Ironbark Sustainability

Everything You Wanted to Know About Community Emissions Reduction Targets

Science Derived Targets, Carbon Budgets, the Difference Between the "2°C" and "1.5°C" Targets and Recommendations for Australian Councils

Prepared for
Australian Councils

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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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Since 2016, dozens of Australian councils have developed municipal science-derived targets or carbon budgets. During recent projects, many councils have queried the "2°C target" rather than "1.5°C target" and why one is favoured over the other.

As global emissions continue to rise, the calculated likelihood of remaining within the budget aligned with a global target of 1.5°C becomes increasingly low. In fact, in October 2018, the IPCC announced that there were no longer any scenarios for remaining within the temperature increase-range of 1.5°C without the use of carbon removal technologies[1].

However, it's not as simple as that.

While a council can indeed model the 1.5°C target, the methodologies used to model a carbon budget based on the 1.5°C target are more contested and the modelling is not likely to be as robust as the widely-accepted 2°C target carbon budget. This limits the ability to compare across regions and presents challenges around the allocation of budget.

This document provides background information on the concept and development of "science-derived targets" that are aligned with the Paris Climate Agreement adopted in December 2015 at the United Nations Climate Change Conference, also known as "Conference of the Parties" or "COP".

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping the global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C.

The purpose of this document is to explain a very complex process – the development and allocation of international carbon budgets – in simple terms and outline how they apply to Australian councils.

This report is not about advocating for or recommending that councils in Australia adopt science-derived targets (or a carbon budgeting approach) to target setting. Local government decisions around, resourcing of and ability to tackle climate change is a dynamic product of community and political support, internal and external policy settings, resourcing, capacity and political will. Publicly setting science-derived targets may not be for every council.

What this document explains is what "setting targets in line with the science" means and how councils in Australia and internationally are calculating targets. It requires adherence to the Intergovernmental Panel on Climate Change (IPCC) which, in itself, is increasingly contested and politicised. However, if you are seeking to set a target in line with the science of the IPCC and the Paris Agreement then this is how you do it.

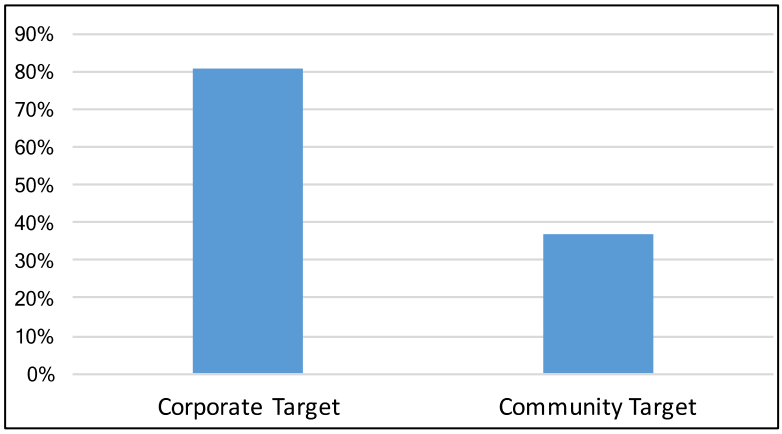
[1] Note that in this report the terms "2°C target" and "1.5°C target" refer to "limiting the increase in the global average temperature to well below 2°C above pre-industrial levels" and "pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels". As you'll see from the information in this report, this is where it gets a little confusing and contested because the terms "limiting the increase" and "pursuing efforts" are considered important and impact on the likelihood of success. It means we're not always comparing "apples with apples".

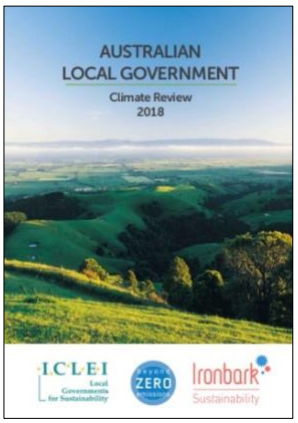
2. Australian Councils and Emissions Reduction Targets

In 2008, at the height of ICLEI Oceania's Cities for Climate Protection (CCP) program, 240 councils around Australia, representing 84% of the population, had community[2] emissions reduction targets that had been passed as a council resolution. Most targets were aligned with the Kyoto agreement and were considered "aspirational". When funding for CPP was removed in 2009, the program ground to a halt and councils rarely went back to check whether targets had been met. Setting community targets became less common from 2010 onwards.

2.1 Status of Community Targets

According to the Australia-wide survey and Local Government Review developed by Ironbark Sustainability, Beyond Zero Emissions and ICLEI Oceania in 2018, under 40% of councils had community targets[3].





We're seeing this number grow again, as more councils declare climate emergencies, have access to robust commissions profile data through Snapshot[4], and are required to set targets through programs such as Global Covenant of Mayors for Climate and Energy[5].

[2] When we refer to "community emissions" and "community targets", this refers to the broader community emissions, also known as "external", "city-wide" or "municipal-wide emissions" and targets. This is different from councils' corporate emissions and targets, which relates to councils' operations only – sometimes known as "internal".
[3] Based on a survey of 129 councils around Australia and research of every council's website and public commitments. Download the full report here.
[4] See Snapshot Climate tool.
[5] See Global Covenant of Mayors for Climate and Energy.

2.2 The Role of Targets

Science-derived targets for reducing greenhouse gas emissions at the community level have typically had a prominent role in community action planning processes. It is useful, then, to understand the role and application of targets.

There are different reasons councils set targets, and different issues that need to be taken into consideration. For example, targets can be used to:

- Provide vital context for action plans
- Focus efforts and resourcing on finding the best and most efficient route to reach the target
- Motivate a group of stakeholders to achieve a particular outcome
- Unify action, providing a common dialog about definitions of success
- Asses the efficacy of a program or action
- Provide a hard limit on what needs to be achieved
- Establishing a minimum performance requirement of any action taken
- Provide guidance on the projected impact of action plans, and to assess their impact

Depending on the rationale for setting a target and what you're trying to achieve, different types of targets (science-derived, aspirational, action-plan based) may be appropriate.

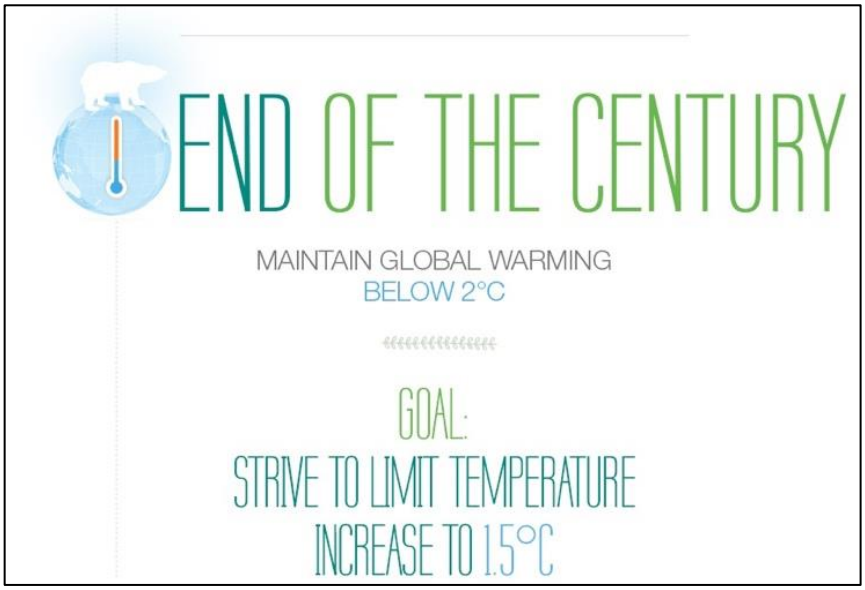
2.3 The Paris Agreement, IPCC and "Science-Derived" Targets

Since the adoption of the Paris Agreement and subsequent ratification in November 2016, there have been ongoing discussions in scientific communities and the climate sector around whether the over-arching targets are strong enough to ensure the best chance of avoiding catastrophic climate change. While these issues will continue to be discussed and presented at future COPs, it is clear that the central aim of the Paris Agreement is to hold "*the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels*"[6]. Therefore, in international and national discussions and plans to tackle climate change, it is generally accepted that "well below 2°C" is the central target.

Modelling around national targets (known as Nationally Determined Contributions or NDCs) centre around this 2°C figure using language filtered through from the Paris Agreement, international carbon budgets developed through the Intergovernmental Panel on Climate Change (IPCC) and local modelling such as that undertaken by the Climate Chance Authority (CCA) in Australia in 2013. For better or worse, this means that the 1.5°C target is widely interpreted as the aspirational or stretch target, or a target to "strive" for.

[6] See full Paris Agreement here.

The science-derived targets developed by Ironbark are based on Australia's carbon budget first established by the CCA in 2013[7]. This is considered the most robust and accepted Australian carbon budget as it aligns with the Paris Agreement to limit global warming to the internationally agreed target. This carbon budget (originally 10.1 GT CO_2-e) is based on keeping the increase in the global average temperature to well below 2°C above pre-industrial levels.



The CCA only developed a carbon budget based on the "well below 2°C" target. An official national budget from the CCA based on the 1.5°C target has never been developed, which is why it has so far been widely accepted that the 10.1 GT CO_2-e figure, linked back to Australia's formal ratification of the Paris Agreement, and thus the scientific analysis of the IPCC, is considered the carbon budget to use in the development of science-derived targets.

It is possible to model a carbon budget based on the 1.5°C target but it is not a simple extrapolation and there are other factors that need to be considered when undertaking such modelling. There is a higher level of uncertainty, it is not linked to the generally-accepted national or international budget, the probability of keeping the temperature increase under the threshold is different and there is more disagreement as to how to model this target. Some reputable stakeholders make the case that there is no budget left for the 1.5°C target. Others, just as reputable, state that there is budget left[8].

Given this contested space, making sweeping statements is problematic. You can't just develop a 1.5°C target or carbon budget for limiting temperature increase to 1.5°C and be done with it. Or if you want to challenge the concept of a 1.5°C target and how it fits, just be aware there a lot of scientific and analytical minds who disagree with you.

[7] See page 50, Reducing Australia's Greenhouse Gas Emissions – Targets and Progress Review, Final Report, February 2014.
[8] See for example a small selection at Climate Reality Check, Carbon Brief, the Carbon Clock project, the University of Oxford, the World Meteorological Organisation, Global Carbon Project, Future Earth, UN Environment Program, the ANU and the leader of the Australian Greens. These examples are not provided for detailed critique or discussion but to demonstrate that it is not as simple as determining a budget in isolation.

With this uncertainty, it also makes it more challenging to compare across councils, regions and states. While this may not seem like a problem in isolation to a project it is worth remembering that the concept of carbon budgets and in turn science-derived targets relies on consistency across sectors, municipalities and nations. If one council's methodology results in a claim of a larger carbon budget then this must mean that another council or councils must have a smaller budget. It's the same with nations. The original global carbon budget for 2000-2050 was 1,701 Gt CO_2-e. If one nation claims a greater share of emissions, then others must claim less for the international community to stay within the 1,701 Gt CO_2-e budget.

A unified local government approach to the modelling and attribution of the budget is critical. Otherwise the total of every Australian council's carbon budget will not add up to the national total.

2.4 Adopting and Advocating for a 1.5°C Target

Many councils have recently advocated to the Victorian State Government to adopt the 1.5°C target. This is based on the interpretation of regional and global impacts of an increase of "well below 2°C" being an unacceptable risk to councils and communities and an acknowledgement of the role Victoria, and indeed Australia, can play as a well-resourced developed nation in reducing emissions.

Adopting a 1.5°C target is possible, and indeed climate science tells us that warming beyond 1.5°C threshold is likely to have increasingly severe social, economic and environmental impacts, not least on a water scarce continent like Australia. However, there are additional challenges in the modelling and communication of this target.

In October 2018, the IPCC announced that there were no longer any scenarios for remaining within the temperature increase-range of 1.5°C without the use of carbon removal technologies[9]. This means that as global emissions continue to rise and the calculated likelihood of remaining within this budget is very low, it has been deemed not possible to achieve without the development and deployment of carbon removal or draw-down technology.

The Victorian State Government released a study paper in 2019 that identified a target of 1.5°C that does **not** require the use of draw-down technologies[10]. However, to achieve this, the analysis looks at a budget with an estimated 50% probability of staying below the temperature target, rather than the 66%+ probability used in the IPCC figure for the 2°C target. If the same probability had been used in the Victorian analysis, according to some analysis, the budget would have been exhausted several months after the paper was published (i.e. around September 2019).

While there are specific draw-down technologies and activities that are available throughout Australia, there are limited reliable peer-reviewed data to accurately model the potential success of the necessary suite of future carbon draw-down initiatives. It is possible to model

[9] IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]

[10] See https://engage.vic.gov.au/climate-change-targets-2021-2030

emissions reductions interventions and activities to reduce emissions to – or near to – zero in many regions of Australia using existing and economically feasible technology. But it is not possible to accurately measure the suite of draw-down technologies, including those available today (such as tree planting or biochar production) and those that are not technologically or economically feasible (such as geoengineering or Solar Radiation Management).

There are risks involved in relying on unproven drawdown technologies from a communications or behaviour change perspective as some stakeholders use this to abrogate their responsibility to reduce emissions. This is not to say it should not be investigated, just that councils and other stakeholders need to be aware of the limitations.

As relevant data becomes available, an assessment of greenhouse gas reductions that could be achieved through carbon draw-down initiatives may be appropriate. Councils may also advocate for the development of large-scale carbon removal technologies on a state and national government level and investment into research and development. Councils should continue to review their climate change programs and advocacy efforts based on future development of local and regional carbon drawdown initiatives and feasible large-scale technologies to contribute towards the regional target of 1.5°C. The table (Table 1) below summarises the current differences between 1.5°C and 2.0°C degree targets.

Table 1: Summary of 1.5°C vs 2.0°C Targets

Regional Target	**Linked to generally-accepted budget nationally and internationally**	**Probability of keeping temperature increase under threshold (without drawdown technology)**	**Level of uncertainty**	**Type of target**	**Need for drawdown technology**
2.0°C	Yes	66%	Medium	Science-derived	Less likely
1.5°C	No	50%	High	Aspirational	More likely

3. Emission Reduction Targets Explained

The Paris Agreement, entered into force on 4 November 2016 and signed by the Australian Government, explicitly recognises and engages local and subnational governments and their critical role in supporting the drive to keep any temperature rise "well below 2°C", and to strive to keep warming below 1.5°C above pre-industrial levels.

Setting targets and aligning strategies to those targets are generally seen as an important component of councils' roles in this space. However, there are a number of ways this can be done. Here, we consider aspirational targets, science-derived targets (top-down) and action-plan based targets (bottom-up). It is important to note that each of these targets has a role to play in a council's climate planning and to understand how they interact.

3.1 Aspirational Targets

The *Aspirational Target* has traditionally been 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, motivate stakeholders and provide a common dialog about definitions of success. It can be set with less understanding of problem, simplifying program inception.

Arguably, the majority of Australian local government targets over the last few decades could be classified as "aspirational" as they are not directly linked to an external requirement – a science-derived target – and they are not constructed based on action to take place. An example of this type of target is, "We will achieve a 25% carbon emissions reduction by 2025".

> *In the non-climate space, we can use the analogy of the safe levels of mercury in drinking water. The maximum containment level for mercury is 2 parts per billion. An analogous aspirational target for safe levels of mercury could be "by 2030 the levels of mercury in our water supply will be zero". This target is not directly connected to an external requirement, nor it is connected to a specific plan.*

3.2 Science-Derived Targets (top-down)

The *Science-Derived Target* is determined from an external requirement or independent research (commonly 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.

> *In the non-climate space, using the analogy above is straight-forward. The target will be, "the level of mercury in our water supply will be under 2 parts per billion."*

Science-derived targets provide a hard limit on what needs to be achieved. The target is there regardless of what the stakeholders may advocate for or commit to. Using the example of mercury in the water, this target exists whether a community sets it or not – if mercury levels breach the 2 ppb levels then people will get sick.

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 generally 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.

There is of course a wealth of recent knowledge to suggest that a target related to a 2°C increase is not an acceptable risk to avoid the effects of catastrophic climate change. Indeed, the Paris Agreement aims to "*pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels".* At the time that the Paris Agreement was drafted in 2016, this was the *aspirational* target. The nomenclature of "aspirational" in this context may seem confusing to Australian councils who have traditionally set "aspirational" targets that had no scientific basis to them whatsoever (for example the standard "reduce emissions by 20% by 2020"). Whereas in the context of the Paris Agreement, the "1.5°C target" is considered ambitious and is still connected to the science of the IPCC.

Adopting a 1.5°C target can therefore still be considered a "science-derived" target, but the underlying methodology is not as robust as the Paris Agreement's central 2°C target due to the nature of the calculation of the carbon budgets from the IPCC and how this filters through to national carbon budgets and targets. There are also issues around the probability or likelihood of success (66.7% versus 50%). The key is to be clear and transparent in the calculation and limitations.

Of course, there are alternative and credible views that the IPCC modelling is too conservative and that things are so dire that a carbon budgeting approach will not work[11].

Our view is that there is a place for science-derived targets in outlining the *upper limit* of carbon that can be emitted in a non-politicised way, by relying on internationally recognised modelling reached by scientific consensus. Understanding how long is left before this budget runs out, if emissions continue at current rates, is a valuable tool for understanding how perilous and urgent the situation is.

It should be understood, of course, that this must be seen as an upper limit – we should be striving not just to meet these targets, but to exceed them.

3.3 Action-Plan Based Targets (bottom-up)

The *Action-Plan Based Target* is one that is constructed from what can be achieved by the actions being considered in a council's action plan. It can be ambitious; however, its scope is directly derived from planned actions. For example, a council's action-plan based target would

[11] See for example the aforementioned Climate Reality Check 2020, and expert analysis and reports from Science Daily, Michael Mann and Mario Molina, Veerabhadran Ramanathan and Durwood J. Zaelke. This is not intended to be exhaustive or representative of the prevailing opinion, just to demonstrate that the consensus IPCC views are also contested.

say that "by funding the planned range of solar, electric vehicles, waste diversion and PPA projects we will reduce our emissions by 36.3% by 2025".

> *In the non-climate space and using the analogy above, an action-plan based target could be, "our mercury reduction strategies will reduce levels of mercury in the water to 0.78 ppb by 2025.*

An Action-Plan Based Target provide guidance on the projected impact of action plans. It can be used to assess the efficacy of a program or action and provide guidance and motivation to those directly involved in a program.

3.4 Australian Councils and Targets

For the purpose of council target-setting, it is proposed that the following targets are used:

Table 2: Targets and Uses

Target	Use
Science-Derived Target	Regardless of aspiration or preference, this is the internationally agreed and pre-established limit aligned with the Paris Agreement and IPCC science. There is still ongoing discussion in the climate and scientific communities about whether a 2° increase is sufficient to avoid catastrophic climate change given the likely negative impacts at that level but generally the 2°C target is considered in line with the science. Both the 1.5°C and 2°C carbon budgets can be modelled so it could be acceptable to say both are "science-derived". However, the methodologies for the 1.5°C target are more contested and the modelling likely to not be as robust as the widely accepted 2°C target carbon budget. This limits the ability to compare across regions and presents challenges around the allocation of budgets, so it is important that assumptions, sources and methodology are transparently communicated to stakeholders.
Aspirational Target	The language of the Paris Agreement refers to the 1.5°C target as something to *pursue* or *strive for*. Traditionally, this would have been referred to as an "aspirational target" as it is more ambitious than the central Paris Agreement 2°C target. This is the language that most international stakeholders refer to - an aspirational target should be more ambitious than the central target. It is being debated in the Australian local government context whether the 1.5°C target should be considered "aspirational" as defined by international stakeholders. Many Australian local government stakeholders and the broader climate movement suggest that the 1.5°C target is in line with a safe climate and anything less ambitious than this, for example the 2°C target, is not enough - especially given Australia's standing as a wealthy nation. This can be reasonably argued; however, it may easily lead to confusion and is not in line with the standard understanding of targets and carbon budgets globally. There is a defensible case that the 1.5°C target shouldn't be considered "aspirational" but is what we need to achieve as a minimum to have the best chance of avoiding dangerous climate change. However, it is important to understand that the view that the 1.5°C target is "aspirational" is more widely accepted internationally. Under some scenarios and analyses we have already overshot the 1.5°C target so suggesting this is the "minimum we need to

	achieve" may be counter-intuitive to some stakeholders if it is – according to some of the scientific analysis – unachievable.
Action Plan Target	This will be the predicted impact of a council's climate action or intervention. This should be measured against the science-derived target to understand the contribution towards achieving this target. It is possible that the predicted impact of the action plan will fall short of the science-derived targets, because action-plan based targets require input from community stakeholders, industry and other levels of government in order to be achieved.

4. Methodology

4.1 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. This was accepted by the global community at the time as 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 at least 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 what was considered a relatively safe and manageable 2°C. The accepted global carbon budget established by the IPCC in 2013 was 1,701 Gt CO_2-e for the period 2000-2050.

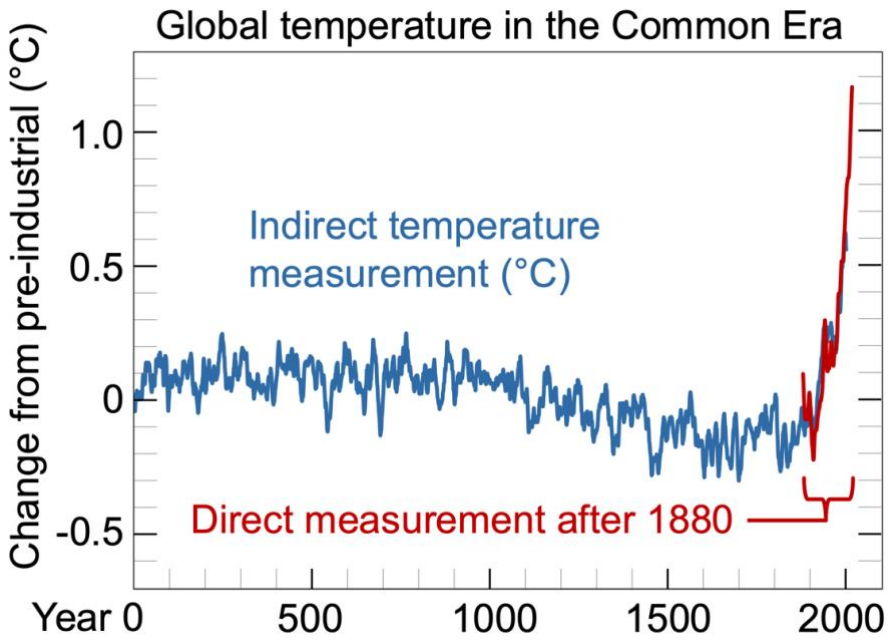


Figure 1: Global temperature changes from pre-industrial levels[12]

Since the ratification of the Paris Agreement, emissions have continued to be released and the temperature has continued to rise. The IPCC reports that as of 2017, the global carbon budget is being depleted by around 42Gt CO_2-e per year. The remaining carbon budget for a 1.5°C scenario was 420Gt CO_2-e (66% probability). This means that this global budget will be depleted by 2027. As global emissions continue to rise and the calculated likelihood of remaining within this budget is very low, it has been deemed not possible to achieve without the development and deployment of carbon capture and removal technologies.

[12] Neukom, Raphael; Barboza, Luis A.; Erb, Michael P.; Shi, Feng; et al. 2019, Consistent multidecadal variability in global temperature reconstructions and simulations over the Common Era, Nature Geoscience. 12 (8): 643–649.

4.2 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. The Climate Change Authority has calculated Australia's carbon budget based on a 2°C limit, with the following justification:

> *On balance, the Authority considers that a global budget based on 2°C is appropriate. […] It is clearly in Australia's national interest to support a global response to climate change that limits warming to below 2°C. While greater international action is necessary to achieve this goal, it remains technically and economically feasible. If the level of global action required to limit warming to below 2°C … does not eventuate, Australia could reconsider its longer term goals in line with a less ambitious global budget.*
>
> *While limiting global warming to 1.5°C is clearly desirable from a climate change impacts perspective, scenarios consistent with 1.5°C rely even more strongly on large-scale implementation of negative emissions technology in the second half of this century. This reliance creates larger risks that the 1.5° target would not be met if such technologies prove infeasible. Again, this could be reviewed in light of changing circumstances when Australia considers its longer term goals.*
>
> *As emissions budgets express temperature outcomes in terms of probabilities, they inevitably include the chance that other temperature levels (besides 2°C) will be reached. Selecting an emissions budget with a lower probability of limiting warming to 2°C or less will increase the likelihood that higher global temperatures will be attained. By comparison, pathways that provide a 50 per cent or greater chance of limiting warming to 1.5°C share many of the same characteristics of 2°C pathways in the first half of this century (Rogelj 2013). This raises the possibility that a 2°C pathway could provide scope, with increased effort in future, to shift to a more ambitious 1.5°C pathway.*[13]

As at December 2020, 6.4 Gt CO_2-e of the CCA's national carbon 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

[13] Climate Change Authority 2014, Reducing Australia's Greenhouse Gas Emissions— Targets and Progress Review final Report, Australian Government, viewed 25 May 2020.

future greenhouse gas emissions reduction targets, the CCA recommends Australia commit to the following targets:

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

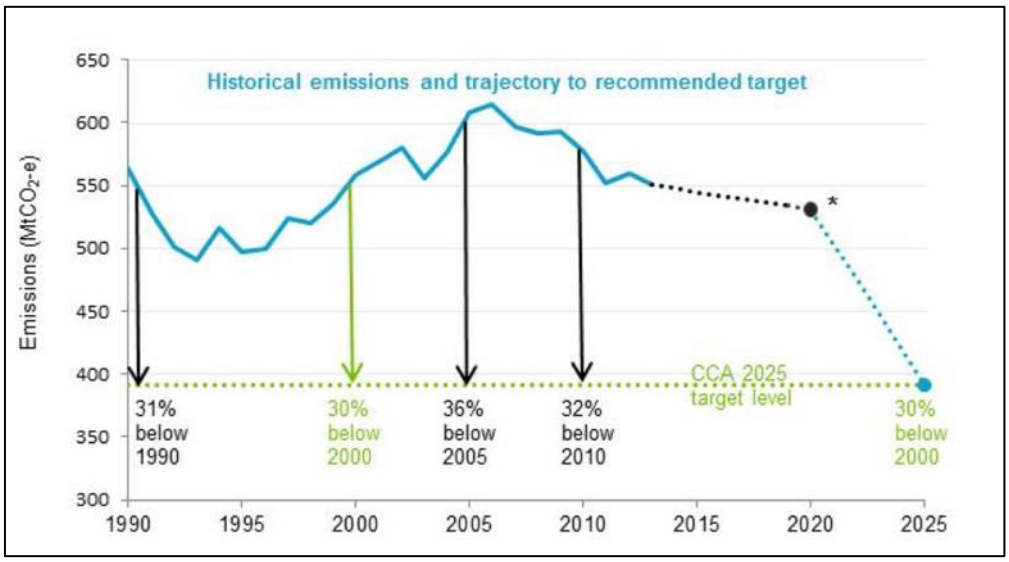


Figure 2: Australia's historical emissions and trajectory to recommended target[14]

4.3 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-derived target for councils, Ironbark applies the following considerations:

1. The CCA's national carbon budget is adjusted to the current year by subtracting all emissions that have occurred since the budget was derived, per the National Greenhouse Gas Inventory. As at March 2020, this figure is calculated as 3.7 Gt CO_2-e.
2. This carbon budget is adjusted to account for the sources that may not have been captured in through CCA processes. This it undertaken by applying the proportions of each emissions sector from the most recent National Greenhouse Gas Inventory.
3. The Australian carbon budget for the relevant sectors is then scaled down to the municipal-level based on the percentage of emissions for each sector that occurred in the region.

[14] CCA 2015, Final Report on Australia's Future Emissions Reduction Targets.

4. The municipal budget is scaled to account for the municipality's growth rate and socioeconomic factors, as discussed below.

4.4 Scaling the Budget

Once a total carbon budget for a council is 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.

4.4.1 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 lower than average SEIFA score (i.e. are experiencing more disadvantage) are allocated a larger share of the national carbon budget
- Municipalities with a higher than average SEIFA score (i.e. are experiencing less disadvantage) 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.

4.4.2 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.

The mathematical equations behind this modelling have been shared with members of the Science Derived Targets for Local Government Working Group. At a meeting on 7th June 2018, Ironbark's Matt Sullivan took stakeholders from NAGA, GBGA, EAGA, Darebin City Council, Penrith City Council, C40, ICLEI and Sustainability Victoria through the calculations and weighing of the scaling factors[15].

4.5 Municipal Carbon Budget for a 1.5°C Target

As discussed above, there is still ongoing discussion in the climate and scientific communities about whether a 2°C increase is sufficient to avoid catastrophic climate change given the likely

[15] Minutes and Communications from the SDT Working Group from June 2018, September 2018, March 2019, June 2019, September 2019 and September 2020 available on request.

negative impacts at that level. Both the 1.5°C and 2°C carbon budgets can be modelled but all limitations, assumptions, sources and methodology should be transparently communicated.

4.6 Monitoring a Science-Derived Target

Historically, success in meeting targets has 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 councils' influence, such as the state emissions factor.

Instead, targeted monitoring on specific greenhouse gas mitigation activities can provide councils with a measure of success in the effectiveness of programs and greenhouse gas emissions reductions.

5. Recommendations for Australian Councils

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 be considered essential to avoiding the negative effects to the community, environment and economy.

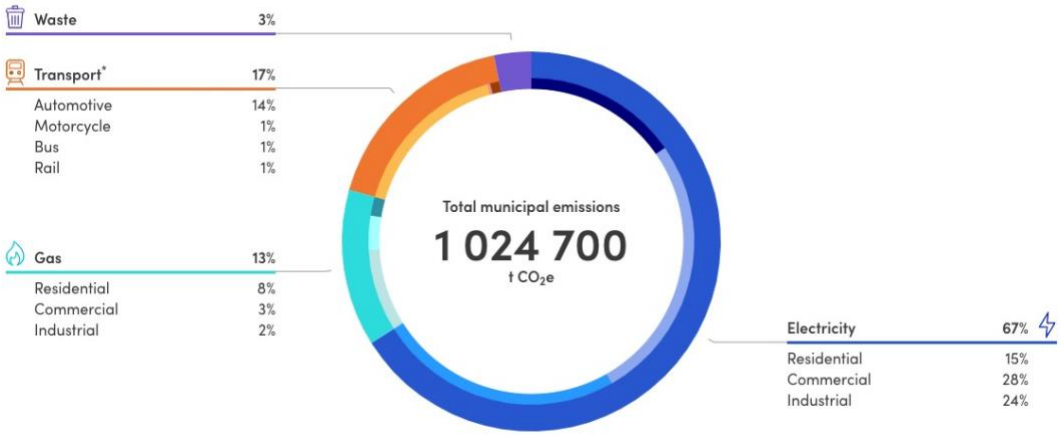


Figure 3: The main game is working out how to effectively, efficiently and urgently get these community emissions profiles (above) to zero[16]

Whilst understanding the necessity of meeting this target, it is also important to understand councils' 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 to 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.

5.1 How to Use a Science-Derived 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.

In undertaking the analysis to determine your council's carbon budget it is almost certain that the required rate of reduction of emissions will be faster and more challenging than current targets or proposed targets. For example, for many councils, it will demonstrate that the "science says" you need to get to zero in the next 8-12 years. While this can appear daunting it

[16] From Snapshot Climate Tool

is important to understand the scale and urgency of the challenge – and more **importantly the scale of the response required**.

It is also possible that the scale of the response required needs to be more ambitious than what even the more progressive and ambitious councils are proposing.

We recommend the following approach for Australian councils considering this approach:

- Undertake the analysis to understand what your council's carbon budget is – according to the science.
- Use this analysis and information to understand the urgency of the problem and discuss with key stakeholders how to resource the required response. These discussions should initially be undertaken with internal council stakeholders.
- You now have a budget and target that has been determined by external factors – the science of the IPCC and local data. You can choose to adopt or simply communicate this target but the key is that is a non-negotiable target. You don't get to choose what the science and evidence says – but you do get to decide how to respond and now have a science-derived understanding of the scale required when developing climate action plans and implementing action.
- Take this understanding into the action planning – the scale of action required, what you should be looking at, into the decision making and resourcing. Make sure other council stakeholders involved in decision-making understand the scale and urgency and present to them if required.
- Frame it as a **call to action and make it work for you**. From a carbon budget view, it depends on what you do in the next decade that will make all the difference, not what happens out to 2050.
- Use the science-derived target and carbon budget in the formal setting of a target. Overall, we **recommend councils do set community emission reduction targets**, although appreciate for some councils it is better to "fly under the radar" and just move onto action. For most, however, setting a target is appropriate and if you are setting a target it should be in line with the science. However, consider the communication and framing of the target and the language used to ensure you are also unifying action, providing a common dialogue around definitions of success and motivating stakeholders
- Be clear on the **line of accountability** in any public discourse. In the past, councils have been criticised for not meeting community wide targets, often because of the framing of the target. Borrowing from the fields of international and community development, it is important to communicate that the budget and target "is what is required according to the science" for your whole municipality, but it is not council's responsibility alone to meet the target. It requires support and action at all levels of the community, businesses and government. Recent climate emergency action plans are exceptional at making this differentiation clear

Finally, keep your eye on the main game. Setting a target and understanding the urgency and scale of what's required is important. More important is reduction of emissions and action. We conceptualise climate action planning as per the diagram below.

It is important to gain an insight to understand the key sources and sectors for emissions are, and then set a target aligned with the appropriate response.

These building blocks underpin effective strategy and action planning, and well-designed monitoring and evaluation allows councils to adapt their approach according to what is (and isn't) working.

Given the urgency and seriousness of the climate challenge, the main game is to be clear on the actions and pathways to emissions reductions that will be effective and efficient[17]. This involves considering how councils can increase emissions reductions beyond business-as-usual, scale-up ambitious interventions and ensure action planning is also based on clear evidence.

[17] See for example Evidence Based Action Planning background webinar.