Ironbark Sustainability

Shire of Strathbogie

Science-Derived Targets for Greenhouse Gas Emissions

Prepared for
Shire of Strathbogie

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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.

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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 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 July 2018, 7.5 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.

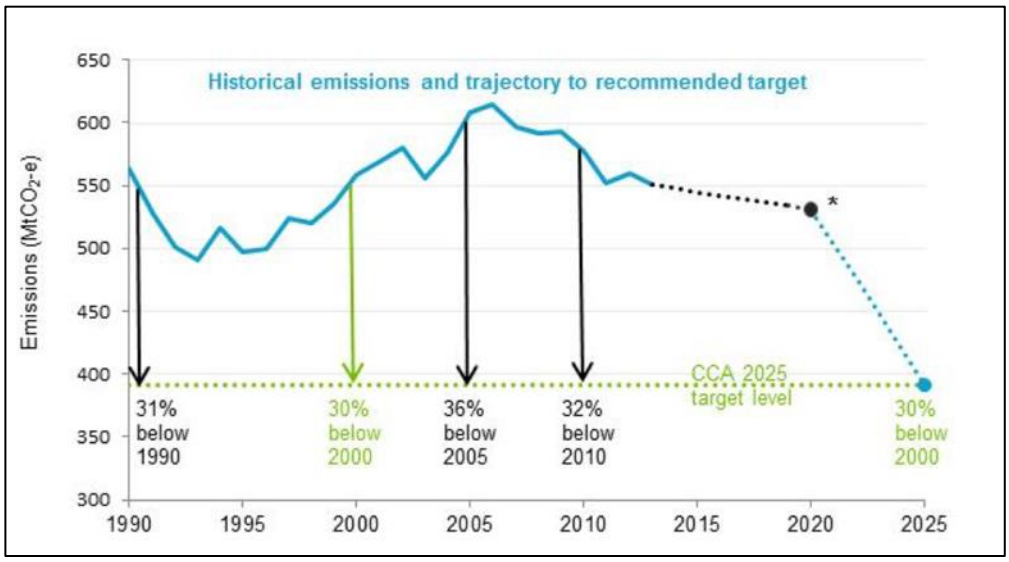

Figure 1: Historical emissions and trajectory to recommended target

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 Shire of Strathbogie, Ironbark has applied the following considerations:

1. Australia's current carbon budget at July 2018 is calculated as 7.5 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 Strathbogie Shire'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 Strathbogie Shire according to the most recent data.

2.4 Scaling the Budget

Once a total carbon budget for Strathbogie Shire 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 (based on normalised growth rates for all Australian municipalities between 2011 and 2016) 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 Strathbogie Shire

The calculated science-derived target for Strathbogie Shire is provided in Table 1.

Table 1: Scaled target for Strathbogie Shire

Remaining budget for Strathbogie Shire (kt CO_2-e)	7,292.6
Remaining years without change (years)	16.3
Required linear rate of reduction (p.a.)	3.1%
Required linear annual reduction (kt CO_2-e)	13.8

The *Remaining budget* for Strathbogie Shire is 7,292 kt CO_2-e.

The *Remaining years without change* (16 years) calculates how long this carbon budget would last, based on the emissions released in 2017/18.

The *Required annual reduction* and *Required rate of reduction* shows that Strathbogie Shire's emissions need to reduce by 14 kt CO_2-e (3.1%) per year until 2050, if the carbon budget is to be used linearly over this time period. To give an idea of the scale of action required, this is equivalent to taking round 3,200 medium-sized petrol fuelled cars off the road each year. Looking at larger scale interventions, Sunshine Coast Council's 15MW solar farm has saved just under 30 kt CO_2-e in the 1.5 years since its installation.

3.2 Solar Equivalent

To better understand the scale of action required to achieve the science-derived target, it can be represented in solar equivalent. The solar equivalent is a measure of how much solar needs to be installed per year to meet the target, based on assumptions around the expected annual solar output of an average system per kW installed in Victoria. We provide both the amount of kW of solar needed and the expected number of 5kW systems. It is important to note that, whilst installing solar is a great way to reduce emissions, the level of opportunity in Strathbogie Shire for achieving the science-derived target using residential solar installations has not been assessed and there are a range of other interventions that can also help the Strathbogie community reach its science-derived target. The available opportunity for solar installations depends on factors such as the number of houses with appropriate roof-space, the number of houses that already have solar panels installed, and the total amount of emissions generated from appropriate houses.

Table 2 shows the science-derived target in equivalent solar installations.

Table 2: Solar equivalent of the science-derived target

New installations of solar equivalent (kW/year)	8,871
Number of solar systems (5kW) needed to be installed / year	1,774
Cost of direct action/year ($M)	$ 9.8

This description of the target shows the need for shared responsibility and investment in reaching the target. Council is not wholly responsible for achieving the community science-derived target and does not need to be spending $10 million per year to do so! Instead, Council can seek avenues to leverage investment through a variety of interventions, collaborate with key stakeholders and thus facilitate action, rather than directly implementing it.

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 Strathbogie Shire'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 done 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 Strathbogie Shire, 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 Strathbogie Shire'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. http://www.worldbank.org/en/topic/urbandevelopment/brief/the-curb-tool-climate-action-for-urban-sustainability
- Beyond Zero Emissions is an Australian think tank that has a number of publications covering municipal-wide emissions reduction solutions (http://www.bze.org.au/bze-publications-overview/), 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.