence, such as the state electricity emissions factor. Instead, targeted monitoring on specific greenhouse gas mitigation activities can provide Council with a measure of success in the effectiveness of programs and greenhouse gas emissions reductions.

4.3 Action Planning for Community Emissions Mitigation

The community emissions profile previously developed by Ironbark Sustainability for Wollongong, coupled with the science-derived target presented in this report are important tools for climate planning. Used together, they allow Council to understand the scale of the impact of their municipality, the breakdown of sectors responsible for the emissions and the magnitude of the reductions needed. They provide the necessary foundation that advances and

enables Council to engage specific sectors or stakeholders in actions to reduce emissions and develop a plan to reduce emissions.

When considering community emissions mitigation against a science-derived target, it is clear that the scale of reductions required is exceptionally high. For this reason, it's important for Council to carefully consider how best to leverage resources. Most often, direct action by Council will not be the most efficient way towards achieving the target. However, there are a number of ways that Council can engage and work with stakeholders and other levels of government to facilitate the required emissions reductions.

In Ironbark's experience, there are twelve key interventions that councils can employ to support the reduction of community emissions. These are:

1. Administration and strategy
2. Advocacy
3. Development of new policy or regulation
4. Education
5. Facilitation
6. Monitoring and reporting
7. New implementation of policy or regulation
8. Performance or supply contracting
9. Provision of incentive schemes or grants
10. Provision of loan schemes
11. Purchase and deployment
12. Strategic planning

4.3.1 Ironbark's Community Action Planning Tool

Ironbark has developed a Community Action Planning Tool (CAPT), which allows us to develop a list of actions that will target a specific emissions source and sector. CAPT is a natural extension to the work we have been doing to develop community emissions profiles and provides a more complete solution to the community-scale carbon management system. CAPT is capable of:

- Calculating the best action list for a specific municipality, down to the estimated spend (or in reverse, if councils have a predetermined budget, CAPT will be able to estimate how much abatement can be achieved)
- Representing uncertainty of outcome, a critical component for mutually aggregate actions that can have either a guaranteed outcome (such as installing solar on councils' own assets) to ones that cannot be certain at all (such as advocacy for closing down coal power plants). This uncertainty is represented in a "descending confidence" table, that maps the amount of carbon a program will mitigate against the probability of achieving success.

- Grouping of all identified activities into "actions", which are activities that actively reduce emissions, and "interventions", which are activities that a stakeholder undertakes to effect the action. Examples of an action is "install EV charging infrastructure in public-accessible locations", and corresponding interventions may be "finance and deploy", and "facilitation".

CAPT is specifically designed for councils, and our intent is for the tool to quantify all the interventions currently being planned or implemented by councils across Australia. As we expand this resource, more and more of the initiatives we are seeing across the country will be available for objective comparison and application to your municipality. Please get in touch to find out more about how to be involved.

4.4 Further Resources

The following resources may also be useful in developing and assessing actions for Wollongong's community emissions mitigation planning:

- The Rocky Mountain Institute's website (www.rmi.org) has a number of useful resources, including The Carbon-Free City Handbook (2007), which reveals 22 actions and associated resources for cities globally to move toward climate-neutrality and see results within a year.
- The World Bank's CURB Tool is an interactive tool that is designed to help cities take action on climate by mapping out different action plans and evaluating their cost, feasibility, and impact. See https://bit.ly/1SeZoS2.
- Beyond Zero Emissions is an Australian think tank that has a number of publications covering municipal-wide emissions reduction solutions (https://bit.ly/2QDcoWz), as well as a Local Government Climate Review (2018).
- Energy Innovation LLC (www.energyinnovation.org) is an energy and environmental policy firm based in the United States with a number of useful resources on designing carbon solutions. Among other things, they have developed free online computer model to help design packages of policies to reduce carbon emissions (https://www.energypolicy.solutions/). Although it is not yet pre-populated with Australian data, the model provides a good visualization of key policy settings and their impacts in other regions like the US and Canada.
- The Global Covenant of Mayors is beginning to collate data on emissions, targets and actions at: https://www.globalcovenantofmayors.org/global-covenant-cities-data

Attachment 2: Australian GCoM Councils Emissions Reduction Targets

Council	Emissions Reduction Target
ACT	Net zero emissions by 2045
Adelaide	Matching state target of zero net emissions by 2050
Byron	30% by 2020
Darebin	Carbon neutral by 2020
Glen Eira	Net zero emissions from the community by 2050 Net zero emissions from council operations by 2030
Hobart	Zero net carbon emissions by 2020
Hobsons Bay	Zero net greenhouse gas emissions by 2020 Zero net emissions community by 2030
Joondalup	Corporate target: Reduce net greenhouse gas emissions by 5% per capita below 2012/13 emissions by 2018/19
Mandurah	Carbon neutral 2020
Manningham	Council: 100% carbon neutral by 2020 Community: 20% GHG reductions
Maribyrnong	No target found
Melbourne	Zero net emissions by 2020
Melton (Australia)	Zero net emissions from council operations by 2025
Melville (Australia)	48% emission reduction from council operations by 2025
Moreland	Zero carbon community by 2040
Mornington Peninsula Shire (Australia)	Zero net carbon emissions for council operations by 2021 Minimum community greenhouse gas emission reductions target of 2.9% annually
Mount Barker (Australia)	No target found
Newcastle (Australia)	30% carbon footprint reduction by 2020 for council operations 30% reduction in per capita carbon emissions below 2008 levels
Penrith	40% reduction in greenhouse gas emissions by 2030
Perth (Australia)	Reduce City of Perth operational emissions by 30% by 2030 Work with the community to achieve 30% reduction in city-wide GHG emissions by 2030
Port Phillip (Australia)	Zero net council carbon emissions by 2020 50% reduction in per capita community carbon emissions by 2020
Sydney	Net zero emissions by 2050
Tweed Shire (Australia)	The goal of reducing corporate greenhouse gas emissions to 20% below 1996 levels by 2010 The goal of reducing community greenhouse gas emissions per capita to 20% below 1996 levels by 2010.
Wyndham (Australia)	Reduce councils corporate GHG emissions by 12% by 2020 Reduce councils corporate GHG emissions by 95% by 2040 At least 55 000 tonnes of GHG emissions avoided from residential and business sectors by 2020 Zero net GHG emissions from electricity use by 2040
Yarra	No target found