

**IN THE HIGH COURT OF NEW ZEALAND
WELLINGTON REGISTRY**

**I TE KŌTI MATUA O AOTEAROA
TE WHANGANUI-Ā-TARA**

CIV-2021-485-000341

UNDER Judicial Review Procedure Act 2016 and part 30 of the
High Court Rules 2016

IN THE MATTER OF an application for judicial review

BETWEEN **LAWYERS FOR CLIMATE ACTION NZ INCORPORATED**
Applicant

AND **THE CLIMATE CHANGE COMMISSION**
First Respondent

AND **MINISTER FOR CLIMATE CHANGE**
Second Respondent

AFFIDAVIT OF RENEE EVA MURRAY

**(Climate Change Commission – the Commission’s Advice on the rules for measuring
progress)**

Affirmed: 10 December 2021

I, Renee Eva Murray, Principal Analyst, of Wellington, affirm–

INTRODUCTION

1. My full name is Renee Eva Murray. I am a Principal Analyst in the Budgets, Adaptation and Markets Team at He Pou a Rangi Climate Change Commission.
2. I was the lead analyst for the Commission's work in providing advice to the government on the rules that will apply to measure progress towards meeting the emissions budgets and the 2050 target. Section 5ZA(1)(b) of the Climate Change Response Act 2002 required the Commission to provide this advice as one of the matters relevant to setting an emissions budget.

SCOPE OF EVIDENCE

3. I provide this evidence in response to the judicial review proceedings brought by Lawyers for Climate Action New Zealand Inc (LCANZ). Those proceedings allege errors in the Climate Change Commission's Advice to the New Zealand Government *Ināia tonu nei: a low emissions future for Aotearoa*, released in June 2021.
4. In particular, LCANZ challenge the adoption of a modified activity-based approach to accounting for land emissions and removals as one of the rules for measuring progress towards meeting the budgets and the 2050 target, and criticise the use of a gross-net accounting approach in assessing the compatibility of New Zealand's nationally determined contribution (NDC). The Commission's Advice sets out the reasons for the Commission's position on these matters. However, addressing LCANZ' specific challenges and responding to the evidence it has filed requires a more detailed discussion than the Commission considered necessary to include in its published Advice.
5. Stephen Walter for the Commission is providing an affidavit setting out an overview of the international emissions reporting and accounting framework. My evidence follows on from this broader outline.
6. In this affidavit, I will address the more specific context and challenges for accounting for land emissions and removals, including:

- 6.1 the significance of the land sector in accounting for targets;
 - 6.2 the evolution of the approaches taken to accounting for land emissions and removals under the international framework and by New Zealand; and
 - 6.3 the Commission's approach in its Advice on what accounting New Zealand should adopt for land emissions and removals.
7. Paul Young for the Commission is providing a separate affidavit setting out the Commission's response to the specific criticisms that LCANZ has made of the Commission's advice on these matters. Matthew Smith is also providing an affidavit specifically addressing LCANZ challenge to the Commission's advice on the NDC.
8. In this affidavit I refer to a number of documents. I understand that some of these have already been provided to the Court by LCANZ, and others will be collated with material referred to by other witnesses for the Commission into a paginated supplementary bundle. I will refer to these documents by reference to those bundles. References in this affidavit will accordingly be to:
- 8.1 the Commission's Advice and Supporting Volumes, which have been combined together as a single paginated "Advice Bundle". The page references I will give will be to the page number at the top of each page (not the original page numbers, as these were not continuous in the original volumes);
 - 8.2 LCANZ's bundle of documents, referred to as "LBD" with the relevant page reference; and
 - 8.3 the Commission's supplementary bundle of documents, referred to as "CBD" with the relevant page reference.
9. I am authorised to provide this evidence on behalf of the Commission.
10. To the extent that my evidence includes matters of expert opinion, I confirm that I have read and agree to comply with the Code of Conduct for expert witnesses in Schedule 4 of the High Court Rules, and I confirm that the evidence I give is within the area of my expertise.

QUALIFICATIONS AND EXPERIENCE

11. I hold a Bachelor of Science with First Class Honours, majoring in chemistry, from the University of Otago, and a Master of Science in Environmental Technology with Distinction, specialising in environmental economics and policy, from Imperial College London.
12. I have been in my role as a Principal Analyst at the Commission since December 2019.
13. Prior to joining the Commission, I held the following roles:
 - 13.1 From 2018 – 2019 I was a Principal Analyst in the Agriculture Inquiry team at the Interim Climate Change Committee. In this role I led the development of the Interim Committee's advice on policy approaches to reducing agricultural emissions, emissions pricing design and analysis of free allocation options for agricultural participants.
 - 13.2 From 2013 – 2018, I was a Senior Policy Analyst in the Climate Markets Policy team at the Ministry for the Environment. My work at the Ministry focussed in large part on the New Zealand Emissions Trading Scheme (ETS). In particular I was the policy lead for the ETS review conducted over 2015 – 2017, resulting in government decisions to fundamentally reform the scheme, including removing the one-for-two surrender obligation and to implement a cap on emissions for the first time. I also led the delivery of content and organisation for three Asia-Pacific Carbon Market Roundtables. These were New Zealand-convened international meetings bringing together senior officials from regional jurisdictions for discussions aiming to lay the groundwork for a regionally-linked carbon market.
 - 13.3 From 2010 – 2013 I was the Global Operations Partnership Manager at CDP (formerly the Carbon Disclosure Project) in London, United Kingdom. CDP is an international, not-for profit organisation that runs the global disclosure system for investors, companies, cities, states and regions to disclose and manage their environmental impacts and risks.
 - 13.4 From 2002 – 2009 I was a Foreign Policy Advisor at the Ministry of Foreign Affairs and Trade. This involved various placements including Advisor in the Antarctic Treaty Policy team, a secondment to the Australian Department of

Foreign Affairs, Advisor on Trade and Environment and Trade and Labour in the Trade Negotiations Division and a posting at the New Zealand Embassy in Moscow.

14. This work history means that I have experience of a range of greenhouse gas accounting approaches used in different contexts. This includes organisational greenhouse gas accounting from my time at CDP, which runs a voluntary environmental reporting platform and holds the largest corporate emissions dataset. My work on carbon markets included examining the design of accounting mechanisms to safeguard environmental integrity when linking and trading across markets. Many of the policy problems addressed in the NZ ETS review were connected to misalignments between the accounting systems used in the NZ ETS and for New Zealand's national emissions reduction targets. Designing reform proposals included considering how to amend and manage NZ ETS settings for better alignment with national target accounting, including the new "averaging" accounting approach for post-1989 forests. This needed to take into account not only national level goals but also the effectiveness and practical realities for NZ ETS participants and those operating the ETS on day-to-day basis. At the Interim Climate Change Committee, I analysed how different emissions accounting approaches affected incentives for farmers to reduce emissions and the practicality of implementation in an emissions pricing system for agricultural emissions.
15. I have also undertaken formal training through the Greenhouse Gas Management Institute on organisational greenhouse gas accounting and on the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.¹
16. Overall this has given me a strong understanding of how greenhouse gas accounting systems are tailored for different purposes, and in particular of the interface between accounting and the implementation of policies and measures to reduce emissions.
17. My CV is at [•] of the CBD.

¹ IPCC *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (2006), available at <<https://www.ipcc-nggip.iges.or.jp/public/2006gl/>>.

ACCOUNTING FOR LAND EMISSIONS AND REMOVALS

18. Chapter 10 of *Ināia tonu nei* sets out the Commission's advice on the rules for measuring progress towards the emissions budgets and the 2050 target.² Further discussion of the Commission's analysis and reasoning is set out in Chapter 3 of the Supporting Volumes.³ One of the main areas of focus for the Commission's advice on the rules for measuring progress was how New Zealand should account for land emissions and removals.
19. In the Commission's Advice, "land emissions and removals" refers to greenhouse gas emissions and carbon dioxide removals (sequestration) by sources and sinks such as forests, vegetation, soils and wetlands. In the New Zealand Greenhouse Gas Inventory, these emissions and removals are referred to as "land use, land-use change and forestry" (LULUCF). Land emissions do not include any direct agricultural emissions such as those from livestock or fertiliser.
20. In this part of the affidavit I will provide an explanation of:
 - 20.1 the significance of land emissions and removals for emissions accounting;
 - 20.2 the evolution of accounting methodologies for land emissions and removals under the international framework; and
 - 20.3 the approaches New Zealand has taken to accounting for land emissions and removals under the Kyoto Protocol and the Paris Agreement.

General issues for land emissions accounting

21. Land emissions and removals require particular attention in the development of any accounting framework because the land sector has characteristics that make it different to other emitting sectors. Some of these characteristics are:⁴

² Climate Change Commission *Ināia tonu nei: a low emissions future for Aotearoa* (June 2021), Advice Bundle at 211 – 223.

³ Climate Change Commission *2021 Supporting Evidence: Chapter 3*, Advice Bundle at 470 – 506.

⁴ This list is drawn from an expert paper by Peter Iversen, Donna Lee and Marcelo Rocha *Understanding Land Use in the UNFCCC* (May 2014), available at <https://rportal.net/library/content/fcmc/publications/understanding-land-use-in-the-unfccc/Land_Use_Guide.pdf>.

- 21.1 Land use can act as a sink or a source: unlike other sectors, land use includes both emissions and removals of carbon dioxide.
- 21.2 Natural effects can be relatively large: the impact of droughts, floods, wind storms and wildfires on the net-balance of emissions and removals from land use can be significant and may in some years exceed the impacts of management practices on the same ecosystems.
- 21.3 It is difficult to separate natural and anthropogenic effects: land emissions and removals can be a consequence of management or of natural factors not under the control of humans. The Intergovernmental Panel on Climate Change (IPCC) recognises that distinguishing such causal factors in the land sector is difficult. For example, emissions from fires may originate from either natural causes (for example, climate cycles and lightning), or indirect and direct human causes (for example, past forest harvest activities, unintended spread of deliberately set fires or, in some parts of the world, climate change), or a combination of causes.
- 21.4 Trends can be cyclical: emissions from land use can experience regular cycles related to timber harvesting or replacement of perennial tree crop systems. Such cycles can cause difficulties if the length of time of a mitigation commitment (a target) is shorter than a full cycle, or if a single base year (that does not reflect the average emissions over one cycle) is used as a reference level, particularly for smaller countries that cannot average out effects over large areas of land.
- 21.5 Legacy effects: natural disturbances, past management decisions and other actions that affect the age distribution of forests (for example, harvesting or reforestation) can have a long-term effect on carbon fluxes for decades to hundreds of years.
- 21.6 Non-permanence: terrestrial carbon (carbon stored in living and dead organic matter), and in particular carbon sequestered that has entered an accounting system is not permanent, can be released back into the atmosphere at some point in the future. Natural disturbances such as fire and wind, or anthropogenic actions such as harvesting or deforestation can totally or partially release the carbon stored in a forest back into the atmosphere.

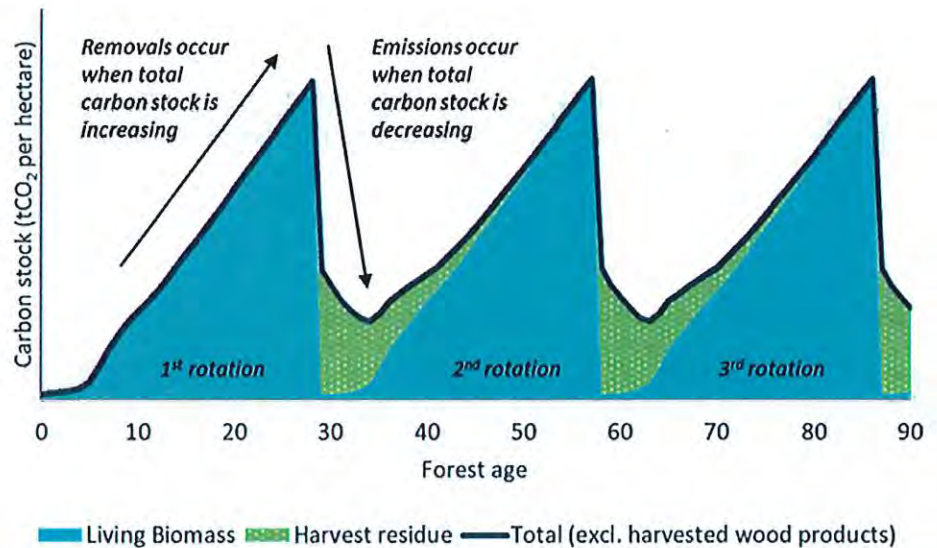
- 21.7 Uncertainties can be high: uncertainties as to the amount of removals or emissions associated with land use are significantly higher than those in the energy and industrial sector (although other gross emissions sources, particularly waste disposal and agriculture, can also have large uncertainties).
22. These features of the land sector can pose significant challenges for accounting and monitoring progress towards emissions targets. For example, if carbon sequestration by trees is used to compensate for emissions from sources such as burning fossil fuels, there is a need to address the potential non-permanence of those carbon removals in the accounting system. This is because carbon in biomass may only be stored for a few decades before being released back to the atmosphere, while the lifespan of a tonne of carbon dioxide emitted is hundreds of years, over which time it continues to contribute to warming.
23. Accordingly, the choice of the accounting framework to be applied to land emissions and removals is of particular importance for the integrity of any system that seeks to incentivise and monitor climate change mitigation. These issues have been acknowledged by Parties to international climate change agreements, and have therefore influenced the approaches developed for accounting for land emissions and removals in targets.

Significance of land emissions accounting for New Zealand

24. While the challenges with respect to accounting for land emissions arise generally, they, and in particular the issues of cyclical trends and legacy effects discussed above, are of high significance in the New Zealand context, for two main reasons.
25. First, and as was explained in the Commission's Supporting Volumes, there are features of New Zealand's production forests that mean that the cyclical nature of land emissions and removals is particularly pronounced.⁵ These features include:
- 25.1 The standard management regime for New Zealand's production forests involves short rotations and clear-fell harvesting. This means that the carbon stock of an individual forest plot follows a "sawtooth" pattern through time, as

⁵ Advice Bundle at 482 – 483.

illustrated in the following schematic graph. This gives a continual cycle of emissions and removals over each forest rotation for the forest plot.⁶

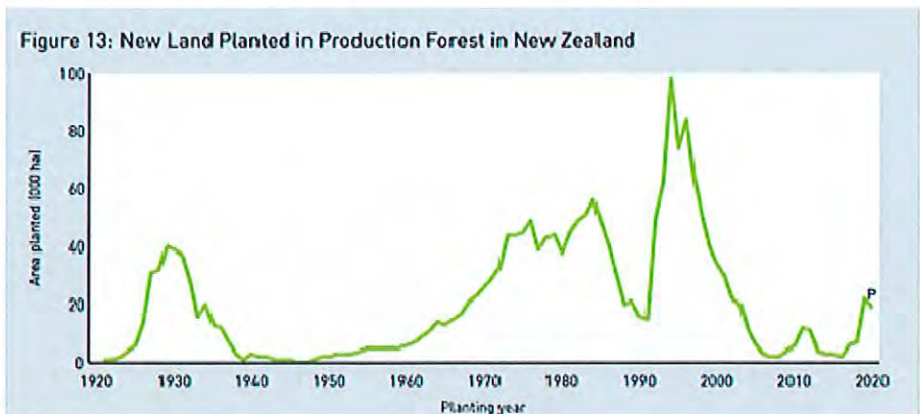


25.2 New Zealand has not had steady planting of production forests over time. Instead, there have been periods of significant planting followed by periods of much slower planting, resulting in an uneven age-class distribution of New Zealand's production forests. This is illustrated in the following two charts from the National Exotic Forest Description 2020 report:⁷

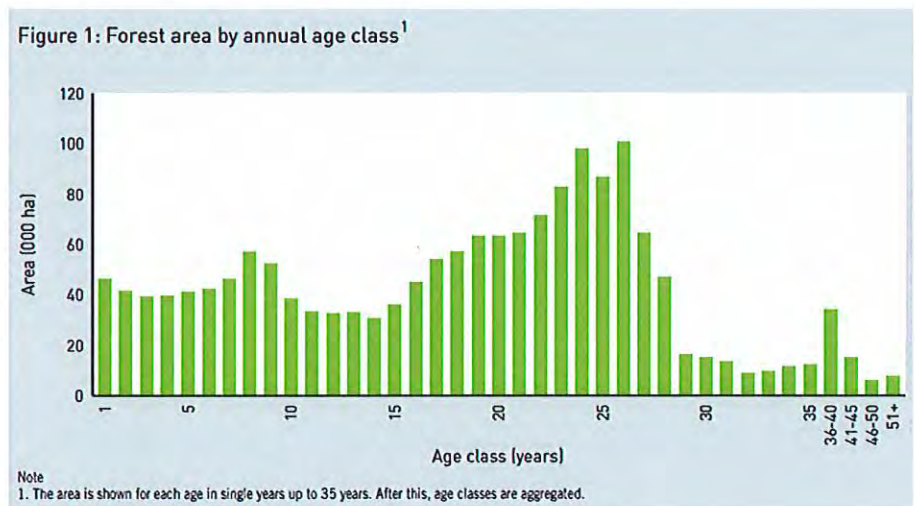
- (a) This first figure shows the varying rate of new production forest planting over time, with particularly high rates of planting in the 1990s followed by much lower rates in the 2000s.

⁶ In this schematic, note that the carbon stock does not return to the initial start point at the start of each new rotation. This is because of residual biomass left on-site following harvest (including litter, stumps and roots), which decays gradually as depicted by the green shaded area. It should also be noted that for simplicity, this schematic graph excludes any adjustment for carbon stored in harvested wood products (such as furniture, building materials and so on). Harvested wood product accounting assumes a proportion of the harvested biomass decays gradually over time rather than the carbon being instantaneously released, which is otherwise the assumption for emissions when a forest is harvested. When estimates of carbon stored in harvested wood products are included, the sawtooth pattern is slightly modified such that total carbon stock does not fall as deeply following harvest and the peak increases over successive rotations.

⁷ New Zealand Forestry Association *National Exotic Forest Description* (as at 1 April 2020) at 1 and 15, available at <<https://www.canopy.govt.nz/assets/content-blocks/downloads/43540-NEFD-2020-12-18-14-10.pdf>>.

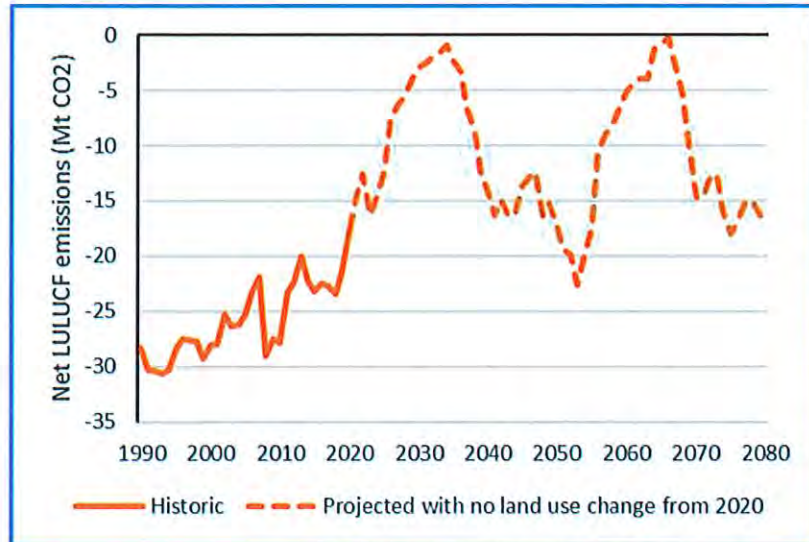


(b) This second figure shows the resulting age-class distribution of New Zealand’s production forests as at April 2020. This uneven age class means that there will be periods of higher and lower harvesting activity, in which production forests switch from being an emissions sink to an emissions source. New Zealand is currently approaching a harvesting peak as a large proportion of forests are near the typical harvest age of around 28 years.



- 26. Taken together, the uneven forest age-class distribution and the sawtooth harvest pattern for individual production forests means New Zealand’s land sector emissions and removals are subject to pronounced cyclical variations at the national level.
- 27. The figure below, using data produced by the Ministry for Primary Industries, shows projected land use emissions and removals under national inventory reporting with land use fixed from 2020 (that is, no change in the overall area of land used for forests, so no afforestation or deforestation occurring). The projection shows that the land

sector will have net removals (that is, net negative emissions), with the volume of removals projected to swing between approximately 20 MtCO₂ and 0 MtCO₂ over one 28-year harvest cycle.⁸



28. This swing is purely due to the projected harvesting and replanting of New Zealand’s current production forest estate. The timing of the swing is also worth noting: purely as a result of planting decisions made decades ago, the removals from the land sector are at their lowest near the end of New Zealand first NDC period (2030), and at their greatest around the 2050 zero carbon target date.
29. Second, the challenges relating to land emissions accounting are also of particular relevance in the New Zealand context because land emissions and removals play such a significant role in New Zealand’s emissions profile. For example, under national inventory reporting, removals by forests in 2018 were equal to around one third of New Zealand’s greenhouse gas emissions from all other sources (with the quantity expressed in CO₂e, meaning carbon dioxide equivalent⁹) and two thirds of the total carbon dioxide emissions.¹⁰

⁸ Note the graphic expresses these removals as negative emissions.

⁹ Carbon dioxide equivalent (CO₂e) is a measure used to aggregate the effects of different greenhouse gases with different warming properties. It does this by applying a conversion factor to describe the emissions of a particular gas in terms of the equivalent amount of carbon dioxide that would produce that warming effect.

¹⁰ Advice Bundle at 482.

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30. In other words, the scale of the 'swing' I have described of between approximately 20 MtCO₂ and 0 MtCO₂ over one harvest cycle needs to be understood in the context where New Zealand's carbon dioxide emissions from non-land sources are currently in the order of 35 MtCO₂ and total greenhouse gas emissions from all non-land sources are in the region of around 80 MtCO₂e. These two features mean that the cycle of land emissions and removals has a major impact on New Zealand's overall emissions profile. Indeed, the variations in emissions and removals from forests can "drown out" changes in other emissions activity in New Zealand. For example, fully halving New Zealand's gross carbon dioxide emissions from 2019 to 2030 (a reduction of 18.7 Mt CO₂) would be almost entirely cancelled out by the projected cyclical increase in net emissions from existing forests (an increase of 18.4 Mt CO₂).
31. This highlights the significant challenges posed by land emissions and removals for tracking progress in climate mitigation efforts in the New Zealand context. Without an appropriate accounting treatment, emissions reduction targets might be very easy to meet without any additional effort, or very difficult to meet, depending on where those targets fall in the forestry cycle. Paul Young for the Commission provides further analysis in his affidavit of the problems with using national inventory reporting to measure progress, as LCANZ is proposing.

Evolution of the international accounting framework to address issues with land emissions and removals

32. The international accounting framework has evolved over time to address the challenges posed by the land sector for measuring progress against emissions reduction targets. Similarly, the approach taken by New Zealand to accounting for land emissions and removals in emissions reduction targets has also evolved.
33. Below, I explain:
- 33.1 the approach that was taken by the international community to accounting for land emissions under the Kyoto Protocol and the evolution of this approach under the Paris Agreement; and
- 33.2 the approach New Zealand has taken to land emissions accounting under the Kyoto Protocol and the Paris Agreement.

Kyoto Protocol

34. As Stephen Walter explains in his evidence, the Kyoto Protocol was the first international agreement to introduce binding emissions reduction targets for individual countries, along with a corresponding framework for target accounting.¹¹
35. I explain below the key features of the greenhouse gas accounting methodology adopted under the Kyoto Protocol for the mandatory land-related components of Annex-1 Parties' emissions reduction targets.¹² These mandatory elements were all forestry-related: the activities of afforestation, reforestation and deforestation in the first commitment period, with the addition of forest management in the second commitment period.

Activity-based accounting

36. The Kyoto Protocol established a new accounting framework for land sector emissions and removals, known as an "activity-based approach". Unlike the greenhouse gas reporting under the United Nations Framework Convention on Climate Change (UNFCCC),¹³ which aims to include all estimated emissions and removals from land use, the Kyoto Protocol restricted the accounting of land emissions and removals to those resulting from specific activities.
37. The activity-based accounting approach for the land sector adopted under the Kyoto Protocol sought, in essence, to account only for the impact of *additional*, human-caused activities starting from the base year of 1990.¹⁴ It sought to exclude from the accounting the ongoing legacy impacts of activities that had occurred in the decades leading up to the base year, even though the effects of those past activities (in

¹¹ Kyoto Protocol to the United Nations Framework Convention on Climate Change 2303 UNTS 162 (opened for signature 16 March 1998, entered into force 16 February 2005). New Zealand signed the Protocol on 22 May 1998 and ratified the Protocol on 19 December 2002).

¹² Annex I Parties were developed countries (those countries who were members of the Organisation for Economic Cooperation and Development in 1992) and countries with "economies in transition" (the Russian Federation, the Baltic States, and several Central and Eastern European States). Their emissions reduction targets are listed in Annex B to the Kyoto Protocol.

¹³ United Nations Framework Convention on Climate Change 1771 UNTS 107 (opened for signature 4 June 1992, entered into force 21 March 1994). New Zealand signed the Convention on 4 June 1992 and ratified the Convention on 16 September 1993.

¹⁴ Countries with economies in transition were provided flexibility in the choice of base year.

terms of emissions and removals) would continue on for years to come. In this way, the accounting would measure and incentivise *changes in human activity* that governments could commit to and should be held accountable for.

38. In respect of forests, Article 3.3 of the Kyoto Protocol provided that Parties must account for emissions and removals related to:

38.1 afforestation and reforestation (that is, planting of new forests on land that did not contain forest at the start of the 1990 base year); and

38.2 deforestation (conversion of any forested land to a non-forested state).

39. In practice, this meant that that emissions and removals from new activities - afforestation, reforestation and deforestation - were all counted towards a Party's target. Where land was already forested at the start of 1990 however, this was put into the "baseline", and emissions and removals from the ongoing cycle of harvesting and replanting were not counted. Emissions and removals from this 1990 forest land were only counted if the land was subsequently deforested (that is, changed from a forest to some other use).

40. A change was made in the accounting for the second commitment period under the Kyoto Protocol (2013 – 2020). This introduced mandatory accounting for the activity of forest management (Article 3.4), which covers pre-1990 forest land. Here, emissions were accounted for relative to a reference level, such that the effects on emissions and removals due to changes from business-as-usual forest management practices are counted towards Parties' targets.¹⁵

¹⁵ In contrast to the earlier approach which excluded all emissions and removals from pre-1990 forest land, this approach factors out only expected business-as-usual emissions and removals. This encourages action to maintain and enhance the carbon stocks in these existing forests, and discourages deterioration in the way forests are managed. For example, if there was a change to production forests' typical rotation length that caused an overall increase or decrease in carbon stock as compared to the previous management regime (perhaps due to moving to using forests for bioenergy rather than timber, or due to improved tree genetics), that change in emissions or removals is calculated and counted towards targets. To address concerns such as uncertainty in the business-as-usual reference level, limits were placed on the maximum amount of removals that a Party could claim from forest management.

Gross-net and net-net targets

41. In conjunction with activity-based accounting for land emissions, the Kyoto Protocol specified rules around how land sector emissions and removals were to be incorporated into a Party's emissions target. These rules give rise to "gross-net accounting", with the emissions targets commonly referred to as "gross-net targets".
42. In this context, the terms "gross" and "net" have specific meanings:
 - 42.1 Gross emissions include total greenhouse gas emissions from agriculture, energy, industrial processes and product use and waste. Greenhouse gas emissions and removals from the land sector are excluded.
 - 42.2 Net emissions include all gross emissions land emissions and removals from the land sector.
43. The Kyoto Protocol accounting rules provided that:
 - 43.1 If a Party's land sector was a net sink of emissions in the base year (that is, it was responsible for more removals than emissions, as New Zealand's were), then the target would be calculated relative to gross emissions in the base year. That is, to measure progress against the target, net emissions in the target period (using the activity-based accounting approach) are compared against gross emissions in the base year.¹⁶
 - 43.2 If a Party's land sector was a net source of emissions in the base year (that is, it was responsible for more emissions than removals), then the target would be calculated relative to gross emissions plus emissions from deforestation in the base year. Net emissions in the target period are compared against this, meaning that a reduction in deforestation from the level in the base year would in effect receive credit.

¹⁶ The requirement to use gross-net accounting is within the text of the Kyoto Protocol itself. Article 3.7 requires that targets be set on the basis of the emissions categories listed in Annex B, which lists the categories of gross emissions, while only Annex I Parties for whom land-use change and forestry were a net source in 1990 must include land-use change (i.e. deforestation) emissions in the calculation of their target. Article 3.3 says that emissions and removals from specified forestry activities shall be used to meet the targets.

44. Most Parties fell into the first category meaning that gross-net accounting was the default approach, with Parties in the second category (notably Australia) being the exception. The approach for Parties in the second category is sometimes referred to as “net-net accounting” or a “net-net target”. However, it is important to clarify that in this case it is strictly only deforestation that is treated on a net-net basis, while afforestation is still treated on a gross-net basis (that is, net removals from afforestation and growth of existing forests are not included in the base year emissions).
45. These accounting rules were adopted to help address some of the issues with land emissions and removals highlighted in paragraph 21 above, particularly cyclical trends and legacy effects. The overall intent was that land emissions and removals resulting from actions taken prior to the base year were excluded from the accounting, and only emissions and removals resulting from land use change occurring since the base year would be counted towards targets.

New Zealand’s greenhouse gas accounting under the Kyoto Protocol

46. New Zealand was bound by Kyoto Protocol accounting rules for the first commitment period (2008 – 2012), and chose to continue to apply those rules for its 2013 – 2020 target taken under the UNFCCC.¹⁷ Accordingly, New Zealand’s 2008 – 2012 and 2013 – 2020 emissions reductions targets were set on a gross-net basis, and activity-based accounting was used to track progress against those targets.

Paris Agreement

47. Following the end of the second commitment period under the Kyoto Protocol in 2020, the period covered by nationally determined contribution (NDC) targets under the Paris Agreement began in 2021.¹⁸ As Stephen Walter outlines in his evidence, the accounting framework under the Paris Agreement offers considerably more flexibility compared to that under the Kyoto Protocol.

¹⁷ New Zealand took an emissions reduction target for the period 2013 – 2020 under the UNFCCC, rather than adopting a binding target under the Kyoto Protocol itself.

¹⁸ Paris Agreement (opened for signature 22 April 2016, entered into force 4 November 2016). New Zealand signed the Agreement on 22 April 2016 and ratified the Agreement on 4 October 2016.

Accounting for land emissions and removals under the Paris Agreement

48. The Paris Agreement is not prescriptive as to the type of targets that countries should set as their NDCs, nor the accounting methodologies that Parties should apply to account for their NDCs – though broad principles are provided for. Accordingly, countries are provided with significant latitude with respect to how they should account for emissions and removals from the land sector.
49. In part due to the flexibility in setting NDCs and the diversity of associated accounting approaches, in communicating their NDCs Parties are required to provide information to facilitate clarity, transparency and understanding.¹⁹ One of the elements to be covered, if applicable, is the approach used to address the effects of age-class structure in forests. This highlights that the issues arising from forest age class distributions are acknowledged among Parties and recognised as an area where accounting methods may vary.²⁰

New Zealand's approach to accounting for land emissions and removals under the Paris Agreement

50. The New Zealand government communicated the high-level approach that it will take to accounting for land emissions and removals under its first NDC as part of its communication of the NDC in October 2016.²¹ This high-level approach was confirmed and expanded upon in the communication of New Zealand's updated first NDC on 4 November 2021.²²
51. The full details of the accounting approach New Zealand will apply to its first NDC will be reported in New Zealand's first communication under the Paris Agreement (being

¹⁹ As per Article 4, paragraph 8 of the Paris Agreement and further elaborated by decision 4/CMA.1: UNFCCC *Decision 4/CMA.1 Further guidance in relation to the mitigation section of decision 1/CP.21 FCCC/PA/CMA/2018/3/Add.1* (15 December 2018), available at: <https://unfccc.int/sites/default/files/resource/4-CMA.1_English.pdf>.

²⁰ This is also demonstrated in the Paris Agreement transparency framework, see paragraph 75(d)(iii) of the annex to Decision 18/CMA.1: UNFCCC *Decision 18/CMA.1 Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement FCCC/PA/CMA/2018/3/Add.2* (December 2018), available at <https://unfccc.int/sites/default/files/resource/cma2018_3_add2_new_advance.pdf>.

²¹ *New Zealand Submission under the Paris Agreement: New Zealand's Nationally Determined Contribution* (October 2016), LBD at 8.

²² *New Zealand Submission Under the Paris Agreement: New Zealand's first Nationally Determined Contribution – Updated 4 November 2021* (4 November 2021), CBD at [•].

the submissions of the first biennial transparency report and national inventory report), at the latest by 31 December 2024.

52. As communicated in October 2016, and confirmed and expanded upon in November 2021, New Zealand will use a modified version of the Kyoto Protocol rules, known as a “modified activity-based approach”, to account for emissions and removals from land for its first NDC under the Paris Agreement. The key change to the approach taken under Kyoto is the introduction of “averaging” for new forests planted post-1989 once they reach their long-term average carbon stock (some refer to the measure therefore as “Kyoto with averaging”).
53. New Zealand’s production forests reach their ‘long-term average carbon stock’ at around 23 years after planting, for an average rotation length of 28-years.²³ At this point, the amount of carbon stored in the forest is at the level that it will on average contain over multiple harvest cycles. That is, in some years it will contain more carbon than this level, when it is mature (closer to 28 years old), and in some years will contain less carbon (when it is recently harvested or immature), but on average will store that quantity of carbon.
54. As outlined in New Zealand’s updated first NDC, communicated on 4 November 2021:
- 54.1 New Zealand’s accounting for the land sector will be based on a combination of the 2006 IPCC *Guidelines for Greenhouse Gas Inventories* and the 2013 IPCC *Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol* (also known as the “Kyoto Protocol Supplement”).²⁴
- 54.2 The core assumptions of the accounting approach for the land sector will be as follows:²⁵
- (a) *Post-1989* forests (that is, “forests established from the 1990 activity start year”) will continue to be accounted for as they would under the Kyoto Protocol, but once they attain their long-term average carbon

²³ This includes the contribution of harvested wood products to the total carbon stock.

²⁴ CBD at [•].

²⁵ CBD at [•].

stock, the forest will be transferred to the “baseline” where it will be accounted for in the same way as pre-1990 forests.

(b) New Zealand will continue to account for all deforestation emissions (that is, any land changed from forest to other uses, regardless of whether the forest pre or post-dates the 1990 activity start year).

(c) *Pre-1990 forests* (that is, “forests established before the activity start year”) will continue to be accounted for under a business-as-usual reference level, as per the Kyoto Protocol.²⁶

55. The communication also explains some of the rationale for the adopted accounting approach for land emissions and removals:²⁷

New Zealand’s forestry and other land use approach builds on experience with accounting under the Kyoto Protocol to recognise and focus on additional action, and will create incentives for the establishment of new forests, recognise permanent, long-term enhancements of carbon sinks resulting from management, and take responsibility for deforestation, while accommodating the long-term cycles in net emissions and removals that arise from sustainable forest management of production forests.

56. The Commission’s Supporting Volumes, Chapter 3 also provides an explanation of the key details of the accounting approach that New Zealand has communicated for its first NDC (though noting that this was published prior to the updated NDC being communicated in November 2021):²⁸

A key feature of the [modified activity-based approach] that distinguishes it from our previous Kyoto Protocol approach is that it will use ‘averaging’ to account for emissions and removals from afforestation and reforestation.

Averaging means that removals from post-1989 forests will only be accounted for up until the forests reach their long-term average carbon stock, taking into account all carbon pools and activities. Emissions and removals from further growth, harvesting and replanting will not be accounted for in the same way, although deforestation emissions will still be accounted for in full using stock change accounting.

Averaging thereby focuses on the long-term effect of a forest on carbon stocks. This contrasts with the stock-change approach used in our national inventory reporting and accounting for previous emissions reduction targets, which results in significant fluctuations in net emissions due to harvest cycles. Averaging smooths the long-term

²⁶ See footnote 15 above, which explains the concept of accounting for forest management activities in pre-1990 forests using a business-as-usual reference level.

²⁷ CBD at [•].

²⁸ Advice Bundle at 486.

net emissions trajectory of exotic production forests by factoring out the 'saw-tooth' peaks and troughs associated with these forests.

Once a post-1989 forest has reached its long-term average it is expected to be transferred to a forest management category, where future additional emissions or removals will be accounted against a reference level.

57. In essence therefore, the modified activity-based approach is designed to “smooth out” the harvest and re-growth cycles of New Zealand’s production forests over time. The approach means that removals from new forests will be credited against the target up to their long-term average carbon stock only. Once the average carbon stock has been reached, there will be no further credits or debits for business-as-usual forest management activities, including harvesting, so long as the land is kept in forest. Essentially, once a forest reaches its long-term average carbon stock, it is treated in the same way as pre-1990 forest under the Kyoto Protocol.
58. The effect of the modified activity-based approach on the saw tooth cycle of a forestry plot is demonstrated in Figure 3.1 from Chapter 3 of the Commission’s Supporting Volumes.²⁹

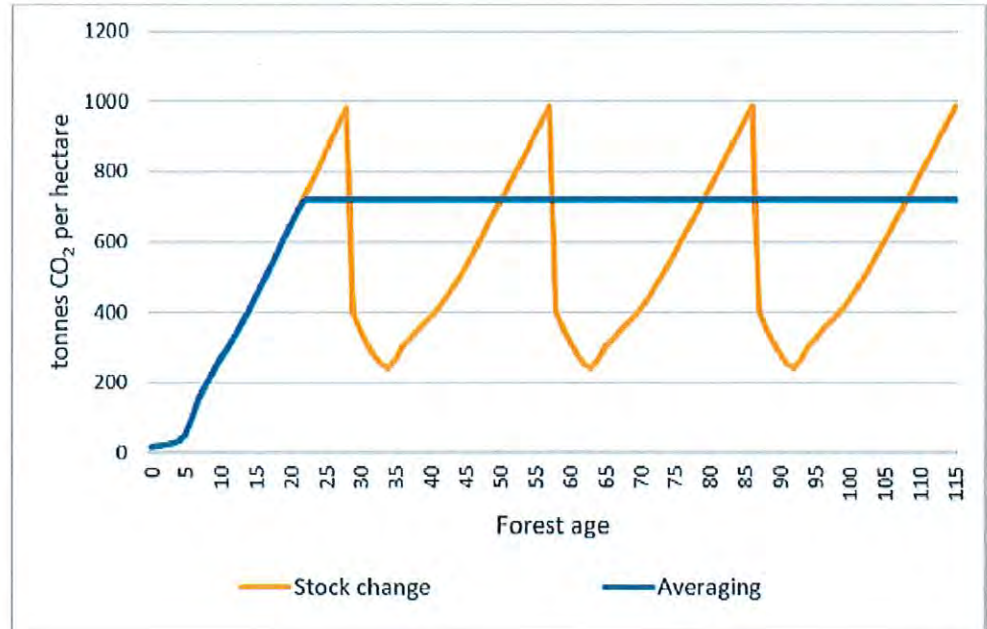


Figure 3.1: Forestry removals accounting under stock change and averaging for a production forest (excluding HWPs). Numbers for purposes of showing pattern only.

59. The modified activity-based approach factors out the cyclical trends from harvest and re-planting of production forests, to ensure that only long-term enhancements to New Zealand’s forest carbon stocks are counted towards New Zealand’s progress to meeting its NDC target.

THE COMMISSION’S ADVICE ON THE RULES FOR MEASURING PROGRESS FOR LAND EMISSIONS AND REMOVALS

60. It was against this background that the Commission developed its advice for government on the rules that will apply to measure progress towards meeting emissions budgets and the 2050 target, in particular the Commission’s advice on how New Zealand should account for land sector emissions and removals.
61. The Commission’s advice was that the government should adopt a modified activity-based approach for accounting for land emissions, similar to the approach that has been adopted by government for New Zealand’s first NDC under the Paris Agreement.³⁰ The Commission did not simply adopt this approach because it was already in use however: the Commission considered it was important to examine the accounting rules for the emissions budget and the 2050 target on a first principles basis.³¹
62. I now turn to outline the Commission’s approach and the reasons why the Commission adopted the modified activity-based approach as its preferred approach.

National inventory reporting vs modified activity-based approach

63. The Commission considered two main alternatives for monitoring the land sector:³²
- 63.1 The first option was national inventory reporting. This was referred to in the Commission’s Advice and Supporting Volumes as a “land based” approach that uses the “stock change” accounting method for both pre-1990 and post-1989 forests”. Other short-hand terms are also used in the Advice, which can be a bit confusing, such as GHGI accounting. LCA NZ

³⁰ Advice Bundle at 212, 216 – 218 and 223.

³¹ In this regard, see the discussion of the high-level objective and principles to guide accounting choices adopted by the Commission: Advice Bundle at 213 and 474 – 475.

³² Advice Bundle at 215 – 216 and 484 – 489.

refer to this measure as the “GHGI net measure”. National inventory reporting is the approach used in New Zealand’s Greenhouse Gas Inventory for reporting emissions under the UNFCCC.

63.2 The second option was the modified activity-based approach. This is also referred to in the Advice as “NDC accounting”. This is the accounting approach that has been adopted by government for New Zealand’s first NDC under the Paris Agreement, and is a modified version of the approach mandated for New Zealand under the Kyoto Protocol. This is based on the approach used in New Zealand’s Greenhouse Gas Inventory for its reporting under the Kyoto Protocol, and will be used by the Inventory for reporting on the NDC under the Paris Agreement.

64. Data on gross and net emissions for each of these approaches will accordingly be available in the New Zealand Greenhouse Gas Inventory reports.

National inventory reporting

65. National inventory reporting is the approach used in New Zealand’s greenhouse gas inventory for reporting under the UNFCCC.³³

66. The national inventory reporting approach attempts to cover all emissions and removals from all land-use categories, including soil, trees, plants, biomass and wood products. It aims for completeness – reporting on all emissions and removals for each land type without any exclusions or limitations as to the timing or nature of the human activities that cause them.³⁴

67. The national inventory reporting approach reports land emissions using a “stock change” approach that estimates emissions and removals as they happen, including the effects of historical activities such as the regrowth of previously harvested natural forests and the cyclical peaks and troughs caused by the growth and harvest of exotic production forests.³⁵

³³ Advice Bundle at 215 and 484 – 489.

³⁴ Advice Bundle at 215 and 484.

³⁵ Advice Bundle at 215 and 484.

68. The Commission’s Advice and Supporting Volumes explained that by trying to record emissions and removals when they occur, the national inventory reporting approach gives in theory a “truer representation of what the atmosphere sees”.³⁶ It is important to clarify however that there is a significant caveat to this point. That is, that the national inventory reporting measure gives a “truer representation of what the atmosphere sees” *in a particular year*. As is discussed further below, what the atmosphere sees in a particular year is not necessarily indicative of longer-term trends, nor additional or enduring effort in terms of emissions reductions (or conversely, emissions increases).

Modified activity-based approach

69. The modified activity-based approach is the accounting approach that has been adopted by government for New Zealand’s first NDC, described above. As explained in the Advice:³⁷

This accounting approach uses a smaller subset of activities and land types than the [national inventory reporting] approach. It focuses on significant sources and sinks whose emissions can be most affected by changes to people’s behaviour now. It does this by filtering out the effects of past actions, such as regrowth of previously harvested native forests.

This approach will be used for the country’s first NDC. The NDC will account for land areas and uses corresponding to the afforestation, reforestation, deforestation and forest management activities accounted for in the country’s 2020 target covering the second commitment period of the Kyoto Protocol, 2013-2020. It is not yet known if the NDC will include the land areas or uses related to the activities of cropland management, grazing land management, revegetation or wetland drainage and rewetting.

The NDC will use ‘averaging’ to account for afforestation and reforestation of post-1989 forests. This approach smooths out the cyclical peaks and troughs in emissions due to harvesting of post-1989 exotic production forests. It does this by accounting for removals only up until the forests reach their long-term average carbon stock. This occurs around 23 years after planting for a production pine forest on a 28-year rotation (if harvested wood products are included). Averaging focuses on the long-term effect of these forests on carbon stocks.

Commission’s preferred approach: the modified activity-based approach

70. I now turn to the reasons why the Commission advised that the government should adopt the modified activity-based approach in accounting for land emissions under the budgets and 2050 target. That is, the approach already selected as the accounting

³⁶ Advice Bundle at 215 and 484.

³⁷ Advice Bundle at 215. See also at 484 – 489.

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approach for New Zealand's first NDC. This is discussed in detail by the Commission in Chapter 10 of the Advice and Chapter 3 of the Supporting Volumes.³⁸

71. As I have said, the Commission considered it was important to examine the accounting rules for the emissions budget and the 2050 target on a first principles basis. In order to do this, the Commission set a high-level objective for the overall goal of the system, as well as principles for accounting.³⁹ The high-level objective adopted by the Commission was to ensure: "A robust, transparent accounting system that tracks genuine environmental gains while balancing completeness with practicality".⁴⁰

72. The principles adopted by the Commission provided that accounting for emissions budgets and the 2050 target should:

72.1 Seek to cover all material human caused emissions sources and sinks.⁴¹

(a) This means that accounting should strive for completeness – aiming for full coverage of human caused sources, sinks and gases across all geographic areas. This parallels Paris Agreement expectations. This needs to be balance by materiality – IPCC guidance recognises that it is acceptable to prioritise more significant sources and sinks.

72.2 Be grounded in robust science and evidence.⁴²

(a) This means that accounting should reflect the current state of scientific knowledge, drawing on IPCC assessments and guidance. It should be informed by and use evidence and methods appropriate to New Zealand. New methods and recalculations which improve emissions estimates should be encouraged. These should, however, be subject to independent expert peer review with governance arrangements to oversee approval of the changes.

72.3 Send a clear signal for climate action.⁴³

³⁸ Advice Bundle at 211 – 223 and 470 – 506.

³⁹ Advice Bundle at 213 and 474 – 475.

⁴⁰ Advice Bundle at 213 and 474.

⁴¹ Advice Bundle at 213 and 474 – 475.

⁴² Advice Bundle at 213 and 474 – 475.

⁴³ Advice Bundle at 213 and 474 – 475.

- (a) A key purpose of emissions budgets and the 2050 target is to drive the policies and actions needed in New Zealand to transition to a low-emissions economy and contribute to limiting climate change. Accounting for these targets should therefore focus on distinguishing the lasting changes in emissions resulting from human actions, rather than capturing variations or changes which cannot be influenced by changing human behaviour now or into the future. It is important to consider how accounting would inform and interact with policy in terms of the mitigation that is recognised. The intent of policy is to encourage actions that are additional, in the sense of driving change from what would happen under business-as-usual.

72.4 Be accurate and reduce uncertainty as far as practicable.⁴⁴

- (a) This means that accounting approaches should be accurate and reduce uncertainty as far as practicable. This will help emissions budgets fulfil the goal of providing greater predictability. Some accounting methods rely on counterfactual projections (that is, measuring emissions or removals against a baseline projected into the future). These methods involve significant accuracy and uncertainty challenges and should be avoided where possible. If they must be used, there should be careful consideration of how to minimise risks of over or underestimation to avoid windfall gains or unpredictable fluctuations.

72.5 Be transparent, practical and acceptable.⁴⁵

- (a) Transparency involves clearly explaining and documenting assumptions and methods, ideally so non-experts can understand how progress is tracking.
- (b) Practicality means considering compatibility with existing accounting methods and the resources needed for implementation.

⁴⁴ Advice Bundle at 213 and 474 – 475.

⁴⁵ Advice Bundle at 213 and 474 – 475.

- (c) Acceptability relates to international perceptions and comparability with other countries. Using recognised methodologies and formats, including IPCC guidelines, can help with this. International greenhouse gas accounting practices or obligations are not static, however – they evolve over time as knowledge and experience grows. New Zealand can influence this process and shape the international rules, rather than just being a rule-taker. This means we should not shy away from using new accounting methods where there is a strong case for doing so, even if this conflicts with established practices.

72.6 Be consistent and maintain the integrity of the targets.⁴⁶

- (a) Consistency means coherence over time and avoiding inconsistencies such as double counting. Accounting methods and coverage can evolve as techniques and data improve, but the same methods and data sets should be used across a time series, with updates applied across all years. This should be done, however, in a way which does not weaken the effect of the targets. In other words, accounting changes should not be used to avoid the level of effort committed to when the 2050 target or emissions budgets were adopted. This means that if major changes to accounting occur, it may be necessary to review the 2050 target.

73. The Commission explained that together, the objective and principles provide a framework to allow options and trade-offs to be understood and to inform decisions about accounting rules, including where the principles need to be balanced against each other.⁴⁷

74. Guided by the high-level objective and these principles, the Commission considered that the modified activity-based approach was a more suitable accounting approach for land emissions and removals than the national inventory reporting approach.⁴⁸

75. The Commission set out its reasoning as follows in the Advice:⁴⁹

⁴⁶ Advice Bundle at 213 and 474 – 475.

⁴⁷ Advice Bundle at 213 and 474 – 475.

⁴⁸ Advice Bundle at 212, 216 – 218 and 223.

⁴⁹ Advice Bundle at 216 – 218.

- 32 **Coverage of material emissions sources and sinks:** The [national inventory reporting] approach's main advantage is that it covers more sources and sinks than the modified activity-based NDC approach. The NDC currently only includes forest-related activities, although its scope could be expanded.
- 33 **Sending a clear signal for climate action:** the [national inventory reporting] approach performs worse against this principle than the modified activity-based approach, primarily due to its use of stock-change accounting for forests. This results in significant fluctuations in net emissions due to harvest cycles. These are temporary and obscure underlying, more enduring trends, confusing policy and price signals about the action needed. These fluctuations also make it easier to reach net zero but difficult to maintain it after 2050. As shown in Figure 10.1, government projections indicate that after a peak in removals around 2050, harvesting would cause forestry emissions to increase. In the NDC's modified activity-based accounting, averaging smooths out the fluctuations. This makes it clear that Aotearoa needs to plant new forests and reduce deforestation to contribute to longer-term emissions reductions.
- 34 **Consistent and maintains integrity of targets:** Activity-based accounting is consistent with the analysis that informed the 2050 targets. Using [national inventory reporting] accounting would reduce the effort to achieve the targets, undermining the commitment made when it was set.
- 35 **Accuracy and reducing uncertainty:** The [national inventory reporting] approach results in emissions estimates with higher overall uncertainty. Reasons for this include: having to combine carbon stock gains and losses, each with their own uncertainty, to determine net change; estimating uncertain factors related to the management of production forests such as harvest age and area; and including some land areas with highly uncertain emissions factors such as wetlands. As an example, pre-1990 production forests introduced uncertainty of $\pm 61.4\%$ into the inventory land emissions estimates for 2019. Netting off significant amounts of land emissions with high uncertainties against gross emissions with much lower uncertainties is problematic.

76. The Commission also set out a detailed chart comparing the two alternative approaches Table 3.6 in Chapter 3 of the Supporting Volumes. This is reproduced below:⁵⁰

Table 3.6: Assessment of the two land emissions accounting frameworks against the Commission's principles for emissions budget accounting

Principles	Land-based (GHG Inventory, using stock change accounting for post-1989 forests)	Modified activity-based (NDC accounting with averaging accounting for post-1989 forests)
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<p>Coverage of material sources and sinks</p>	<p>✓✓</p> <p>Covers all human caused sources and sinks.</p> <p>Also includes non-human caused sources and sinks such as standing stocks of tall, natural forest.</p>	<p>✓</p> <p>Selecting 'activities' or a limited set of land areas often involves the exclusion of some human caused sources and sinks, but these are usually those that are difficult to measure or small in magnitude.</p> <p>Can be extended to include more activities or land areas over time.</p>
<p>Robust science and evidence</p>	<p>✓✓</p> <p>Based on detailed IPCC guidance and subject to international peer-review through UNFCCC processes.</p> <p>Extensive expertise already exists in Aotearoa for compiling and reporting data.</p>	<p>✓✓</p> <p>Based on IPCC guidance.</p> <p>Extensive expertise already exists in NZ for compiling and reporting data for the most significant activities.</p>
<p>Signal for climate action</p>	<p>✗</p> <p>Inclusion of all sources and sinks without a base year creates noise by mixing the legacy effects of historic activities with the additional impact of new actions.</p> <p>Stock change approach introduces large emissions fluctuations due to production forest harvest cycles that obscure progress towards targets and reduce incentives for sustained action.</p>	<p>✓</p> <p>Accounting for activities after the 1990 base year reduces much of the noise from harvest and replant cycles of forests planted before the base year. Although the 1990 base year is arbitrary, it is now widely embedded and brings focus to the additionality of new actions and the need for behaviour change now.</p> <p>Averaging partially reduces the remaining fluctuations caused by harvest cycles and is being implemented into the New Zealand Emissions Trading Scheme (NZ ETS) where it is considered to give a better incentive to landowners or managers making decisions about planting new forests.</p> <p>Changes in the harvest age may create emissions fluctuations in a growing area of post-1989 forests that have surpassed the long-term average. This could interfere with policy and price signals to reduce emissions.</p>
<p>Accurate and reduces uncertainty</p>	<p>✓</p> <p>While accurate methods are used to account for what is included, some of the sources and sinks have particularly high uncertainties that increase the overall uncertainty of land emissions estimates.</p>	<p>✓✓</p> <p>Focusing on the most significant activities and their long-term effects on emissions reduces the need for uncertain data inputs such as harvest age profile. Some of the more uncertain sources and sinks are generally excluded.</p>
<p>Transparent, practical and acceptable</p>	<p>✓✓</p> <p>Practical as already in use by Government and is widely accepted as an international common practice through UNFCCC reporting.</p>	<p>✓✓</p> <p>Practical as already in use by Government and is widely accepted as an international</p>

	Significant detail on the process exists for purposes of transparency, although it is technical and not readily understood by the public.	common practice through the Kyoto Protocol. Significant detail on the process exists for purposes of transparency, although it is technical and not readily understood by the public.
Consistent and keeps integrity of target	x The inclusion of significant net emissions removals over and above what was considered in the analysis underpinning the 2050 target would reduce the level of effort required.	✓✓ This was the basis for the analysis underpinning the 2050 target analysis so a comparable level of effort would be maintained.

77. In brief, the Commission considered that the modified activity-based approach performed better than the national inventory reporting approach with respect to the following principles:⁵¹

77.1 signal for climate action;

77.2 accurate and reduces uncertainty; and

77.3 consistent and keeps integrity of the target maintained.

The Commission also considered that the modified activity-based approach performed as well as the national inventory reporting approach with respect to the principles that the accounting should be grounded in robust science and evidence; and be transparent, practical and acceptable.⁵²

78. The Commission considered that due to the challenges posed by land sector emissions and removals for New Zealand’s accounting, particularly as a result of the age classes and harvest cycles of production forestry, a modified activity-based approach would provide the proper focus “on the impact people's decisions have on emissions now and into the future, rather than rewarding or penalising decisions made in the past”.⁵³ The averaging involved in the modified activity-based approach in particular would provide

⁵¹ Advice Bundle at 216 – 218 and 490 – 491

⁵² Advice Bundle at 216 – 218 and 490 – 491

⁵³ Advice Bundle at 212.

“steady and predictable emissions estimates for these forests that reflect their enduring, long-term effect on carbon stocks, rather than temporary fluctuations”.⁵⁴

79. It is also relevant to note that the Commission’s Advice relates to the first three emissions budgets, covering the period 2022-2035. In 2024, the Commission will advise on the fourth emissions budget covering 2036-2040. At that time, the Commission will have the opportunity to revise its recommendations on accounting for the second and third emissions budgets, if this is warranted by developments in knowledge or accounting methods.
80. In this regard, the Commission identified several areas for further work to expand the options available for the accounting for emissions budgets and the 2050 target.⁵⁵ For example, the Commission indicated that while it does not see the national inventory reporting approach as appropriate for accounting for emissions and removals by New Zealand’s exotic production forests, it remains open to the possibility of using it in accounting for other sources and sinks, such as pre-1990 natural forests. It therefore recommended that government accounting experts undertake technical work to examine the feasibility of combining the national inventory reporting approach with the modified activity-based approach for production forests, to enable this to be considered for the Commission’s next advice on accounting in 2024.⁵⁶

Affirmed

Renee Eva Murray

At Wellington this 10th day of December 2021

before me:



Hana Khan
Solicitor, Wellington



A Solicitor of the High Court of New Zealand

⁵⁴ Advice Bundle at 212.

⁵⁵ Advice Bundle at 218 – 220 and 492 – 495.

⁵⁶ Advice Bundle at 213.