BEFORE THE INDEPENDENT HEARINGS PANELS APPOINTED TO HEAR AND MAKE RECOMMENDATIONS ON SUBMISSIONS AND FURTHER SUBMISSIONS ON PROPOSED CHANGE 1 TO THE REGIONAL POLICY STATEMENT FOR THE WELLINGTON REGION

UNDER	the Resource Management Act 1991 (the Act)
	AND
IN THE MATTER	of Hearing of Submissions and Further Submissions on Proposed Change 1 to the Regional Policy Statement for the Wellington Region under Schedule 1 of the Act

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STATEMENT OF EVIDENCE OF GIJSBERTUS JACOBUS (JAKE) ROOS

ON BEHALF OF WELLINGTON REGIONAL COUNCIL

TECHNICAL EVIDENCE

HEARING STREAM 3 – CLIMATE CHANGE

7 AUGUST 2023

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INTRODUCTION

1 My full name is Gijsbertus Jacobus Roos, known as Jake Roos. I am Manager, Climate Change for Greater Wellington Regional Council.

2 I have prepared this statement of evidence on behalf of Wellington Regional Council (**the Council**) in respect of technical related matters arising from the submissions and further submissions on Proposed Change 1 to the Regional Policy Statement for the Wellington Region (**Change 1**).

3 Specifically, this statement of evidence relates to the issues and submission points addressed in the Section 42A Report: Climate Change – General, while also providing context for the Section 42A Reports for Climate Change – Agriculture; Energy, Waste and Industry; Transport; Climate-Resilience and Nature-Based Solutions; and Natural Hazards.

4 I am authorised to provide this evidence on behalf of the Council.

QUALIFICATIONS AND EXPERIENCE

5 I hold both a Bachelor of Science with Honours and a Master of Applied Science in Energy Management. My studies included the topics of physics, economics, resource management and environmental policy.

6 I have 22 years of professional experience in the fields of energy conservation and climate change mitigation, centred mainly in local government. I have overseen the development of climate change mitigation strategies, policies, and action plans for Uttlesford District Council (in England), Kāpiti Coast District Council and Wellington Regional Council, and provided input to others, including for Upper Hutt City Council and Nelson City Council.

CODE OF CONDUCT

7 I have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2023 (Part 9). I have complied with the Code of Conduct in preparing this evidence. My experience and qualifications are set out above. Except where I state I rely on the evidence of another person, I confirm that the issues addressed in this evidence are within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

SCOPE OF EVIDENCE

8 I provided advice to the Council officers drafting the Change 1 provisions relating to greenhouse gas (GHG) emissions targets, including the development and evaluation of options for targets to be included in Objective CC.3, and the Section 32 report.

9 My evidence addresses matters raised by submitters on the climate change provisions in Change 1 in my capacity as a subject matter expert on greenhouse gas emissions reduction targets and plans.

10 I have grouped the matters raised by theme or common line of argument and provided comment on each of these, rather than responding to submissions point-by-point.

BACKGROUND – RELEVANT RPS PROVISIONS

11 Change 1 introduces a new Climate Change Chapter, recognising climate change as a regionally, nationally and internationally significant issue that requires bold and decisive, yet careful, action. Issue 1 is of particular relevance to the topic of this evidence, being that:

Greenhouse gas emissions must be reduced significantly, immediately and rapidly [1]

12 Change 1 includes a suite of new objectives, policies, and methods to provide for the reduction of greenhouse gas emissions. The most relevant objectives are[2]:

Objective CC.1:

~~By 2050, t~~ The Wellington Region is a low-emission and *climate-resilient* region, where climate change mitigation and climate change adaptation are an integral part of:

(a) sustainable air, land, freshwater, and coastal management,

(b) well-functioning urban areas ~~environments~~ and rural areas, and

(c) the ~~well~~ planning ~~ed~~ and delivery of infrastructure.

Objective CC.3:

To support the global goal of limiting warming to 1.5 degrees Celsius, net *greenhouse gas emissions* from transport, agriculture, stationary energy, waste, and industry in the Wellington Region are reduced:

[1] Change 1, p9
[2] As recommended be amended in the Section 42A report: Climate Change - General

(a) By 2030, to contribute to a 50 percent reduction in *greenhouse gas emissions* from 2019 levels, including a:

(i) 35 percent reduction from 2018 levels in land transport-generated *greenhouse gas emissions*,
(ii) 40 percent increase in active travel and public transport mode share from 2018 levels, and
(iii) 60 percent reduction in public transport emissions, from 2018 levels, and

(b) By 2050, to contribute to achieveing net-zero *greenhouse gas emissions*.

TOPIC EVIDENCE

13 The pressing need to reduce human-caused emissions of greenhouse gases deeply and rapidly to try and stabilise global temperatures, and thereby avoid severe and devastating impacts on the living world and human societies, is beyond question. Human civilisation was established and has thrived overall (despite localised reversals in well-being) during the mild, stable conditions of the Holocene epoch which began following the end of the last ice age, 11,700 years ago[3]. The global average surface temperature has already been pushed outside of this known 'safe' range by human activities[4] and is projected to move further beyond it (the warmest 200-year period was 0.7°C warmer than the 19th century datum, current warming is at 1.2°C). Clearly these unprecedented, widespread, and unstable climatic conditions will tax and possibly exceed the ability of human civilisation to adapt.

14 The situation was summarised by UN Secretary General Antonio Guterres in his statement accompanying the release of the Intergovernmental Panel on Climate Change (IPCC) Working Group 1 report in 2021 thus:

> *Today's IPCC Working Group 1 report is a code red for humanity. The alarm bells are deafening, and the evidence is irrefutable: greenhouse-gas emissions from fossil-fuel burning and deforestation are choking our planet and putting billions of people at immediate risk. Global heating is affecting every region on Earth, with many of the changes becoming irreversible.*

[3] Safe and just Earth system boundaries | Nature
[4] Holocene global mean surface temperature, a multi-method reconstruction approach | Scientific Data (nature.com) See Figure 6.

> *The internationally agreed threshold of 1.5°C is perilously close. We are at imminent risk of hitting 1.5°C in the near term. The only way to prevent exceeding this threshold is by urgently stepping up our efforts and pursuing the most ambitious path.*
>
> *We must act decisively now to keep 1.5°C alive. We are already at 1.2°C and rising. Warming has accelerated in recent decades. Every fraction of a degree counts.*[5]

15 The report itself says:

> *...Global warming of 1.5°C and 2°C will be exceeded during the 21st Century unless deep reductions in CO_2 and other greenhouse gases occur in the coming decades.*[6]

16 The need to cut emissions urgently has been acknowledged in domestic court rulings. Justice Palmer ruled in December 2020 in the judicial review brought by Hauraki Coromandel Climate Action Incorporated against Thames-Coromandel District Council that:

> *[5] I also accept the evidence that the scientific consensus demonstrates dangerous anthropogenic warming is likely to be unavoidable unless substantial mitigation steps are undertaken immediately.*[7]

17 Given that the urgent need to cut human-caused greenhouse gas emissions at the global aggregate level is not in doubt, my evidence centres on concerns raised by submitters on the efficacy of the Change 1 climate change objectives and policies and provides background information where necessary.

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[5] Secretary-General Calls Latest IPCC Climate Report 'Code Red for Humanity', Stressing 'Irrefutable' Evidence of Human Influence | UN Press
[6] IPCC AR6 Working Group 1: Summary for Policymakers | Climate Change 2021: The Physical Science Basis
[7] Judicial review of a decision of the Thames-Coromandel District Council between HAURAKI COROMANDEL CLIMATE ACTION INCORPORATED (Applicant) and THAMES-COROMANDEL DISTRICT COUNCIL (Respondent). Hearing: 31 August 2020

Evidence to support introductory text on impacts of different greenhouse gases

Explanation of the impacts of different greenhouse gases, including the implications of atmospheric lifetime (short-lived vs long-lived greenhouse gases)

18 Different types of GHGs have different average residence times in the atmosphere (atmospheric lifetimes) before they are removed by natural processes, and this affects the impact they have on global warming.

19 Some GHGs, such as methane, hydrogen and the refrigerant HFC-134a, have relatively short lifetimes. Despite their short lifespan, they still have a significant warming effect. For example, a tonne of methane emitted to the atmosphere has a warming effect that is 27 times higher than a tonne of carbon dioxide emissions when averaged over a 100-year time horizon (this ratio is called its global warming potential or GWP_{100})[8]. Over 20 years, the warming effect of methane is much higher, around 80 times, than that of carbon dioxide. This difference is attributable to the amount of time their total warming effect is averaged over. This process of averaging the warming effect of different GHGs over a common period allows the quantity of different GHGs to be converted and totalised in a common unit that relates directly to their combined warming effect: tonnes of carbon dioxide equivalent (tCO_2e). This is the internationally accepted method formalised by the UNFCC in their 'Paris Rulebook'[9]. All countries are required to report their emissions to the United Nations Framework Convention on Climate Change (UNFCCC) using GWP_{100}.

20 Long-lived GHGs, such as carbon dioxide, nitrous oxide, and fluorinated gases, have lifetimes that can range from decades to centuries, or even millennia. Carbon dioxide, which is the most important GHG in terms of warming impact, can influence the global climate for thousands of years: a large fraction of human CO_2 emissions are absorbed by the ocean within a 20-200 year timeframe, while the remainder are mostly removed much more slowly by rock formation and rock weathering processes[10]. Nitrous oxide has a lifetime of around 109 years and a warming effect 273 times that of carbon dioxide over a 100-year time horizon (i.e. its 'GWP_{100}' is 273). Fluorinated gases, such as

[8] IPCC AR6 report: Chapter 7: The Earth's Energy Budget, Climate Feedbacks and Climate Sensitivity (ipcc.ch) table 7.15, page 1017
[9] Demonstrating GWP*: a means of reporting warming-equivalent emissions that captures the contrasting impacts of short- and long-lived climate pollutants - IOPscience
[10] Atmospheric Lifetime of Fossil Fuel Carbon Dioxide (uchicago.edu)

hydrofluorocarbons (HFCs), have lifetimes that range from a few years to several centuries and have very high GWPs. [11]

21 To summarise, the global warming effect of different gases depends on both their heat-trapping ability, which can be expressed as its GWP, and the quantity (concentration) of the gases in the atmosphere.

Response to assertion that using an 'all-gases' approach to measuring emissions (i.e. using GWP_{100}) is incorrect or inappropriate.

22 Use of GWP_{100} for managing short-lived GHGs has shortcomings in that it overestimates their impact on warming if their rate of emission is steady or declining. In practice, a declining rate of short-lived GHG emissions will result in global cooling, all other things being equal. Use of the newer 'GWP*' conversion method can more accurately reflect their effect on warming when expressed in tCO_2e. However, this method implicitly assumes that changes to emissions rates are sustained, which is totally uncertain in practice.[12]

23 Despite this, use of GWP_{100} does not create significant issues for managing emissions: the Paris Agreement goal is to contribute to preventing global temperatures from rising beyond a threshold, it is a threshold that the world is rapidly approaching, and human activities emit a combination of long-lived and short-lived GHGs. It is widely accepted that cutting emissions of both long-lived and short-lived GHGs is the wisest course of action to stay below the threshold. That we might inadvertently cool the world an unwanted amount due to inaccurate accounting of short-lived GHGs effects via use of GWP_{100} is such a remote and unlikely prospect that it is wholly irrelevant.

Evidence for the rationale to address climate change through Change 1

Response to the assertion that addressing emissions in the Wellington Region through Change 1 will have no impact on the global climate

24 All emitters, or regulators of GHG emissions, such as regional or national governments, can argue that the contribution to global warming they are responsible for is relatively

[11] IPCC AR6 report: Chapter 7: The Earth's Energy Budget, Climate Feedbacks and Climate Sensitivity (ipcc.ch) Table 7.15, page 1017
[12] ICCC-technical-appendix-4-split-gas-policy-and-GHG-metrics.pdf (climatecommission.govt.nz)

small, therefore it is not necessary to cut their emissions given that there are countless individual emissions sources in the world, and each compared to total emissions will be comparatively small. Likewise, every emitter can find a reason to exempt themselves, via subjective judgements of the importance of their emitting activity. Some of these arguments will have merit, others less so. However, the more actors that take a lax attitude to limiting emissions, the stronger the impetus for others to follow suit, either because they are emboldened, or in response to the unfairness of the situation. The endpoint of adopting this rationale is that no-one cuts or regulates their emissions, not even those in a comparatively good position to do so, and climate change continues to worsen as a result.

25 There is no solution to this 'collective action problem' other than for emitters and regulators of emissions to act responsibly and limit the emissions sources they have influence over. The more actors that do this, the more the 'vicious circle' of lax or negligent behaviour becomes reversed to become a 'virtuous circle' of mutually reinforcing good behaviours that reduce the causes of climate change. Governments are both role models for wider society and have the widest powers of any actors in any given geographic area to act in the public and intergenerational interest. It is critical that they show leadership on this issue.

26 New Zealand has one of the highest per capita emissions rates in the OECD, currently and historically[13]. We are also a relatively prosperous and developed nation and are therefore better able to afford to take emissions reduction action. These factors support the argument that we should cut our emissions more quickly than the global average, not less. This was a principle behind the structure of the global Kyoto Protocol emissions treaty, where developed 'Annex 1' countries (including Aotearoa New Zealand) were obliged to reduce their emissions, whereas developing countries were not. The Kyoto Protocol approach of specifying legally binding targets for Annex 1 countries was abandoned for its successor, the Paris Agreement, not because this differentiation of responsibility for emissions was incorrect, but because it was not enforceable. Under the Paris Agreement, it is up to each country to specify its own 'Nationally Determined Contribution' (NDC) towards the goals of the Agreement.

[13] https://ourworldindata.org/greenhouse-gas-emissions, OECD iLibrary: Climate Change

Response to the assertion that addressing emissions through Change 1 will lead to emissions leakage

27 The term 'leakage' in this context means the relocation of emitting activities to other jurisdictions with laxer standards and higher emissions intensity for that activity in response to an emission reduction policy. Possibly there could be some displacement of some high-emitting activities to regions or countries without policy settings that limit GHG emissions. There is no certainty regarding whether the leakage happens at all for a given activity and, if so, whether it will be partial or total. This will depend on the product or service in question and many other factors. Partial leakage may only have the effect of reducing the benefit of a policy to global aggregate emissions, but not necessarily eliminating or reversing it. Furthermore, if the jurisdiction that an activity leaked to has an economy-wide emissions target, any increase in their emissions due to leakage would need to be compensated for with greater cuts elsewhere in their economy while that target endured.

28 Presently the Climate Change Commission is arguing strongly to the Government that the 'free allocation' of emissions units to industries subject to the New Zealand Emissions Trading Scheme (ETS) and officially identified as being at risk of carbon leakage is overly generous. They assert the risk of carbon leakage is lower than when the policy was first set in 2009.

29 Regarding leakage of agricultural emissions if they are regulated in Aotearoa New Zealand, the Interim Climate Change Committee concluded in their advice to Government in 2019:

> *"…while some emissions leakage may occur, the risk of perverse outcomes (i.e. a net increase in global emissions because of emission reductions within New Zealand) is very low, at least in the near term. Consequently, the risk of leakage does not appear high enough to provide a convincing argument for New Zealand not to implement policies to reduce its own emissions, especially since the detailed design of policies… can further reduce this risk."*[14]

[14] ICCC-technical-appendix-7-international-context-and-leakage.pdf (climatecommission.govt.nz)

Response to the assertion that the approach of Objective CC.3 is inconsistent with national climate change targets and policy and may lead to regional inconsistencies, inefficiencies and inequalities

30 There are no legal requirements regarding whether or what emissions targets should be included in a Regional Policy Statement. In my opinion, that the Change 1 targets are not the same as government targets poses no issue. If it is assumed that whichever target is more stringent is achieved in practice this will be helpful in achieving the goals of the Paris Agreement. The level of risk we face from climate change is reduced the more emissions are reduced.

31 Furthermore, there is no agreed formula for how national emissions targets should be shared out between the regions of Aotearoa New Zealand. Applying percentage reduction targets relating to the national GHG inventory directly to the Wellington Region requires assumptions to be made that could be challenged in the same way the Change 1 targets have been. Setting any target is ultimately a political decision, influenced by a wide range of social, environmental, and economic factors. I make further comment on this topic in paras 39-42.

32 Regarding inconsistencies in planning requirements between regions, this is not uncommon. For example, uniquely among territorial authorities, the Kāpiti Coast District Plan requires that new dwellings have rainwater collection tanks or greywater systems installed[15]. These rules were brought in to help address local water supply capacity issues[16], but this issue has been resolved primarily by other means since[17]. Yet politically there is no appetite to remove the rule, recognising its value for contributing to water supply resilience, and this inconsistency is now accepted by all. This example serves to illustrate that local political preferences and circumstances shape planning rules, but once everyone involved adapts, it is not necessarily problematic.

Response to the assertion that there is no/limited evidence on the emission reduction benefits of Change 1

33 Change 1 sets direction for regional and district plans to include provisions to reduce GHG emissions in the Region, guided by new climate change objectives and policies and

[15] Guidelines - Kāpiti Coast District Council (kapiticoast.govt.nz)
[16] https://www.stuff.co.nz/environment/292084/New-Kapiti-homes-must-all-have-water-tanks
[17] Water meters reduce usage | Stuff.co.nz

supported by a suite of new climate change methods. These provisions in Change 1 are intended to be complementary to other decarbonisation policies, such as the ETS. The Climate Change Commission and central government (though the Emissions Reduction Plan) are both clear that local government and the planning system have important roles to play in climate change mitigation, to complement the NZ Emissions Trading Scheme and national policy initiatives, particularly for sectors unaffected by, or less responsive to, emissions pricing.

34 Central government has adopted a range of policies to reduce emissions, such as the Clean Car Standard, which limits the number of highly polluting vehicles that can be brought into the country, and grant schemes like GIDI (Government Investment to Decarbonise Industry). This indicates that the government does not expect to achieve its targets solely via the ETS, and various other deliberate interventions are necessary. All cuts to domestic GHG emissions will reduce the amount of offshore carbon abatement (called an internationally traded mitigation outcome or ITMO) the government will need to purchase to meet its NDC.

35 Specifically, the Climate Change Commission reported[18] that the current shortfall between Aotearoa New Zealand's domestic emissions budgets and its 2030 NDC is 99 million tonnes of CO_2e emissions. Treasury estimates of the cost of buying ITMOs to cover this shortfall vary between $3.3 billion NZD and $23.7 billion NZD[19]. This range is wide and still highly uncertain because as Treasury says: *"The future price of international reductions is unknown, reflecting that many markets are at early stages or yet to be developed"*.

36 The cost of ITMOs will need to be met from taxes and the money will go offshore, worsening Aotearoa New Zealand's balance of payments. However, if GHG emissions can be cut below the domestic carbon budgets, for example in response to the Change 1 greenhouse gas targets, the smaller the taxpayer's bill for ITMOs will be, and theoretically more money will remain to circulate within the local economy.

37 As explained above, the risk of emissions leakage blunting or reversing the effect of new policies to reduce emissions is low. One risk that does need consideration is the lifecycle emissions of alternatives. For example, many widely used liquid biofuels can have higher lifecycle emissions than the fossil fuels they are put forward to replace[20]. Because of how

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[18] Ināia tonu nei report (He Pou a Rangi – Climate Change Commission, 2021)
[19] Climate Economic and Fiscal Assessment 2023, NZ Treasury
[20] Liquid-Biofuel-Research-Report-March-2021.pdf (eeca.govt.nz) See table 8

emissions are accounted for, if these biofuels are imported, they can reduce reported national GHG emissions while increasing them in aggregate globally. Similarly, hydrogen fuel is presented as an alternative to fossil fuels, but hydrogen is most commonly and cheaply made from fossil fuels[21]. Using this kind of hydrogen as fuel (often referred to as 'grey hydrogen') does not reduce global emissions, it increases them.

38 Provided that those evaluating proposals for new activities under Change 1 provisions consider their total global lifecycle emissions, not just their local emissions, my opinion is that it is highly unlikely that Change 1 would not be beneficial to global efforts to reduce emissions.

Evidence to support, and impact of, climate changes targets including discussion on split-gas targets, gross vs net, baselines

Response to the assertion that the RPS climate change targets should be consistent with national CCRA targets and there is insufficient evidence to "cut deeper"

NATIONAL GHG EMISSIONS TARGETS

39 Aotearoa New Zealand's domestic targets under the Climate Change Response Act (CCRA) are:

- Net zero emissions of all greenhouse gas (GHG) emissions, other than biogenic methane, by 2050.
- 24 to 47 per cent reduction below 2017 biogenic methane emissions by 2050, including 10 per cent reduction below 2017 biogenic methane emissions by 2030.

40 Under the CCRA the Government is obliged to set 5-yearly domestic emissions budgets to manage progress towards these targets.

41 In addition, the Government's first Nationally Determined Contribution (NDC) under the Paris Agreement is to reduce net GHG emissions to 50 per cent below gross 2005 levels by 2030. This is an 'all gases' target, measured in tCO_2e. The Government uses gross-net accounting for this target, where sequestration by forests is excluded from the base year emissions inventory (gross) but included in measurement of subsequent years' emissions (net). Despite this, the NDC exceeds the amount of emissions reduction that our domestic

[21] The hydrogen solution? | Nature Climate Change

emissions targets and budgets equate to and the Government intends to address the shortfall by purchasing carbon abatement from offshore.

42 As part of the development of Change 1, the Council considered the option of adopting the national CCRA GHG emissions targets at the regional level but made a deliberate decision to be more ambitious and adopted those in clause CC.3 instead. A decision was also made against setting separate targets for biogenic methane and long-lived gases. The rationale for this is set out below.

HOW TARGETS ARE DETERMINED

43 As explained in the Section 32 Report for Change 1, there are two main approaches that are used to set emissions targets:

43.1 A 'top-down' method determines what would be a reasonable contribution to limit global warming via emissions reduction, informed by climate science and a wide range of factors, such as the tolerable level of risk, the expectations of the international community, what others are doing and perceived fairness. This method will tend to lead to tougher targets/deeper cuts than other methods.

43.2 A 'bottom-up' method, where the target is set according to the amount of reduction estimated to result from a specific set of actions that actors involved (for example central or local government) are prepared to take. This approach will usually result in weaker targets as these estimates tend to be conservative, and it is human nature to favour the status quo over making change.

44 While both approaches influence the outcome of a target setting process, the final decision will always be a political one, based on a wide range of influences and judgements which are inherently subjective. The Council used a combination of these approaches in developing Objective CC.3.

THE SCIENTIFIC EVIDENCE BASE FOR GHG REDUCTION TARGETS

45 While the work of the IPCC provides an evidence base for setting emissions reduction targets, it can by their own admission only be a guide, rather than provide a definitive answer. The 2030 target that was adopted for Change 1 falls within the range of the global GHG emissions scenarios included in the IPCC AR6 report that give a better than 50% chance of limiting warming to 1.5°C with no or limited overshoot: They range from making

a 34 to 60% reduction by 2030[22]. The higher and lower values indicate the 5th and 95th percentile values for modelled scenarios in the ensemble consistent with the goal. The median (50%) percentile corresponds to a reduction of 43%. To be clear this means:

- 5% of modelled scenarios in the ensemble had a reduction of 34% or less
- 50% of modelled scenarios in the ensemble had a reduction of 43% or less
- 95% of modelled scenarios in the ensemble had a reduction of 60% or less

46 It should be noted that modelled scenarios in the ensemble used for the IPCC reports come from many sources and differ from each other in important respects. Some will be less comprehensive than others, for example by not including certain feedback effects that occur in the real climate system or might be more conservative in their assumptions than the others. Adopting the median value as an emissions reduction target because it is in the middle may seem reasonable, but carries a high level of risk, layered on top of the uncertainty in each modelled scenario.

47 What can be concluded from the IPCC's ensemble of emission reduction scenarios is that, despite the variances between models and the low certainty of the outcome (50%) from each of them, the more that GHG emissions are cut, the better the chance the goals of the Paris Agreement will be attained in practice. This can be seen on the Climate Change Tracker website where the remaining 'carbon budget' associated with limiting global warming to 1.5 °C is reduced from 250 gigatonnes of CO_2 to 150 gigatonnes if the objective is to have a 67% chance of success, or to 100 gigatonnes for an 83% chance[23].

48 There has been strong criticism from scientists that the IPCC's approach is too conservative and downplays the significant probability of catastrophic climate changes, normalising risks that should be totally unacceptable, given the consequences[24].

49 The less warming there is, the less chance catastrophic 'tipping points' for the global climate will be reached. These tipping points are changes to Earth systems that promote further warming in addition to the warming that can be expected by adding GHGs to the atmosphere. One example is the loss of reflective Arctic sea-ice due to melting which in turn makes the Earth absorb more of the sun's energy. Another is the loss of the Amazon,

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[22] Climate Change 2022, Mitigation of Climate Change. Summary for Policymakers (ipcc.ch), Table SPM.2
[23] Current Remaining Carbon Budget and Trajectory (climatechangetracker.org)
[24] (PDF) What Lies Beneath: The scientific understatement of climate risks (researchgate.net)

where the moist conditions necessary to maintain the rainforest ecosystem cannot be sustained in a warmer world and the entire biome suddenly transforms into a dry, mostly bare savannah, releasing massive amounts of planet-warming carbon from former trees and peatlands in the process. The result of crossing tipping points is that major changes occur to the environment that are either effectively irreversible, drive further warming, or both. If too many are passed, progression towards higher levels of global warming could become self-sustaining[25].

50 We do not know exactly where such tipping points are, justifying deeper cuts. This can be thought of like walking out into a minefield. The further you walk out into the minefield, the greater the chance that you'll stand on a mine (analogous to crossing a climate 'tipping point'). If you know a minefield is ahead of you, the wise move is not to walk out into it, or if it is too late for that, stop as soon as possible and carefully retrace your steps. Recent research[26] has found that some tipping points may have already been passed, and many others may be passed within 2°C of warming. Still more tipping points are likely to be passed within the 2.7 °C of warming predicted to result from the combined result of all countries' current levels of policies and action[27]. That was part of the rationale for setting the Paris Agreement goals: to avoid crossing too many of these tipping point thresholds.

51 The percentage reductions emissions in IPCC scenarios apply to global aggregate emissions. While it follows that if every country cut its emissions by these percentages, the combined result would correspond with the global aggregate pathway, this approach is not 'fair' for those countries with low per capita emissions both now and cumulatively over their histories. Aotearoa New Zealand is not one of these countries (per capita emissions in 2021 were 13.4 tonnes CO_2e for Aotearoa New Zealand, whereas the global average was 6.9 tonnes CO_2e, and in the past this disparity was much higher[28]) meaning that if an equitable approach is taken to emission reductions, then we should reduce more than the global average.

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[25] What does the new IPCC report say about climate tipping points and feedbacks? Oct 2021, Dr David A. Mackay, climatetippingpoints.info
[26] Exceeding 1.5°C global warming could trigger multiple climate tipping points | Science
[27] https://climateactiontracker.org/documents/1094/CAT_2022-11-10_GlobalUpdate_COP27.pdf
[28] Greenhouse gas emissions - Our World in Data: 'Per capita greenhouse gas emissions: how much does the average person emit?'

52 The Climate Change Commission's 2021 advice to Government on what NDC it should adopt said:

> *[93] "… science alone cannot determine the share Aotearoa should contribute to those global reductions. Reaching a conclusion on this also depends on social and political judgements about international equity. These should be made by the Government of the day."*
>
> *[99] "In general, applying equity approaches implied that New Zealand should make "significantly deeper reductions than the global average".[137] Emissions trajectories based on New Zealand's relative wealth would lead to deeper reductions by 2030 than the IPCC 1.5˚C pathway range"*

53 And in Chapter 5 of its advice to Government on emissions budgets, the Climate Change Commission also said:

> *[174] "There is no one prescriptive path of emissions reductions for Aotearoa or any other nation that will guarantee the world limits warming to within 1.5°C. This also means there is no single prescribed way to determine whether our recommended emissions budgets are compatible with contributing to the global 1.5°C effort."*

54 These sentiments regarding the role of national governments in making value judgements when setting national emissions targets equally apply to regional governments setting regional emissions targets.

55 Analyses of Aotearoa New Zealand's Zero Carbon Act targets by the international independent not-for-profit consortium Climate Action Tracker have shown that they are not aligned with limiting global warming to 1.5°C, either against the global pathway or a 'fair-share' pathway that recognises the country's historically high per capita emissions compared to other countries.[4]

56 To conclude, Aotearoa New Zealand's national level emissions targets do not represent a fair share of the global effort to limit warming to 1.5°C, and that a global average reduction of 43% by 2030 is highly uncertain to deliver that goal also. The only way to improve the odds is to cut emissions more deeply. Even if the 1.5°C threshold of warming

is passed, any reduction in emissions, and thereby warming, reduces climate related damages and the chances of humanity encountering catastrophic tipping points in the climate system.

RATIONALE FOR TARGET CC.3

57 As stated by Justice Mallon in her ruling on the case of *Lawyers for Climate Action NZ Inc vs the Climate Change Commission*[29], the Climate Change Response Act (CCRA) does not explicitly require the Government to follow an emissions pathway consistent with limiting global warming to 1.5°C, only that it adopt a pathway that 'contributes to' limiting warming to 1.5°C. Therefore, while the national targets have the legitimacy of the government's endorsement, they are not the final word on what Aotearoa New Zealand or the Wellington Region could, or should, do to help prevent dangerous or catastrophic climate change impacts.

58 The target adopted in Change 1, set out in Objective CC.3, requires deeper emissions cuts than the CCRA targets, but shallower ones than the target adopted by Wellington City Council (WCC) for their Te Atakura: First to Zero climate strategy. WCC used a 'fair share' approach to calculate their target and decided on a 57% reduction by 2030 compared to 2020 for their city as a whole[30]. Auckland City Council adopted a region-wide target of a 50% reduction by 2030 in their climate plan Te Tāruke-ā-Tāwhiri[31]. Both have adopted net-zero all-gas targets for 2050.

59 In adopting Objective CC.3, the Wellington Regional Council weighed a wide range of factors, making a determined decision to adopt an ambitious target sufficient to achieve a 1.5°C world, but not as ambitious as achieving a fair-share reduction. In my opinion, the targets adopted for total emissions provide a strong directive to all actors in the Region to cut their emissions deeply.

SPLIT GAS TARGETS

60 Like Auckland City, Wellington City and most other nations, municipalities and businesses that have adopted emissions reduction targets, Change 1 has an 'all gases' GHG emissions reduction target. As previously explained, all GHGs are converted into the common unit of

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[29] Lawyers for Climate Action NZ Incorporated v Climate Change Commission [2022] NZHC 3064 (23 November 2022) (austlii.edu.au)
[30] Climate change - What we're doing about climate change - Wellington City Council
[31] Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan (aucklandcouncil.govt.nz)

CO_2e using GWP_{100} conversion factors. This differs from the national CCRA targets which have separate targets for long-lived gases and biogenic methane. The implications of using GWP_{100} instead of separate short and long-lived gas targets have been explained in paras 23-24.

61 Methane emissions can arise from natural gas leaks and from biological (biogenic) sources, such as livestock, wetlands and landfills. The Parliamentary Commissioner for the Environment (PCE) researched the contribution that methane emissions from livestock in Aotearoa New Zealand make to global warming[32], addressing the following questions:

- Given New Zealand's past methane emissions from livestock, what would be the warming contribution of future methane emissions from livestock in New Zealand if they were held steady at current levels?
- Given the most recent projected emissions of methane from livestock in New Zealand, what additional warming might be expected?
- What annual reductions in these methane emissions would be required to avoid any additional warming contribution from New Zealand methane emissions by 2030 or by 2050?

62 The main finding from this study is that if Aotearoa New Zealand was to hold its livestock methane emissions constant at 2016 levels then the amount of methane in the atmosphere due to those emissions would stop increasing within a decade, but warming from this methane would still increase for well over a century, albeit at a gradually declining rate.

63 It takes about 50 years after the beginning of a constant rate of methane emissions for methane concentrations to stabilise. It then takes several hundreds of years for temperatures to stabilise in response to the increased methane concentrations, owing to both the inertia of the climate system and various feedbacks that further enhance the warming that comes from methane alone.

64 Methane emissions do not need to be brought to zero for them not to contribute to additional warming. The PCE report states that livestock emissions 10-22% below current levels by the year 2050, and 20-27% by 2100 are required to produce no net additional

[32] A note on New Zealand's methane emissions from livestock, August 2018, Parliamentary Commissioner for the Environment.

warming effect compared to their model's baseline (2016). However, using that as a target assumes that it is acceptable that the current amount of global temperature elevation due to the methane emitted by livestock is sustained indefinitely. The Interim Climate Committee said it:

> "...implies an assumption that the warming caused by CH_4 (methane) to date is the socially appropriate amount for those industries emitting methane – effectively this would create a grand-parented entitlement to a certain level of warming being sustained into the future."[33]

65 They go on to say:

> *"Even though on-going CH_4 emissions at the current rate would not add much more above current warming, reducing future CH_4 emissions could substantially reduce future warming. Put simply, the less CH_4 we emit in future, the less we will contribute to future global warming.*
>
> *"How much methane should be reduced is a value judgement about how much total warming we are prepared to cause. Natural science alone cannot answer this question, nor tell us how to prioritise methane reductions now relative to reductions in long-lived gases. This depends on our relative concern about climate impacts at different points in time, as well as political judgement on the extent to which effort to reduce one gas might displace efforts to reduce the other. Choices will also depend on how society weights the impacts on current and future generations, different expectations about humans' ability to adapt, to innovate, and to transition toward a low-emissions society without undue social cost.*
>
> *"Reducing CH_4 emissions, in addition to bringing emissions of long-lived greenhouse gases to or below net zero, has been identified consistently to play an important role to help achieve the ambitious*

[33] ICCC-technical-appendix-4-split-gas-policy-and-GHG-metrics.pdf (climatecommission.govt.nz)

temperature goals set out in the Paris Agreement (e.g. IPCC 2018; Collins et al. 2018; Nisbet et al. 2019; Rogelj et al. 2018).

66 The international Global Methane Pledge[6], to which Aotearoa New Zealand is a party, states that the global temperature enhancement from methane should be reduced by 0.2°C to help fulfil the Paris Agreement goals. The Pledge website states:

> *Rapidly reducing methane emissions from energy, agriculture, and waste can achieve near-term gains in our efforts in this decade for decisive action and is regarded as the single most effective strategy to keep the goal of limiting warming to 1.5˚C within reach while yielding co-benefits including improving public health and agricultural productivity.*

67 So, the need to reduce methane emissions of all kinds is widely acknowledged by climate scientists and governments. Managing them separately with separate explicit targets can confer some benefits, as stated by the IPCC:

> *"... treating short- and long-lived GHG emissions pathways separately, can improve the quantification of the contribution of emissions to global warming within a cumulative emissions framework, compared to approaches that aggregate emissions of GHGs using standard CO_2 equivalent emissions metrics."*[34]

68 However, as previously stated, the GWP_{100}, 'all gases' method of measuring and managing emissions is widely used, including by the United Nations Framework Convention on Climate Change (UNFCCC) for national-level emissions reporting, is straightforward to use and understand and, in my opinion, its use for Change 1 presents no practical issues or disparities for the foreseeable future.

GROSS VS NET TARGETS

69 Gross GHG emissions targets exclude enhanced removal of CO_2 from the atmosphere, whereas net targets include them. These removals are typically via sequestration by

[34] Chapter 7: The Earth's Energy Budget, Climate Feedbacks and Climate Sensitivity (ipcc.ch) page 1017

forests. There are other means, such as other natural sequestration by wetlands, soils and mangroves, and industrial capture and storage methods. The logic for using net emissions targets is that this is what the atmosphere 'sees' in terms of global warming, and that it is impossible to bring gross emissions of all long-lived gases to zero. The Paris Agreement itself says explicitly that the method of stabilising global temperatures is to bring emissions from sources and sequestration by sinks into balance. However, while net-zero emissions may be necessary, there are numerous shortcomings and pitfalls associated with focussing on this exclusively as the means to avoid dangerous climate warming. These include:

- Developing science says that there is asymmetry between the effects of emissions versus the effect of removals on global temperatures. On a tonne-for-tonne basis, emissions appear 4% more effective at causing warming than cooling by removals.[35]
- The high risk, which has been seen in practice already, that in a warming world more forest fires, powerful storms and invasive pests driven by climate change will destroy forests, causing the carbon they store to be released[36].
- The fact there is a finite amount of land that can be devoted to forestry, and that as new forests reach maturity, the net amount of additional carbon they sequester each year drops away to zero.

70 While achieving net-zero emissions may be necessary, it is critically important to minimise the reliance on removals/sequestration and maximise the reduction of gross emissions. Policy CC.8 addresses this with respect to Change 1 by prioritising reducing gross emissions.

DIFFERING BASELINES

71 Regarding base years, a 2019 base year is that specified for the current IPCC scenarios. It is the last year before the COVID-19 lockdowns temporarily affected the economy and emissions. Base years are not important with respect to net zero targets as these are not relative to a base year: zero is zero. Biogenic methane emission targets are specified

[35] Asymmetry in the climate–carbon cycle response to positive and negative CO_2 emissions | Nature Climate Change, Chapter 5: Global Carbon and Other Biogeochemical Cycles and Feedbacks (ipcc.ch)
[36] Worrying finding in California's climate initiative reveals problem with using forests to offset CO2 emissions (phys.org)

relative to a 2017 base year in the 2019 CCRA Zero Carbon amendment, which differs to the base year for Aotearoa New Zealand's NDC (which is 2005).

72 The base year for the transport sector target is 2018 because this is what is specified in the Regional Land Transport Plan from which it is drawn.

73 Regardless, targets can easily be recalculated relative to any other base year should this be necessary, provided the same methodology for measuring the GHG emissions for that year has been used. In my opinion, the lack of base year alignment between the different targets in Change 1 presents no issue.

Response to the assertion that the RPS climate change targets cannot be achieved through an RPS/RMA/planning system

74 It is important to note that the targets in Objective CC.3 are framed to "contribute to" achieving. As well as influencing resource consent decisions, the policies in Change 1 also direct authorities to give effect to them in other ways, including non-regulatory methods. The targets therefore have utility beyond the planning system – they will reinforce other emissions reduction efforts and plans and indicate a strong direction of travel for GHG emissions reduction to all actors within the Region. The combination of these approaches may allow the target to be achieved, and if not, any additional GHG emissions reduction brought about by the Change 1 policies will contribute to helping prevent dangerous or catastrophic climate change.

The objectives will create inequalities for sectors across the Region (e.g. setting shorter term reduction targets for transport)

75 By specifying relatively low gross emissions targets for transport and agriculture compared to the net emissions target for the Region as a whole, the logical consequence is that if those two sectors just achieve the Change 1 targets but no more, the other sectors, including sequestration by forests, will need to achieve the balance of net emissions reduction. This may be considered inequitable if it is assumed that each sector should contribute equally to the aggregate target. However, if the ability to reduce and cost of reducing emissions within each sector is considered a factor in setting sector targets, it may not be. It is a subjective judgement. Further work needs to be done to develop a regional emissions reduction plan and to assess the best approaches to achieve reduction in each sector. This work may result in work to amend the existing sector targets in

Change 1 or add others. Regardless, the Change 1 targets as they stand set the direction of travel for reducing GHG emissions in the Region which will be given effect to through future planning processes in the Region. In my opinion, given our current knowledge of the action needed to avoid dangerous levels of climate heating, the Change 1 climate change targets, policies and measures are appropriate and address a significant gap in our responses to the issue to date.

76 The intention of the climate change targets in Change 1 is to set a direction for emissions reduction which is a reasonable contribution of the Wellington Region to limiting global warming to 1.5 °C with no or limited overshoot, alignment with the Regional Land Transport Plan (RLTP) and Regional Public Transport Plan (RPTP), and indicate a direction of travel for the agricultural sector, given it is the second largest source of emissions after the transport sector. Stronger targets could be set for both sectors to reduce the degree of reduction required from other sectors and sequestration by forestry needed to deliver the overall target, assuming sector targets are only met and not exceeded.

Clarification of why shorter-term (2030) targets have not been set for other sectors

77 Objective CC.3 sets numeric emission reduction targets only for the transport sector as calculations to establish these had already been prepared as part of the Regional Land Transport Plan. Targets for other sectors are intended to be developed as part of the Emissions Reduction Plan and it is my understanding that these may be incorporated into the RPS later.

Should the Change 1 Objective CC.3 transport targets be more stringent?

78 The Regional Land Transport Plan and the Regional Public Transport Plan are currently being reviewed, including a review of the sufficiency of the GHG and mode-shift targets. It is my understanding that if these plans adopt new targets, then a process will be considered to review the targets in Change 1. Regardless, in my opinion, the transport-related targets set out in Objective CC.3 (a) provide a clear direction of travel and therefore serve a useful purpose.

Response to the assertion that more detailed assessments/section 32 analysis of achievability and impacts of the targets, including on the regional economy, are needed

79 As previously discussed, a top-down approach to setting GHG reduction targets based on science and recognising Aotearoa New Zealand's current and historic responsibility for emissions and ability to act (due to our relative affluence and stability as a society) would require stronger targets to be set. So too would consideration of the level of acceptable risk exposure to climate change for our country and world now and in the future. 'Bottom-up' target setting, based on the estimated level of change that is acceptable to various stakeholders at the time it is set, would lead to lower, more conservative targets than a 'top-down' process.

80 It is possible to construct theoretical emissions pathways for the Region that correspond to reductions in emissions similar to the targets in Change 1. There is an online tool developed by Wellington Region councils, the Wellington Region 2050 Emissions Calculator, that allows users to experiment with this, specifying changes to the economy and showing their effect on regional emissions[37]. Notwithstanding its limitations, experimenting with this tool shows that there are different ways to achieve a 'net zero by 2050 target'. Updated modelling and scenario building work of this kind is being carried out for the Greater Wellington Leadership Committee.

81 What is achievable in practice depends on not only what is physically possible but the political priority and resources that are devoted to the goal and the level of public support there is to sustain the effort. It is not possible to know all these factors in advance of setting an emissions reduction target. But our leaders frequently need to make decisions with imperfect information that balance competing interests.

82 However, macro-economic studies, beginning with the Stern Review by the UK Treasury in 2006, have consistently shown that the costs of acting to limit emissions are far less than not doing so[38]. They show only small curtailment in the rate and amount of economic growth that would have occurred had action to reduce emissions not been taken, even when the avoided climate-related damages are not factored in.

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[37] Wellington Region 2050 Emissions Calculator (2050calculator.nz)

[38] https://www.lse.ac.uk/GranthamInstitute/publication/the-economics-of-climate-change-the-stern-review/, https://eiuperspectives.economist.com/sites/default/files/The%20cost%20of%20inaction_0.pdf,

https://www.nature.com/articles/s41558-021-01203-6, IPCC_AR6_SYM_SPM C2.4

83 Similar studies have been made for Aotearoa New Zealand. The Climate Change Commission estimated that achieving the national emissions targets would reduce GDP in 2050 to 1.2% lower than it would otherwise be, not including the benefits to GDP of avoided climate-related damages. Of the known modelling exercises for the country, NZ Treasury said:

> *The impact on GDP from achieving New Zealand's targets will depend on multiple factors, such as the specific emissions reduction pathway the country follows, but under most considered scenarios is not expected to be a material departure from business-as-usual.*[39]

84 Furthermore, conventional economic analysis (which considers only the marginal or incremental cost and impact of action or inaction) fails to consider or reflect the risk of widespread systems collapse, which becomes more likely as damage to human societies and natural ecosystems increases and more climatic 'tipping point' thresholds are crossed.

85 To summarise, the IPCC AR6 Synthesis report summary for policy makers said:

> *Cost-benefit analysis remains limited in its ability to represent all avoided damages from climate change (high confidence). The economic benefits for human health from air quality improvement arising from mitigation action can be of the same order of magnitude as mitigation costs, and potentially even larger (medium confidence). Even without accounting for all the benefits of avoiding potential damages the global economic and social benefit of limiting global warming to 2°C exceeds the cost of mitigation in most of the assessed literature (medium confidence).*[40]

86 In the technical memo I prepared for the Change 1 Section 32 analysis, I compared a total net emissions pathway for the Region consistent with meeting the targets in Objective CC.3 to a counterfactual pathway I created by applying the percentage reductions in the Climate Change Commission's 'current policy reference' scenario for Aotearoa New Zealand to the Region's emissions. I then evaluated the difference in avoided costs to

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[39] Climate Economic and Fiscal Assessment 2023, NZ Treasury
[40] IPCC AR6 Working Group 1: Summary for Policymakers | Climate Change 2021: The Physical Science Basis

2050, using both Treasury's estimate of future emissions prices and using a value of the Global Social Cost of Carbon (GSCC). The resulting estimates of avoided emissions costs regionally and avoided damages globally are NZ$5.9B and NZ$10.8B respectively.

87 These values give an indication of the some of the 'upside' benefits that have not been included in estimates of the costs of achieving emissions targets, but they still exclude the additional value of co-benefits, such as improved air quality and biodiversity.

88 I have estimated the downside cost to the Region of meeting targets, using the Climate Change Commission value of 1.2% of GDP in 2050 and an average annual growth rate of 2.3% for the period 2023-2050[41] as $1.1B, a sum that would be recovered in just 6 months of further growth in the Region. Doubling the cost of achieving targets to 2.4% of GDP for this estimate does not materially affect the outcome: the benefits still substantially outweigh the costs.

Evidence relating specifically to the agriculture emission target CC.5

Clarification of the rationale for a no increase in gross emissions target for agriculture when Objective CC.3 requires 50% reduction in net emissions by 2030 and net-zero emissions by 2050 (i.e. why not focus on a reduction target for net agricultural emissions rather than no increase in gross emissions)

89 It is my understanding that, in the Section 42A report: Climate Change – Agricultural emissions, Mr Wyeth has recommended that Policy CC.5, that set an expectation of no increase in gross GHG emissions from agriculture, be amended to refer instead to supporting a reduction in agricultural GHG emissions from 2019 levels to contribute to the Objective CC.3 2050 net-zero emission target. In my opinion, this is justified as there is clear need for all sectors to contribute to achieving gross emissions reductions. The greater cuts to gross emissions are, the less reliance on removals by forests is needed, which is desirable for many reasons, as outlined elsewhere in this evidence.

Clarification of how this target and supporting policy will align with central government policy/pricing for agricultural emissions

[41] Wellington Region GDP in 2022 was $48.0B, and the average annual growth rate in the region was 2.33% over 2000-2022. Applying this rate forward gives the GDP for the region in 2050 of $91.4B. See ecoprofile.infometrics.co.nz/Wellington Region/Gdp/Growth

90 Pricing of agricultural emissions will increase the costs of production relative to how emissions-intensive different agricultural products are. The Government proposes to recycle all the revenue raised into funding on-farm emissions reduction activities. This scheme, if implemented, will be complementary, rather than in conflict, with the emissions reduction targets and policies in Change 1. For example,

- Agricultural emissions pricing may make certain farming activities financially non-viable without efficiency improvements. Making these improvements may also allow the activity to comply with the Change 1 Policy CC.5 approach of supporting a reduction in GHG emissions from agriculture.
- Policy CC.5 must be given effect by regional plans. The approach taken in a regional plan may motivate farmers to modify their plans so they are not as emissions intensive, thereby reducing their costs under the agricultural emissions pricing scheme.
- Revenue recycling into on-farm emissions reduction could fund measures that allow a proposed activity to comply with the future regional plan change to give effect to Policy CC.5.
- Agricultural emissions pricing may make an activity that would be inconsistent with the direction in Policy CC.5 and future plan change to reduce agricultural GHG emissions over time be non-viable financially as well.

91 It is possible that an activity which is financially viable with agricultural emissions pricing would nonetheless be inconsistent with the direction in Policy CC.5 and therefore be prevented from proceeding. Assuming that the activity was not wholly displaced to outside the Region, the amount of net emissions abatement would be higher than if CC.5 was not in place.

92 There are many examples of complementary policies like these being implemented in other sectors. For example, the ETS increases the costs of electricity and fuels by pricing their GHG emissions. As well as this emissions pricing scheme there are minimum energy performance standards (MEPS, administered by EECA[42]) for electronic equipment, and minimum fuel efficiency and emissions standards for light vehicles (the Clean Car Standard administered by Te Manatū Waka). Similarly, the government modified the Resource

[42] https://www.eeca.govt.nz/regulations/equipment-energy-efficiency/about-the-e3-programme

Management Act so that point-source GHG emissions from industrial process heat can be regulated, which complements the ETS.

Suggested refinements to wording in introductory text

93 In the introduction to Chapter 3.1A of Change 1 starting on page 9 of Change 1 document, I suggest replacing references to 'short-term' methane reductions with the term 'near-term' in line with IPCC AR6 Synthesis Report, which says: *"C2.3. …Strong, rapid and sustained reductions in methane emissions can limit near-term warming…"*

94 The revised wording I propose for page 9 is:

> *"1. …recognising that methane reductions offer a significant opportunity for limiting global warming cooling in the ~~short~~ near-term.*

95 In the IPCC AR6 report, 'near-term' means the period 2021-2040[43].

96 'Short term' is defined in the National Policy Statement on Urban Development as a period of between 1-3 years. I consider that the use of the phrase 'short-term' in Change 1 in relation to climate change should be removed and replaced with 'near-term' to avoid ambiguity.

97 The intent behind use of the term 'short-term' on page 9 point 2 was to indicate that sequestration potential is limited by land availability and by uncertainty whether the sinks will be maintained and retained in the long term (i.e. beyond 100 years) in the face of human pressures, natural disasters and a changing climate. But this meaning is unclear and needs to be more explicit.

98 Therefore, the revised wording I propose is:

> *"2. Increase greenhouse gas sinks through carbon sequestration, while recognising that, due to the limitations of this approach, ~~this is only a short-term solution, and~~ the focus must be on reducing gross GHG emissions."*

[43] IPCC AR6 Working Group 1: Summary for Policymakers | Climate Change 2021: The Physical Science Basis

CONCLUSION

99 With the amendments proposed by Mr Wyeth in his S42A Report Climate Change - General, I consider the framing and targets in Objective CC.3 and Policy CC.5 to be appropriate and useful to regional, national, and global efforts to arrest global warming and limit the harms that climate change will cause.

100 Targets of this kind must be informed by science to be sound, but the nature of climate change as a global collective action problem with widely dispersed and unequal causes and impacts means that science alone cannot tell individual actors, such as regional government, exactly what to do. As with many other issues, any decision is ultimately political, and represents a settlement between competing interests.

DATE: 7 August 2023

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