Ministry for the Environment
Manatū Mō Te Taiao

PO Box 10362, Wellington 6143
Website: www.mfe.govt.nz
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18-D-02217

s 9(2)(a) [redacted]

Dear s 9(2)(a) [redacted]

Thank you for your request lodged via the FYI website on 21 September 2018 in which you requested the following information under the Official Information Act 1982 (OIA):

1. *Does MfE have any documents, correspondence, computer models or other information that shows what New Zealand's total Carbon Sequestration from forests could be? (pre and post 1990 forests included)*

2. *Does MfE have any documents, correspondence, computer models or other information that comments on whether New Zealand would be a net contributor to global warming?*

3. *Does MfE have any documents, correspondence, computer models or other information that contains discussion on the merits or otherwise of including pre-1990 forest in New Zealand GHG budget.*

The scope of your questions was discussed and refined in a phone conversation and email correspondence with Nigel Searles. It was agreed that the sequestration of pre-1990 forests and post-1989 forests was to be considered in scope. This includes projected forestry emissions and removals, and publically available information on our projections and targets.

You also expressed interest in naturally regenerating forests and it was agreed that the Ministry would provide links to publically available information that describes how the estimates are derived and used in New Zealand's Greenhouse Gas Inventory Report.

We also agreed to provide a decision document around the selection of the forestry ruleset for the 2030 target along with publically available information on the 2030 target forestry ruleset.

Q1.

New Zealand's Greenhouse Gas Inventory 1990-2016 is the most recent official annual report of all anthropogenic (human-induced) emissions and removals of greenhouse gases in New Zealand. Chapter 6 documents the greenhouse gas fluxes occurring within the Land Use, Land-Use Change and Forestry (LULUCF) sector. The fluxes are separately reported for forest land and harvested wood products, as well as the other land use categories we are required to report on. Table 6.1.1 provides the total emissions and removals by category for the years 1990 and 2016.

The full report can be found here:

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www.mfe.govt.nz/climate-change/state-of-our-atmosphere-and-climate/new-zealands-greenhouse-gas-inventory

When calculating the net effect of the LULUCF sector on emissions, all land use categories need to be included. The forest land category cannot be considered in isolation because it would exclude other relevant categories. For example, emissions from harvested wood products and deforestation are reported in different categories.

You also expressed interest in understanding the status of our naturally regenerating forests. There are two publically available journal articles detailing the methods used to derive the estimates used in New Zealand's Greenhouse Gas Inventory report and can be found here:

Holdaway, R.J., Easdale, T.A., Carswell, F.E., Richardson, S.J., Peltzer, D.A., Mason, N. W.H., Brandon, A.M., Coomes, D.A. Ecosystems 2017 20, 944-959. www.link.springer.com/article/10.1007%2Fs10021-016-0084-x

Beets, P.N., Kimberley, M.O., Paul, T.S.H., Oliver, G.R., Pearce, S.H., Buswell, J.M. The Inventory of Carbon Stocks in New Zealand's Post-1989 Natural Forest for Reporting under the Kyoto Protocol. Forests 2014, 5, 2230-2252. www.mdpi.com/1999-4907/5/9/2230

Please note, not all of New Zealand's natural forests are a net carbon sink. The majority of our natural forests are mature and in steady state.

Q2.

As mentioned in our previous correspondence to you on similar questions, key findings in New Zealand's Greenhouse Gas Inventory 1990–2016 report (for the full report follow the link provided above in Q1) are:

- New Zealand's gross greenhouse gas emissions were 78,727 kilotonnes carbon dioxide equivalent (kt CO2-e) in 2016.
- New Zealand's net greenhouse gas emissions (including land-use and forestry) were 55,953.3 kt CO2-e in 2016.

This means that in the year 2016, New Zealand emitted more greenhouse gases to the atmosphere than were removed.

The LULUCF sector was a net sink and offset 29 per cent of New Zealand's gross emissions in 2016.

Q3.

The attached document produced by the Ministry for Primary Industries indicates options for New Zealand's contribution from forestry and land use post-2020.

We have also attached a worksheet with estimated and projected LULUCF removal scenarios out to 2050. Please note that these projections do not currently include the impact of the Governments One Billion Trees programme. Furthermore, these estimates are also anticipated to change over time due to improvements in methods and data collection.

In your previous requests you have been provided information on New Zealand's contribution to the Paris agreement. These are communicated in New Zealand's Nationally Determined

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Contribution (NDC) and the accompanying addendum which have both been published online. The NDC can be found here:

http://www4.unfccc.int/ndcregistry/PublishedDocuments/New%20Zealand%20First/New%20Zealand%20first%20NDC.pdf

and the addendum can be found here:

http://www4.unfccc.int/submissions/INDC/Published%20Documents/New%20Zealand/1/NZ%20INDC%20Addendum%2025%2011%202015.pdf

There are seven documents within the scope of your request and these are listed in the table below. I am withholding five of these under section 18(d) of the Act as they are publicly available at the links provided above.

The Ministry for the Environment will release responses to some selected requests for official information on our Official Information Act requests page soon after the requester has received their response.

Our website also provides further information on our emissions, projections and targets out to 2030 under various forestry rulesets and can be found here:

http://www.mfe.govt.nz/climate-change/what-government-doing/emissions-reduction-targets/understanding-our-targets

You have the right to seek an investigation and review by the Ombudsman of this decision. Information about how to make a complaint is available at www.ombudsman.parliament.nz or free phone 0800 802 602.

If you have any queries, please feel free to contact our Executive Relations team.

Yours sincerely,

Roger Lincoln
Director Climate Change

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List of documents

Document no.	Document date	Content	Decisions	OIA sections applied
1	12 April 2018	Report: New Zealand's Greenhouse Gas Inventory 1990-2016	Withhold in full	Section 18(d)
2	28 November 2016	Journal article: Nationally Representative Plot Network Reveals Contrasting Drivers of Net Biomass Change in Secondary and Old-Growth Forests	Withhold in full	Section 18(d)
3	19 September 2014	Journal article: The Inventory of New Zealand's Post-1989 Natural Forest for Reporting under the Kyoto Protocol	Withhold in full	Section 18(d)
4	31 May 2015	Report: Post-2020 Forestry and Land Use Options for New Zealand's 2015 Contribution	Release in part	Section 9(2)(j), Section 6(a), Section 9(2)(g)(i), Section 6(e)(iv), Section 9(2)(ba)(i)
5	11 September 2017	Excel Workbook: LULUCF projections for New Zealand's 7th National Communication to the UNFCCC	Release in full	
6	5 October 2016	Submission: Submission under the Paris Agreement New Zealand's Nationally Determined Contribution	Withhold in full	Section 18(d)
7	25 November 2015	Submission: Submission to the ADP Addendum to New Zealand's Intended Nationally Determined Contribution	Withhold in full	Section 18(d)

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Document 1

Ministry for Primary Industries
Manatū Ahu Matua

Post-2020 Forestry and Land Use

Options for New Zealand's 2015 Contribution

Restricted – Not Government Policy

Draft for consultation – 31 May 2015

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Ministry for Primary Industries

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Executive Summary

The Issue

1 New Zealand is expected to identify its forestry and land use rules when it submits its intended post-2020 nationally-determined contribution to the UNFCCC in 2015.

2 The new climate change agreement is expected to be more flexible, and is an opportunity for New Zealand to propose accounting rules that better fit our national circumstances.

3 The current Kyoto framework of rules is uniquely expensive for New Zealand, due to our fast-growing planted production forests, and the spike we experienced in new plantings in the early 1990s. The Kyoto rules require that the harvest of post-1989 forests be fully debited (unlike pre-1990 forests), and as a result create significant emissions costs for New Zealand after 2020 when these post-1989 production forests shift from a net sink to a net source. The Kyoto rules also create liability risks for ETS forestry participants when it comes time to harvest.

4 As a result, New Zealand will face significant international emissions liabilities for our post-1989 forests under the current Kyoto Protocol accounting rules. These liabilities arise from the sustainable harvest of our 'Kyoto forests', the credits for which were a major factor in enabling New Zealand to meet its first, and likely second, Kyoto commitment period targets.

Purpose of this Report

5 This report provides a detailed technical assessment of the potential options for the treatment of forestry and land use in the post-2020 agreement. The report provides a recommended option that best meets New Zealand's unique circumstances, and the overall objectives for what we are trying to achieve, against the assessment criteria. This report is comprehensive for a reason. This is a unique opportunity for New Zealand to fully assess all forms of international forestry and land-use accounting options against our overall objectives.

Exclusions – implications to the NZ ETS

6 This report does not attempt to provide a comprehensive assessment of the potential implications to the NZ ETS or the international-domestic forestry interactions from any particular option. The assessments are based on initial thinking and expert judgement, may be subjective, and depend on future domestic policy direction. However, MPI have consulted with forestry stakeholders on international forestry accounting options, on averaging in particular, and their issues and concerns are reflected in the assessments.

Objectives and Assessment Criteria

7 The fundamental objective for forestry in previous climate change agreements was to reward Parties for changing behaviour from business as usual in relative to a base year or other benchmark. Under the Kyoto Protocol, countries are rewarded for the establishment of new forests, debited for deforestation activities since the base year, but limited in their ability to claim removals from pre-existing forests (pre-1990 forests).

8 The assessment criteria are provided in Section 4 of the report. However, it is important to note that the criteria used for assessing the best option for New Zealand are not based on cost

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considerations alone (maximum credits claimable), but factor in other objectives and criteria that have material impact, such as:

- Environmental integrity and credibility
- Cost effectiveness for mitigation and other outcomes
- Implications for the NZ ETS
- Alignment with other countries
- Risks and uncertainties around future emissions scenarios, and future rules – to determine upside and downside risks
- Impact on NZ's future ability to participate in international carbon markets, market access or forest unit exportability.
- Delivery of specific international forestry accounting objectives
    a. Effective incentives for new forest sinks and other mitigation behaviours changes we want to see
    b. Continued ability to apply successful **Kyoto accounting principles** – Harvested wood products, Flexible land use, natural disturbance exclusions, etc.
    c. Continued use of accounting approaches which take into account our **uneven historical rates of forest planting** – e.g., through the use of 'business-as-usual' reference levels for forest management after 2020.
    d. More **cost-effective treatment for sustainable harvest emissions**, which doesn't penalise sustainable production forestry – eg, through extended use of BAU reference levels to cover all sustainable forest harvest.

Options Analysis

9 Each option identified has been described in detail within this technical assessment report and assessed against the overall objectives. After input from the Ministry for the Environment, three options have been selected for consideration in this summary. For a full description of all options refer to Section 8.

- **Kyoto Protocol status quo**. Continue with the Kyoto Protocol framework of rules (options between either 1, 2 or 3, Table 1).
- **Averaging with land use transitions**. Utilise the existing Kyoto Protocol rule set, but smooth out fluctuations in removals and emissions from post-1989 forests, whilst keeping incentives to increase carbon stocks above BAU for pre-1990 forests. This option maintains other Kyoto Protocol useful rules (such as Flexible land use and natural disturbance (either option 4 or 5, Table 1, depending on the average carbon stock).
- **Gross-net accounting**. Recognise the total forestry estate, regardless if this is existing forest established before the 1990 baseline or new forest (options 6 or 7, Table 1).

10 International forestry rules determine how carbon stocks and flows are accounted for under the Kyoto Protocol for CP1 and CP2. Understanding the value, or potential value, of these existing rules in limiting future liabilities is important in assessing the best possible rule set for New Zealand.

11 The potential impact of the rules for accounting is provided in Table 1 for the three main options. Sub-options are also provided for each depending on how that option is accounted.

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12 Three different scenarios (Low, Mid-point and High emissions scenarios) have been modelled to address uncertainties relating to future rates of afforestation, deforestation and harvesting, rotation ages, harvested wood products and carbon prices.

Table 1: INDC Options Cost in Million Tonnes CO2

Principal INDC Options for Forestry & Land Use	Total Net Emissions over 2021–2030 by Emissions Scenario (Mt CO2)		
	Best Case	Mid	Worst Case
CURRENTLY AVAILABLE APPROACHES			
1. Kyoto CP2 Status Quo – 3.3 ARD & 3.4 FM (BAU RL)	2	26	64
2. Kyoto CP2 Rules + Zero FMRL (gross-net of pre-1990 forest) + 3.5% cap	-21	-21	-21
3. UNFCCC based accounting – No special rules – Net-net on 1990	-104	71	185
THEORETICAL ALTERNATIVE APPROACHES			
4. Land in Transition' – Land use transitions at average carbon to BAU RL	-35	-10	26
5. Land in Transition' + Roll-over at 28 years (proxy for inclusion of HWP within Average carbon stock) – 1990 start	-100	-74	-38
6. Kyoto CP2 Rules + Zero FMRL (gross-net of pre-1990 forest) + No Cap	-176	-152	-114
7. UNFCCC based accounting + Full carbon accounting of FOLU offset	-388	-213	-95

Note 1: the use of a 28 year roll-over point may not provide a good proxy for the inclusion of HWP effects if a different base year (and therefore activity start year) is used

Note 2: Positive = emissions to the atmosphere, negative = removals from the atmosphere

13 Based on the assessment completed to date, the relative advantages and disadvantages of the options are discussed below.

Maintaining the Kyoto Protocol Status Quo

14 As part of its analysis, MPI has considered the effect of continuing with the current Kyoto Protocol framework of rules. Table 1 (options 1-3) shows New Zealand's projected net forestry and land use emissions liabilities over 2021-2030 under the available Kyoto Protocol second commitment period rules.

15 The approach is considered least risk, but provides the highest cost over 20210 – 2030. A summary of the pros and cons of maintaining the existing framework of rules is provided in Table 2.

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Table 2: Pros and Cons of Continuing with Kyoto Protocol CP2 Rules

Criteria	Pros	Cons
International Expectations	• Continues the international status quo. No major changes are required to New Zealand's current international forestry and land use accounting systems. • Positions our international support behind what is currently the most recognised and strongest alternative accounting approach to UNFCCC GHG Inventory based net-net accounting against 1990, which would likely impose a much higher cost on New Zealand. • May help to keep the current Kyoto CP2 forestry rules in their exact current form, and protect them from future modification under new approaches under the new agreement (though similarly, may prevent improvement in other areas, such as post-1989 forests, or agriculture).	
Environmental effectiveness & integrity	• Has high international credibility (even if the future of Kyoto approaches are uncertain under the New Agreement) and meets political expectations that developed countries maintain current or better accounting standards after 2020. • Is based entirely on an existing agreed international accounting 'rulebook' – the 2013 IPCC KP Supplement. • May enable New Zealand to earn significant forestry credits from its post-1989 forests for a second time round, once these attain full growth in the 2040s (provided other rules remain the same and 1990 stays the starting year for eligible mitigation activity).	• Two parallel accounting systems for pre-1990 and post-1989 forests, including as reflected in deforestation liabilities, may be seen as increasingly unfair and untenable over time
Commitment is least cost	• New Zealand might get its net forest sink back in the 40s, and enable New Zealand to earn significant forestry credits from its post-1989 forests for a second time round, once these attain full growth in the 2040s (provided other rules remain the same and 1990 stays the starting year for eligible mitigation activity). • New Zealand would have a strong case for arguing that net removals under Kyoto rules should remain eligible mitigation towards our commitment, and be internationally transferrable under any future international carbon market (even if overall we would face a net debit from forests over the 2020s) • Could attempt to negotiate and apply a rule used in CP! that limited harvest emissions to removals received over commitment periods. The addition of this rule would reduce the liability from post-1989 harvest.	• New Zealand will incur net emissions from our post-1989 Kyoto forests over 2021-2030, as these forests reach harvest age, adding around $95 million to $3 billion to the costs of our post-2020 target (at a $50 carbon price per tonne). • While New Zealand is expected to hold sufficient surplus units by 2020 to pay the international liability costs of our Kyoto forests after 2020, our expected inability to carry over our accumulated surplus of units from CP1 and CP2 means that we pay 'twice over' for this harvest. • Over the long term, the peaks and troughs of New Zealand's emissions liabilities will create a 'boom and bust' cycle in the government's fiscal

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		liabilities under any climate change commitment, which will be difficult to manage across commitment periods. The right to carry-over surplus between commitment periods will becomes critical beyond 2030 (when we start to re-accumulate credits under Kyoto rules), but is not assured under the new agreement. • A significant portion of our post-1989 forest harvest liability could be considered to be an arbitrary and 'unfair' accounting penalty that arises for New Zealand as a result of our unusually high new forest establishment and growth that occurred between 1990 and the start of CP1 (2008), for which we were never credited, but which incurs full emissions liabilities on harvest. (This issue was acknowledged and addressed by the ARDC rule, but this was discontinued internationally after CP2).
Other considerations	• No additional changes required to current NZ ETS systems, beyond those that have already arisen from the CP2 rules, or will arise from the loss of carry over beyond 2020. • Enhances domestic policy certainty by continuing current Kyoto framework that underpins the ETS forestry settings. • If rules remain the same, would enable NZ ETS participants to continue earning credits on second subsequent rotations of post-1989 forest, enabling them to potentially benefit from changing carbon prices or reduced harvest.	• Where devolved, the Government's fiscal liability for our post-1989 forests becomes an ETS liability for forestry participants, but with limited carbon benefits for them over future rotations unless they reduce their harvest. This creates a domestic carbon price incentive that works against the sustainable harvest of our production forests that will become more severe if the carbon price rises. • ETS harvest liabilities for post-1989 forestry participants becomes a financial risk for them under high carbon prices if they do not hold enough units for their harvest liabilities. This also creates a potential ETS default risk for the government.

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Allow for Averaging with Land Use Transitions (new forests transition to established forests)

16 There are a number of accounting approaches that score highly against one or more important objectives. MPI believes the most viable option is one that improves on the current set of Kyoto Protocol accounting rules. This approach would provide full credits for the first new forest planting but no liabilities thereafter as long as the forest is replanted and maintains business as usual carbon stocks. The effect is to smooth out the growth and harvest fluctuations of new forests over time. As such it would avoid our forests alternating between a source and a sink of CO2 across future commitment periods.

17 This option is considered the most favourable based on the assessment which is summarized in Table 3.

Table 3: Pros and Cons of Averaging Post-1989 Forests Emissions and Removals

Criteria	Pros	Cons
International Expectations	▪ 'Builds on' an existing agreed international accounting approach. ▪ Should gain increasing environmental credibility over long term as it becomes clear that only new actions are credited and only once.	▪ If this is not explained well then it might be perceived as changing the CP2 rules to suit ourselves. ▪ May not meet expectations that developed countries progress towards a more comprehensive 'land based' approach after 2020 particularly if we do not extend coverage to grasslands.
Environmental effectiveness & integrity	▪ Avoids re-crediting the same forest over and over again. Has a very high integrity compared to other accounting options. ▪ Better reflects permanently stored carbon. ▪ Activity based approach focuses on human effects. ▪ Uses existing IPCC approaches and guidance.	
Commitment is least cost	▪ Avoids the high liability costs on New Zealand over 2020s under current Kyoto Protocol rules ▪ It will likely deliver larger forest credits for NZ (and reduce target costs) because its higher integrity makes it is unlikely to be capped. The averaging approach is also primary based on levels of new planting and deforestation which has greater certainty in data collection and measurement than the alternatives.	▪ Does potentially reduce the total forestry credits for New Zealand over the 2040s (if 1990 remains the base year). ▪ Would not credit regeneration of forests resulting from new management after 1990 but does after the chosen 2009 reference level policy base year.
Other	▪ Reference levels offer the functionality to differentiate the treatment of 'new' activities versus 'existing' activities on a more dynamic basis than simply using a fixed base year. Reference levels offer flexibility to define how long an activity should be credited or debited as 'new and additional' – i.e., excluded from the BAU baselines. ▪ This approach would retain Kyoto's strong incentives for new forest planting, but extend 'business-as-usual reference levels' (accounting baselines) to all fully-grown forests to minimise liabilities for sustainable harvest, which is carbon neutral in the long-term. ▪ This option has the effect of smoothing (or averaging out) gains and losses from the growth then subsequent harvest - to then better reflect the long term gain in carbon from planting new forests. ▪ To achieve this approach in our international accounting means enabling post-1989 afforestation/reforestation land (current under gross-net crediting) to 'transition' or shift across to the Forest Management category (currently pre-1990 forests) where it can be accounted for under a BAU reference level. The functionality	▪ Domestic implications are uncertain

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	for land-use transitions already exists under GHG Inventory reporting, whereas the basis of reference level accounting comes from Kyoto; the solution may therefore be a hybrid approach combining reference levels with the Inventory's land-use transitions ▪ It builds strongly on the current, internationally-accepted principles of the Kyoto Protocol and allow NZ to us other favourable rules such as the flexible and use rule, natural disturbance ▪ It directs international carbon incentives towards the future land use actions and behaviours we want to see – not retrospectively rewarding past actions ▪ It preserves the credibility, legitimacy and fungibility of international forestry mitigation – avoiding risks that we will lose forestry abatement towards our target, or have to account for it in more costly ways.	

Apply Gross-net Accounting to All NZ Forests

18 Fully uncapped gross-net accounting would produce a large forest sink for NZ after 2020, but has major drawbacks. This is a current rule option under the Kyoto Protocol 2nd commitment period. But it comes with a cap on the credits that can be received of 3.5% of New Zealand 1990 emissions (about 2 Mt C02 a year or a total of 21 Mt CO2 over 2021 -2030). Currently we cannot claim the estimated 213 Mt CO2 of removals from New Zealand forests. The option of full uncapped gross-net accounting would recognises the total forestry estate, regardless of whether this was existing forest established before the 1990 baseline.

19 This option is considered unfavourable based on the assessment, which is summarized in Table 4.

Table 4: Pros and Cons of Gross-net Accounting

Criteria	Pros	Cons
International Expectations	Withheld under s9(2)(j), s6(a) and s9(2)(g)(i)	▪ [redacted]
Environmental effectiveness & integrity		▪ Has significant environmental integrity and credibility issues ▪ Rewards removals from pre-existing forests which in itself achieves nothing in actually reducing emissions, increasing removals beyond business-as-usual levels. It goes against the objectives of targets which is setting achievements relative to baselines
Commitment is least cost	Could provide a large credit towards the achievement of our target over 2021-2030, reducing its costs,	▪ Very high risk – it could cause higher costs for NZ under some future emissions scenarios ▪ Recognising all forest removals would almost certainly be capped after 2020, just as it is currently capped under Kyoto (at

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	provided it is not capped or ruled out under future accounting rules.	3.5% of 1990 gross emissions per annum) as it would deliver a huge credit for BAU regeneration of native forest that started before 1990. This would give a credit of just -21 MT over 20210-2030 – less than the averaging approach.
Other		▪ Would impose an international carbon price on all sustainable forest harvest in New Zealand – risking the viability of the sector under high carbon costs, if devolved ▪ Would fundamentally change the carbon incentives on NZ's forests – rewarding mitigation at the expense of sustainable land use – essentially putting forestry under an absolute approach like agriculture – and crediting past actions – not future ones. ▪ Cause problems for the NZ ETS if it was to **reflect international accounting**

Consultation

20 Over the past 18 months, MPI has undertaken analysis of all the potential options available to New Zealand in regard to forestry and land use settings for the post 2020 period. It has done so in consultation with MfE's Land-use and Carbon Analysis System (LUCAS) team and as well as through discussion with international experts and New Zealand forestry stakeholders.

21 MPI gave a technical PowerPoint presentation to forestry stakeholders on the 19th May 2015 on issues and options for our next international target, including a proposal for a modified international forestry accounting approach based on averaging. Generally, there seemed to be fairly good acceptance of why the Government would want to apply the proposed averaging approach in its international accounts. The arguments for it seemed reasonably well understood.

Potential ETS Implications

22 Officials would need to consider the implications of any change to how forestry is accounted internationally for the NZETS. As the NZ ETS is setup to mimic the old style Kyoto Protocol rule set - that being creating new forests established and deforested since 1990, any new approach, if implemented, would have significant implications.

Recommendations

23 **Note:** that under New Zealand's current international climate change commitment the objective is to incentivise behaviour change relative to a base year, is focused on human induced actions, and not just rewarding the mere presence of forests, but changes above business-as-usual.

24 **Note:** The averaging option has the potential to deliver larger forest credits for New Zealand (and reduce target costs) because its higher integrity makes it is unlikely to be capped. The averaging approach improves on the Kyoto Protocol rule set by averaging out the emissions and removals from post-1989 forest, while still being about to recognise additional carbon increases above business-as-usual for our pre-1990 forest estate has cost benefits as well as meeting wider objectives and considerations.

25 **Note:** the averaging approach would be an improvement to the existing Kyoto Protocol rule set, and as such New Zealand would still be able to draw on existing Kyoto Protocol rules that are favourable to New Zealand, such as flexible Land-use, Natural Disturbance and Harvested Wood Products.

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26 **Recommendation:** Averaging and Land in Transition is the most favourable option and has considerable advantages over gross-net accounting or the status quo.

27 **Recommendation:** Assuming a change to the status quo, and given the potential implications of changing how New Zealand accounts for forestry and land-use internationally, MPI considers it is prudent to first complete a detailed risk/impact assessment on the preferred option.

28 **Recommendation:** There are also a number of other future decisions that need consideration. These take into account not just deciding on the high level accounting option, but other aspects such as accounting coverage, domestic impacts, measurement approach, base year, how forestry is treated within a target and accounting by land use or activity. The issues are discussed within this report with the recommendation for each provided in Section 11.

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1 Issue

UNFCCC Invitation for National Post-2020 Mitigation Commitments[1]

29 Parties to the United Nations Framework Agreement on Climate Change (UNFCCC) have agreed to develop a new global climate change agreement ('a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties'), to be adopted in December 2015 in Paris and come into effect and be implemented from 2020.

30 Parties' mitigation commitments – or 'intended nationally determined contributions' (INDCs) – are to be submitted in March 2015 by Parties in a position to do so, and well before the December 2015 meeting by all Parties.

31 It is not yet clear whether a common set of accounting rules will subsequently be applied to all commitments, as under Kyoto, or whether each country will be allowed to specify its own rules. Parties may have significant leeway in how they choose to formulate their contributions. It could comprise an economy-wide quantified greenhouse gas (GHG) responsibility target (QELRO), or a combination of quantified and non-quantified approaches. Many countries currently outside of Kyoto's Second Commitment Period (CP2) are expected to apply different forms and the rules to that applied to date by New Zealand under the Kyoto Protocol.

32 New Zealand is required to specify the rules and assumptions it has applied to determining the contribution of its forestry and land use sector when submits its intended nationally-determined contribution (INDC) (or emissions reduction commitment) to the UNFCCC in 2015.

33 In particular, we may need to specify any assumptions which would have cost implications for the target, if they were not met. This could help to ensure that if future rules are agreed under the new agreement which would rule out an element of New Zealand's intended accounting approach, then a special 'non-retroactivity' clause in the agreement might prevent having to change our accounting assumptions until onset of the next commitment cycle.

Accounting rules affect the cost of future commitments

34 New Zealand's emissions profile is unique amongst developed countries, dominated by agriculture and with post-1989 forests due to shift to a net source of emissions under Kyoto rules after 2020. As a result, the future approach to land sector accounting will be critical to determining the overall cost and quantum of New Zealand's emission reduction commitments after 2020.

35 Accounting rules may have a material impact on the quantified emission reductions implied by nominal targets.

Accounting Decisions Must Accommodate Multiple Uncertainties

36 New Zealand's choice of the forestry and land use settings we assume under our INDC need to take into account uncertainties in relation to:

- The uncertainty in predicting New Zealand's future emissions and removals from forestry

[1] This text adapted from MFAT advice.

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- Future international rules for accounting
- How other countries will treat the land sector in their INDCs
- How attitudes and values will evolve on subjective elements of land sector accounting - how important is it to build on Kyoto, or move towards a common approach, and what constitutes 'progression', and
- What portions of expected credits and debits for New Zealand under different approaches and from different activities are more or less certain to be 'bankable', predictable in their quantity, durable over time under different policies or emissions scenarios, credible internationally and domestically, subject to caps or limits in future, and/or otherwise have different upside or downside risk profiles.

International Forestry Rules must Accommodate New Zealand's National Circumstance

37 Many land sector accounting provisions are fairly complex, and when combined with different countries' individual national circumstances and emissions profiles, may produce different accounting liability outcomes for different parties. Under some approaches, such as accounting against an historical baseline ('net-net' accounting), some countries will inherently be 'winners', others 'losers' (referred to as the 'forest lottery' effect). This means a simple, one-size-fits-all approach to forestry and land use may create unfair and arbitrary outcomes.

38 New Zealand has a number of particular forestry and land use characteristics which differentiate us from other developed countries in particular, which are relevant to our accounting approach, and which could potential result in arbitrary accounting outcomes for us if not properly accommodated.

International Forestry Rules will have Domestic ETS Implications

39 The ETS is the Government's main domestic policy tool for reducing our GHG emissions. It assists New Zealand to meet its international obligations under the UNFCCC. As a result, many of its forestry settings have been designed to reflect New Zealand's international forestry accounting under the Kyoto Protocol.

40 In the event that New Zealand's international forestry accounting was updated after 2020 to reflect future accounting improvements, then it's possible that the Government could decide to implement these international changes in the ETS. However, there would be no automatic requirement on the Government to do so. The ETS is a domestic policy instrument, which operates independently of New Zealand's international reporting and accounting under the UNFCCC and Kyoto Protocol.

41 If any international forestry rules were changed after 2020, the benefits for forest owners and the options for devolving any changes to the ETS would need to be carefully considered and assessed by Government before any decision were made on potential domestic implementation in the ETS. This would include analysis of any possible impact on foresters' expected NZU holdings or on their future entitlements and liabilities under the ETS.

International Forestry Rules are Highly Contested

42 Some of the principles behind land sector accounting, such as contained in the Kyoto Protocol's Marrakesh Accords, are not universally accepted. This means that different countries can be expected to seek to apply different approaches.

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2 Situation Analysis

New Zealand's accounting for forestry and land-use over 2013-2020

43 On 16 August 2013, the Government announced an unconditional climate change target to reduced net emissions to 5 per cent below 1990 emissions by 2020. New Zealand took this commitment under the UNFCCC rather than under the Kyoto Protocol Second Commitment Period (CP2), but announced the New Zealand would apply the Kyoto framework of rules to its international reporting and accounting over this period.

44 Applying the Kyoto framework of rules means that New Zealand must, amongst other aspects of Kyoto accounting, apply the agreed Kyoto reporting and accounting rules for forestry. The Kyoto forestry rules for the second commitment period (CP2) were agreed at the UNFCCC Conference of the Parties in Durban in December 2011, and apply from 1 January 2013.

45 The CP2 forestry rules include:

- Mandatory accounting for forest management (pre-1990 forests)
- Reference level accounting for pre-1990 forests
- Flexible land use rule ('carbon equivalent forest conversion' rule)
- Accounting for harvested wood products
- Natural disturbance exclusion rule
- Gross-net accounting for post-1989 forests and any forest deforestation since 1990

46 The official guidance and rules for how countries must report emissions and removals under the Kyoto Protocol is provided by the IPCC document '2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol' (the 'KP Supplement').

47 The implementation of these accounting rules by New Zealand in our international reporting under the Kyoto Protocol over CP2, and in how we account for our climate change target over 2013-2020, means the following:

- New Zealand will include its pre-1990 forests (both planted and natural) in our accounting for the first time, from 2013 onwards.
- Our pre-1990 forests will be accounted for using a projected 'business-as-usual' Reference Level accounting approach. New Zealand's reference level is an average of 11.15 Mt CO2-e per year over 2013-2020, but it will likely be subject to revisions ('technical corrections') as data and methodologies improve. In practice, accounting against a BAU reference level means that only emissions and removals which deviate from the reference level result in credits or debits.
- New Zealand will continue to report and account for the emissions and removals from post-1989 forests and any emissions from the harvesting of post-1989 forests.
- New Zealand will continue to report and account for emissions from all deforestation of any type of forest (planted or natural/indigenous).
- New Zealand will have the option to use the Carbon Equivalent Forest Conversion provision for pre-1990 planted forests (better known as the 'flexible land use' or 'offsetting' rule).
- New Zealand will have the option to exclude emissions from major natural disturbances.

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- Where appropriate data is available, New Zealand will be able to apply the Harvested Wood Products rule, which allows harvest emissions to sometimes be accounted for more gradually overtime, as wood products decay, rather than assume all harvest becomes an emission at the point of harvest.

48 While New Zealand did not take a formal commitment under the Kyoto Protocol for CP2, in practice this does not lessen New Zealand's obligations for reporting its emissions and removals under the Kyoto Protocol as if it had signed CP2. This is because Parties agreed at the Doha CMP in December 2012 that all Annex 1 countries (developed countries under the UNFCCC) must still report their LULUCF emissions and removals in accordance with the Kyoto CP2 reporting and accounting rules over 2013-2020.

Why Forestry & Land Use are treated differently to other sectors

49 The Land use, land-use change and forestry (LULUCF) sector is unique under the Kyoto Protocol in that a large number of specific accounting rules apply to it which do not apply to other sectors of the economy. This means it is the only sector where emissions accounted for are different to the emissions estimates reported in countries' national GHG inventory reports.

50 For this reason, accounting approaches and rules have a special significance for the forestry and land-use sector.

51 The reasons for the different accounting approaches applied to the forestry and land use sector include:

- It is a highly complex biological system – with potential for both source & sink
- Carbon stock change approach captures both natural and human emissions & removals
- Emissions & removals are on a huge scale – and affected by country size
- Large inter-annual fluctuations and cycles – due to both natural phenomena and historical actions – and outside human control
- Kyoto accounting targets specific activities only, and has many special rules and fixes to address these differences

52 For these reasons, Kyoto accounting estimates of forestry and land use emissions and removals are different to, and generally a smaller subset of, UNFCCC Inventory reported estimates.

Current International Accounting Approaches to Forestry and Land-use

About UNFCCC Reporting and Kyoto LULUCF Accounting

53 tbc

INDC Accounting Parameters

54 Accounting parameters can be generic to all quantified GHG targets (e.g., base years), specific to certain types of targets (e.g., baseline emissions for national BAU reduction targets) or specific to certain activities or sectors. Some of the types of accounting parameters that could apply to New Zealand's contribution are listed below

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Table 5: Accounting System

Length of contribution cycle	2021-2025 / 2021-2030 / Other
Use of carry-over	From CP2 to post-2020 / From first commitment cycle to the second and subsequent cycles
Caps on carry-over	None / % of base year / % of period average / trading restrictions
Accounting mechanics	AAUs / Unders only (ERUs) / RMUs
Market Access	Yes / No
Full recourse to markets	Supplementarity requirements apply / Not apply
Functioning international carbon market	Expected supply and demand enable a viable, functioning international carbon market / or not

Table 6: General Accounting Elements

Type of contribution	Quantified GHG target / Non-GHG target / NAMA / policies & measures / combination
Contribution coverage	Economy-wide / specific sectors / specific gases / activities (e.g., REDD+)
Target expression	Single number / Additive number (e.g., EU) / Multiple components
'Expressed nature of reductions target	Absolute / relative / intensity / peak year
Delivery of target	Responsibility target (carbon budget + use of markets) / Legislated compliance / Domestic policy only / Aspirational (no delivery indicated) / Externally financed actions only
Type of carbon budget	Kyoto-type QELRO (commitment period average) / trajectory to single year-based carbon budget / single year
Scope of carbon budget	Economy-wide / Specific sectors only
Target baseline type	Historical year / Historical year (except for land) / national BAU projection / intensity-based (e.g., per unit product, GDP) / Other
Base year	1990 / 2005 / 2013 / Other historical year or average
Gross/Net Approach	Baseline excludes LULUCF/AFOLU (gross-net) / includes LULUCF/AFOLU (net-net) / includes deforestation only (Australia's 3.7 net-net)
Base Year emissions specified	Yes / No / Value given
Gas scope	CO_2 only / All 7 Kyoto Annex A gases / other
Gas approach	Basket of gases / single gas targets
CO2-e Metric	IPCC AR4 100 year GWP / AR5 100 years GWP / GTPs / other
Type of reductions	Relative to fixed level (e.g., base year, or current intensity) / relative to dynamic baseline (BAU) / differs by sector
Plan to use carbon markets	Yes / No / Reserve right to

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Methodologies	2006 IPCC Guidelines / 2003 LULUCG-GPG / 2013 KP Supplement / 1996 IPCC Guidelines / Domestic policies / Others
Conditionality	Subject to approval by Parliament / other

Forestry & Land Use Accounting Parameters

55 Current UNFCCC accounting rules address a wide range of possible variables. Table 3 outlines most of the key variables that apply in some form under Kyoto, GHG Inventory, REDD+ or CDM based accounting (or quasi-accounting).

56 New Zealand will need to decide whether it's current CP2 accounting settings over 2013-2020 will continue to apply after 2020, or whether to adopt new accounting settings. For example, we might choose to expand accounting to cover more land-use categories, revise our base year, or shift from Kyoto's activity-based reporting approach to the land-based categories used for UNFCCC Inventory reporting.

Table 7: Elements of Land Sector Accounting

Element	Options	Current NZ
Approach	National accounting within QELRO / National quantified target / Sectoral (e.g., REDD+) / Project (e.g., CDM A/R)	QELRO
Land Sector Definition	Land sector / Land-use sector / AFOLU / Ag & LULUCF / other	Ag & LULUCF
Approach	Land based / activity based	Activity-based
UNFCCC Framework	Kyoto / Convention / REDD+	Kyoto
Descriptive framing	[Country specific]	Kyoto CP2 framework of rules
Coverage	Deforestation only / Forests / Forestry & land use / agriculture, forestry & land use	Forests and deforestation only
Agriculture inclusion	Base year gross emissions / land sector / separate / excluded	Included within gross emissions
Comprehensiveness	Specific categories or activities	AR, D & FM
	Specific pools	All
	All lands / managed lands only (anthropogenic proxy)	All lands
	Definition of managed lands	All NZ
	% land covered / % emissions covered	About 40% of NZ
Accounting approach (category-specific)	Net-net historical year / Net-net historical period / gross-net /Zero RL / Projected BAU reference level / Historical trend / Intensity	
• AR		Gross-net
• D		Gross-net
• FM		BAU RL
• Non-forest		NA
• Agriculture		Net-net 1990
Reference level type	Historical year / zero / BAU projection / BAU adjusted for	BAU projection

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(category-specific)	suppressed demand / intensity-based / 'Without measures' baseline scenario	
RL policy base year (RL specific) – Projection purposes	2009 / other (e.g., year of RL construction)	2009
RL policy base year – definition of included area		Pre-1990 forests still in existence
RL value	Annual average CO2-e Mt [if specified]	10.15 MT in CP2
Special exclusions or provisions	Historical/legacy effects / harvested wood products / non-anthropogenic / natural disturbance / flexible land use / ARDC (pre-2008 removals) / SFM? / methane?	ND, HWP Production approach, FLU
Activity start year	Activities accounted since 1990 / 2005 / 2013 / Continuous / Other	1990
Crediting period	Ongoing / CP only / 20 years / Average / Country or species specific	Ongoing/permanent
Deforestation debiting approach	Carbon stock on clearance / Expected carbon stock at maturity / Long-term average	Carbon stock on clearance
Deforestation definition	Forest clearance / land-use change	Land-use change
Caps	Debits capped / credits capped / discounting / offsetting	3.5% on FM credits
Additionality	Actions must be direct-human induced / additional to BAU	LUC must be direct human induced
Units	Permanent (RMUs) / Temporary (tCERs/lCERs)	RMUs
Unit issuance	Self-issued (RMUs) / issued externally (CDM)	Self-issued (RMUs)
Accounting timing	End of commitment period accounting / annual accounting	End
Methodologies	2006 IPCC Guidelines / 2003 LULUCG-GPG / 2013 KP Supplement / 1996 IPCC Guidelines	KP Supplement

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Forestry and land use emissions in New Zealand

Trends in New Zealand's forestry and land-use emissions

57 To date, the forestry and land-use sector has contributed significantly to offsetting New Zealand's gross emissions. However, due to historical planting back in the early 1990's soon to

be reaching harvest maturity, emissions will be increasing during the 2020's. This is largely the result of increased harvesting of post-1989 plantation forests as a larger proportion of the estate reaches harvest age and to the conversion of plantation forests to grassland.

58 With the total area of forestry in New Zealand estimated to be around 10 million hectares (38 per cent of the New Zealand's total land area) the forestry and land-use sector emissions profile is dominated by emissions from harvesting, deforestation, and removals from the growth of forests, which together account for around 98 percent of forestry and land-use emissions and removals.

59 Natural indigenous forests comprise 79 per cent, or around 8 million hectares of total forest area and are a significant influence on the forestry and land-use emissions profile, estimated to be around 6 Mt CO_2 removed per year from 1990 to 2013, according to New Zealand's 2013 National Inventory Report.

60 Planted forests comprise around 21 percent of forest area (around 2 million hectares) and have the most significant impact on the observed trends in the forestry and land-use emissions profile, with carbon storage in plantation forests being cyclical in nature (absorbing CO_2 during growth and releasing CO_2 after harvest). With the harvesting of plantation forests nearly tripling since 1990, and with the spike in forest planting in the early 1990s now reaching harvest maturity (from around 2016), post-1989 planted forests may transition from a net sink to a source of CO_2 for a period of years.

New Zealand's current and projected future forestry and land-use emissions

61 New Zealand's forestry and land-use sector is currently a net sink of carbon dioxide. In 2013, LULUCF contributed around 27 Mt $CO_{2\,eq}$ removals, compared to around 29 Mt CO_{2eq} in 1990. This value includes removals from the growth of planted and natural forests, emissions from the conversion of land to planted forest, delayed emissions from harvesting due to harvested wood products and deforestation.

62 Projecting future emissions and removals from the forestry and land-use sector is a difficult task. As such, uncertainty has been included in the projections through the use of scenarios that represent low, midpoint and high emissions. The three forestry scenarios incorporate assumptions to address uncertainties relating to future rates of afforestation, deforestation, harvesting rates, treatment of harvested wood products, rotation ages and carbon prices.

63 New Zealand's post-1989 planted forestry sector is likely to temporarily transition from a net sink to a net source of carbon between 2017 and 2023 as forests planted in the early 1990s are harvested for timber production. However, given the cyclical nature of plantation forests (absorbing carbon dioxide during growth and releasing it after harvest), the post-1989 forestry sector is expected to revert to a net carbon sink in the late 2030s once the forests harvested in the 2020s are replanted and again sequester carbon dioxide.

64 Emissions for planted forestry are very sensitive to future forest owner harvest behaviour. The three projection scenarios of low, midpoint and high emissions use rotation ages of 32, 30 and 28 years, respectively, to reflect this uncertainty. The effect of forest owners delaying harvest and moving to a longer rotation length would be increased removals in the short-term as the trees grow and sequester more carbon, but then increased emissions as eventually these trees are harvested for timber in later years.

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New Zealand's National Circumstance

65 Many land sector accounting provisions are fairly complex, and when combined with different countries' individual national circumstances and emissions profiles, may produce different accounting liability outcomes for different parties. Under some approaches, such as accounting against an historical baseline ('net-net' accounting), some countries will inherently be 'winners', others 'losers' (referred to as the 'forest lottery' effect). This means a simple, one-size-fits-all approach to forestry and land use may create unfair and arbitrary outcomes.

66 New Zealand has a number of particular forestry and land use characteristics which differentiate us from other developed countries in particular, which are relevant to our accounting approach, and which could potential result in arbitrary accounting outcomes for us if not properly accommodated. These include:

- In New Zealand, natural forests cover around 8 million hectares or 30% of New Zealand's land area.
- Forestry in New Zealand, unlike many countries, is characterised by a clear functional separation between commercial production planted forests and, natural indigenous forests.
- New Zealand natural forests in pre-human times dominated the landscape, and resulted in soils with very high carbon stocks. Current natural forests are largely Government-owned and are mainly managed for non-timber uses – protection, conservation, recreation, landscape. Limited timber production is allowed from some private forests under the Forests Act's principles of sustainable forest management.
- Planted production forests cover around 2 million hectares and comprise species introduced into New Zealand over 100 years ago. These planted forests are the result of a long term strategy commenced in the early decades of the last century to establish an alternative resource to offset the depletion of relatively slow growing indigenous forest species. They are the mainstay of the of utility timber supply.
- New Zealand is a small player in the international forestry industry, accounting for 1.1 percent of the world's total supply of industrial wood and 1.3 percent of the world's trade in forest products. However, New Zealand supplies almost 9% of the Asia Pacific forest products trade volume, representing nearly 20% by value. Forestry is therefore a significant industry in New Zealand, contributing an annual gross income of around $5 billion, 3 percent of New Zealand's GDP and directly employing around 20 000 people.
- Wood products are New Zealand's third largest export earner behind dairy and meat. New Zealand had very high forest planting rates in the early 1990s that will be reaching harvest age in the early 2020's which will increase emissions over that period.
- Twenty one percent of the natural, indigenous forest estate is in private or Māori ownership, and of this area, less than 10% is used for timber production purposes.
- Planted forests are privately or company-owned and managed for commercial timber production.
- Commercial planted forests, predominantly of Pinus radiata (89% by area) with other species (Douglas fir 6% by area and other introduced softwood and hardwood species making up the balance), are managed at the stand scale predominantly for timber production.
- Our forests are also at the centre of New Zealand's climate change response efforts, and there is also increasing realisation of the environmental and social benefits delivered by forests. Some planted forests also increasingly serve important environmental service roles.

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In these cases stand management is tailored to provide for such purposes as water management, soil stabilisation or for specific landscape or cultural requirements.

- The Resource Management Act 1991 (RMA), Conservation Act 1987 and the Indigenous Forest Provisions of the Forests Act 1949 are key New Zealand statutes that govern the conservation and sustainable use of forests.

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3 Problem Definition

Introduction

67 The accounting framework developed under the Kyoto Protocol currently determines which emissions New Zealand is internationally accountable for, and what activities can earn credits or debits. The Kyoto accounting and carbon trading rules have also been used as the basis for determining emissions liabilities and carbon property rights under the NZ ETS.

68 Alternative approaches are being considered in the international negotiations, and in the informal dialogue on the land sector, which have the potential to alter how land sector emissions are treated, and create new opportunities and risks for New Zealand.

69 New Zealand now has the opportunity to reassess the performance of the Kyoto framework, including in how it prices emissions in the land sector, and to consider whether it can put forward a more effective international forestry and land-use accounting framework than that currently in place under Kyoto.

70 At the international, national and domestic levels, a number of issues have been observed on the overall UNFCCC and Kyoto mitigation framework for the land sector, which are listed in Table X and described in more detail below.

Problem Dimensions

International Dimension – An Effective Global Agreement

71 At the global level, the effectiveness of the Kyoto Protocol has been limited due to low participation of developing countries, where land sector emissions primarily occur.

72 The current Kyoto framework for land use, land-use change and forestry (LULUCF) is well developed, and includes important accounting innovations (e.g., reference levels, flexible land use), but was designed to apply to Annex 1 Parties only, is highly complex, and can impose high costs on land management activities such as sustainable forest harvest and increased food production.

73 The Kyoto accounting approach to LULUCF was also designed primarily for stable land use systems, with relatively low land-use change, and little deforestation. As a result, it fully debits deforestation emissions even where these are declining.

74 The high costs of the Kyoto approach to land use may therefore mean it is unlikely to support broad participation after 2020.

National Dimension – 'NZ Inc'

75 Securing more effective accounting treatment for the land sector under the future agreement is also a key priority from the perspective of New Zealand's national interest. Our agricultural emissions are projected to grow, while our production forests are unique amongst developed countries due to their rapid growth rate and the high level of planting that occurred after 1990. The approach to harvest emissions applied under Kyoto could create significant costs for New Zealand after 2020, when our post-1989 production forests shift from a net sink to a net source. To this end, New Zealand seeks approaches which are consistent with the sustainable harvest of

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production forests, while creating effective marginal incentives for long-term enhancement of carbon sinks.

76 For participating countries, the Kyoto accounting framework establishes effective national incentives for new forest planting (afforestation) and reducing deforestation. Where these incentives have been devolved domestically to through the New Zealand Emissions Trading Scheme (NZ ETS), their limited effect to date has been due more to the low carbon price than the design of the accounting approach.

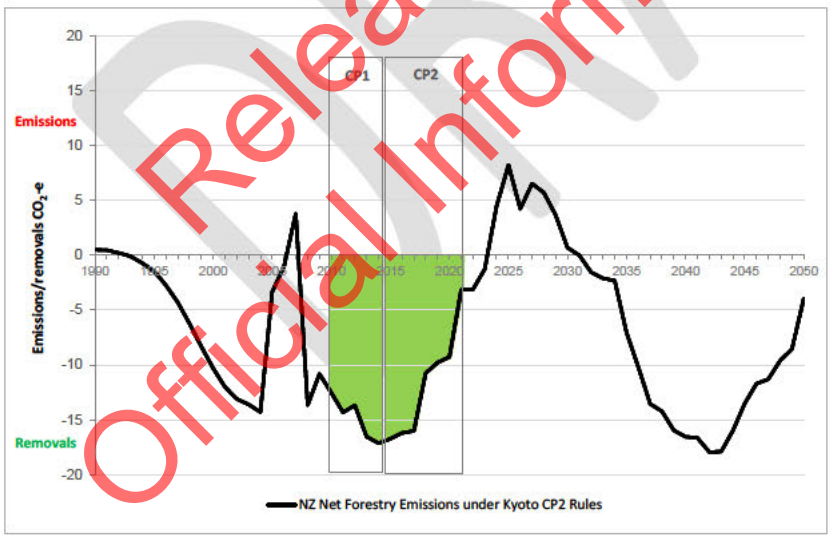
Positive impact of Kyoto to date on New Zealand

77 As a result, the Kyoto accounting approach has been largely beneficial for New Zealand to date (Figure X – CP1 and CP2 credits). In CP1 and CP2, New Zealand's post-1989 forests were a large sink under Kyoto accounting rules of approximately -71.6 MT CO_2 in CP1 and -87 MT CO_2 in CP2 (based on current projections).

78 This large sink in CP1 and CP2 reflects 3 main factors:

- New Zealand was unusual amongst developed countries in having very high rates of new planting in the 1990s, combined with very fast forest growth rates.
- New Zealand did not have to account for its large (pre-1990) Forest Management emissions in CP1, as this category was elective in CP1 and we did not account for it, and
- Our Forest Management emissions (pre-1990 forests) will have no net cost to New Zealand if the actual harvest rate is equal to or less than the projected harvest under the Forest Management Reference Level in CP2.

Figure 1: New Zealand's CP1 and CP2 accounting liability: Post-1989 new planting, harvesting and all forest deforestation emissions and removals under Kyoto Accounting Rules (High emissions scenario from 2013)



79 In CP2, New Zealand's pre-1990 planted forests are a source of emissions of approximately 51 MT CO2, which are factored out under the Kyoto CP2 Forest Management Reference Level. Over 2021-30, however, these forests become a large sink of approximately -107 MT CO2 – also factored out under a BAU RL

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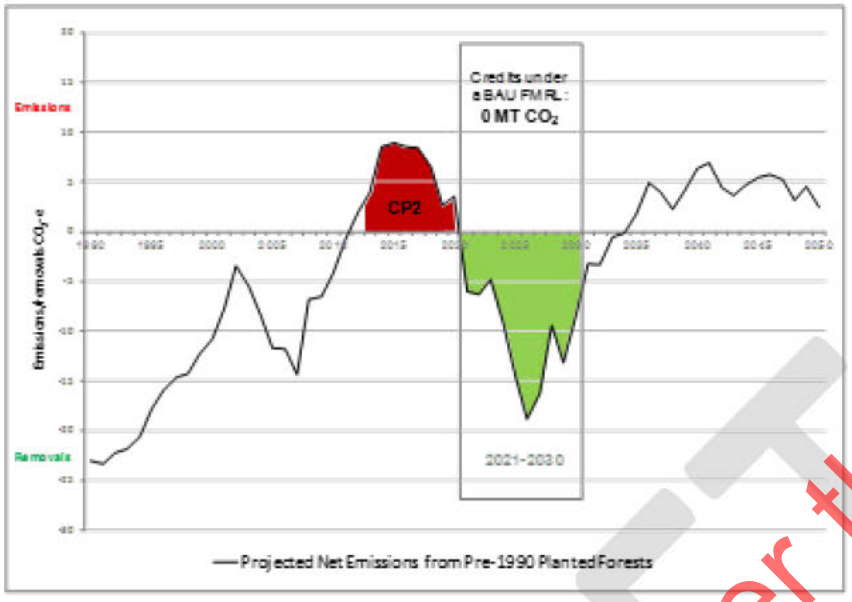
Figure 2: NZ's Pre-1990 Planted Forests – High harvest emissions and uneven age-class legacy factored out under FMRL



Impact of Kyoto on New Zealand's future accounting liabilities

80 Over 2021-2030, however, New Zealand's post-1989 forests become a source of emissions under Kyoto CP2 accounting rules of approx. ≈ 26 (2-64) MT CO_2

81 Only post-1989 forests create a liability for New Zealand under Kyoto rules, because pre-1990 forests (planted and indigenous) are factored out under a BAU reference level.

82 Kyoto rules create a large accounting liability for New Zealand over 2021-2030 because our Article 3.3 forest land (i.e., post-1989 forests and deforested land) stays permanently under gross-net accounting. This fully credits new forest planting, but debits the subsequent harvest of these forests – effectively punishing sustainable forest management as if it were deforestation, even though it is only a temporary carbon stock loss.

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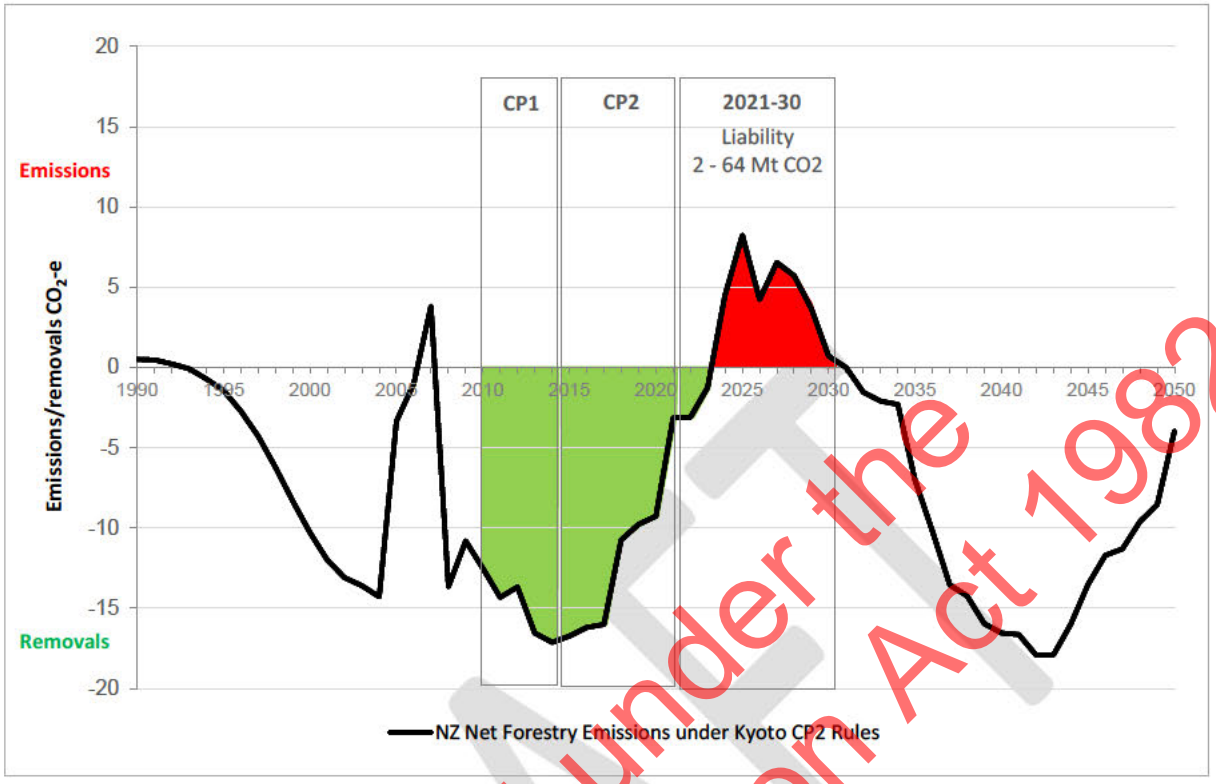
Figure 3: New Zealand's accounting liability: Post-1989 new planting, harvesting and all forest deforestation emissions and removals under Kyoto Accounting Rules (High emissions scenario from 2013)



Accounting Issues under the Kyoto Framework

Just NZ national circumstances – or is there a problem with Kyoto?

83 A key objective of Kyoto was to incentivise new mitigation action in addition to business-as-usual – i.e., '1990'

84 It did this by treating new activities differently to *existing* activities:

- New activity (since 1990) = fully credited/debited under gross-net accounting
- Existing activity (pre-1990 or BAU) = largely factored out through net-net accounting or use of BAU FMRLs

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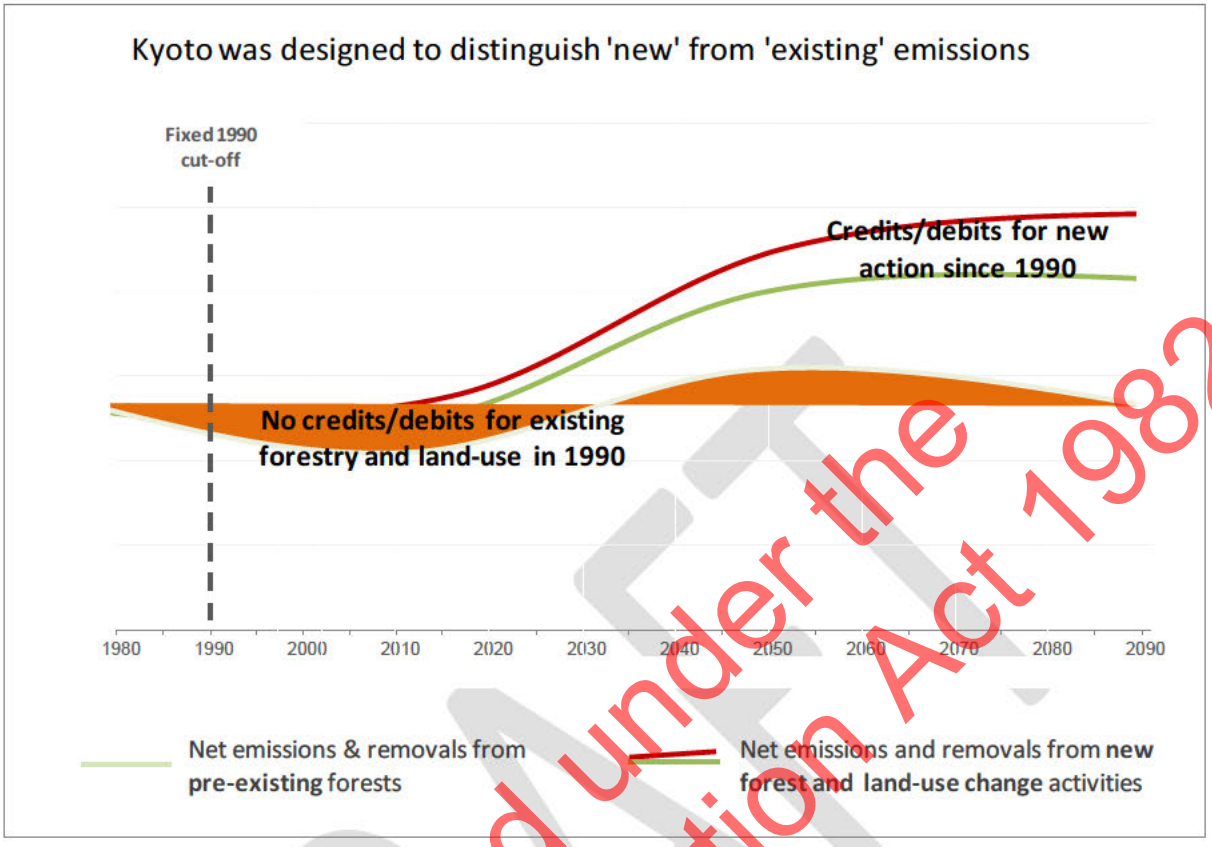
Figure 4: The crediting/debiting of the Kyoto Protocol



85 This approach attempts to 'reward' (or penalise) new actions, by defining anything that has happened relative to 1990 levels as 'new'. For participating countries, this approach has established effective national incentives for new forest planting (afforestation) and reducing deforestation.

86 The problem with the Kyoto accounting approach is that it defines land subject to 'new' relative to a fixed year in time (1990), creating arbitrary winners and losers with the classification of this land (Article 3.3) remaining permanent through time.[2]

87 This results in two classifications of forests within Kyoto accounting, each under different accounting treatments:

- 'new' post-1989 or Article 3.3 forests and any deforestation since 1990, which are subject to full (gross-net) accounting, and
- 'existing' pre-1990 Article 3.4 Forest Management forests, which are only accounted for relative to BAU levels.

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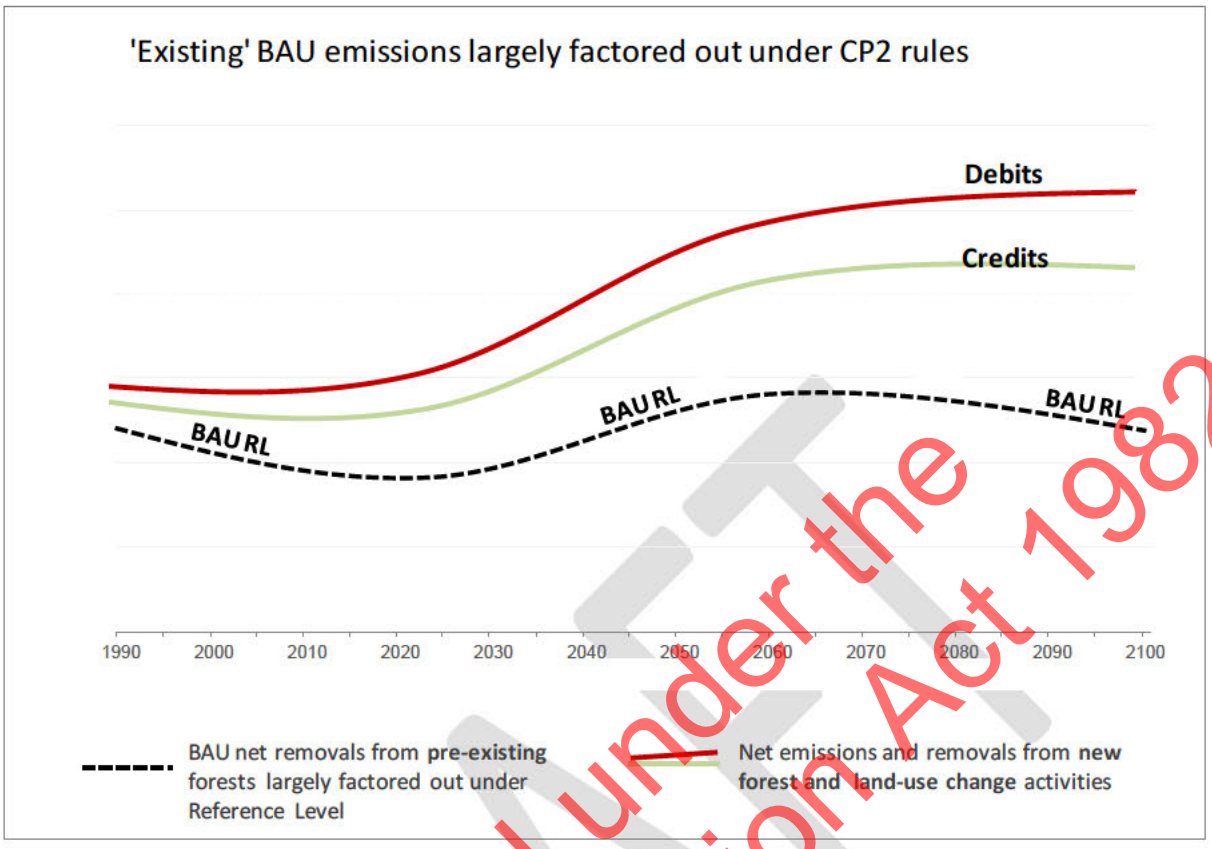
[2] With the minor exception of the Flexible Land use rule, which allows Article 3.3 deforested land to be classified as Article 3.4 Forest management land – but this is the exception.

Figure 5: Factoring BAU emissions and removals from pre-existing forests



88 This approach creates few problems for countries with:

- relatively low and/or constant levels of new mitigation activity (Article 3.3 afforestation or deforestation), resulting in an even age-class distribution in forests.
- very slow growing, temperate forests, or
- selective harvest practices, which result in relatively stable emissions across multiple commitment periods.

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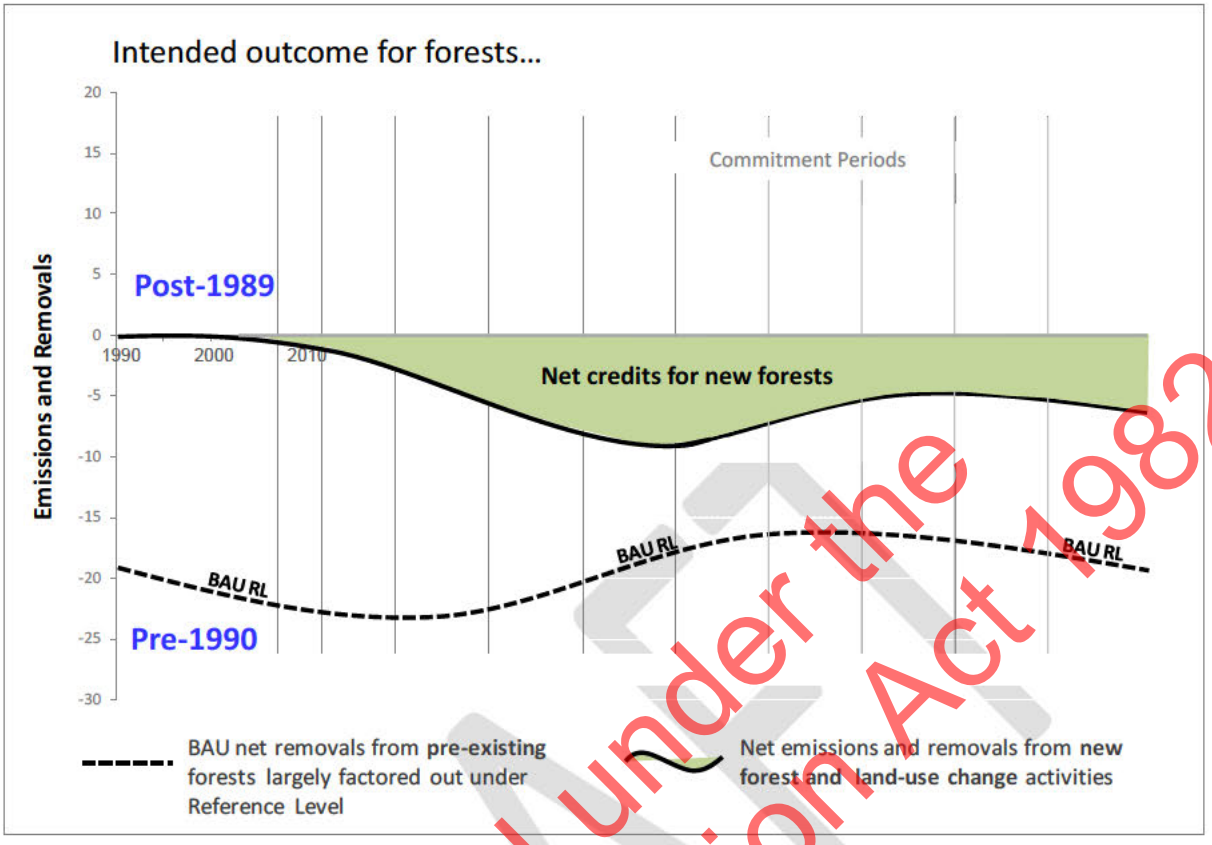
Figure 6: The intended outcome from the Kyoto Protocol



89 An unintended outcome of the Kyoto approach is that the temporary carbon stock losses from the harvest of post-1989 forests is accounted for under the same gross-net approach as the permanent carbon stock losses from deforestation. This results in full debits for the sustainable harvest of post-1989 forests.

90 The effect of this approach is an inconsistent treatment of sustainable forest harvest emissions. The harvest emissions of existing pre-1990 forests is accounted for under a BAU reference level, which removes the legacy effects of past management and uneven age class distributions, and imposes no carbon liability for business-as-usual sustainable forest harvest. The harvest of post-1989 forests however is accounted for in the same way as deforestation emissions – i.e., it is fully debited, even though the carbon stock loss is not permanent but will be restored as the forest is replanted and re-grows.

91 In countries with short rotation planted forest, however, the rapid growth and cyclical harvest emissions creates significant difficulties for managing forest emissions over short commitment periods, particularly where no carry-over or banking of units is possible.

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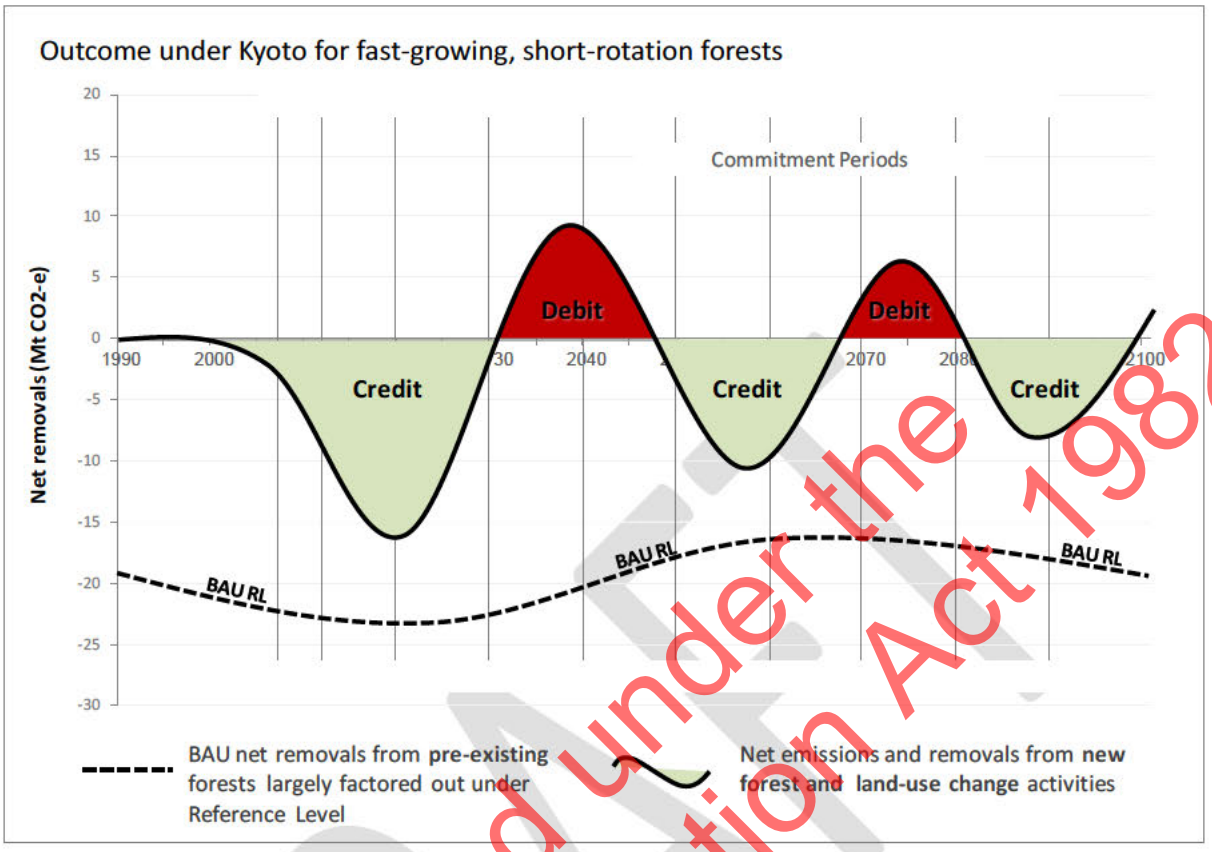
Figure 7: The issue in New Zealand with fast growing planted forests



92 This is a particular problem New Zealand, where our uneven historical rates of forest planting mean we have a very uneven age-class distribution of forests in the post-1989 and pre-1990 forest categories. Together, these factors mean we face a large post-1989 harvest liability after 2020 under the Kyoto approach.

Domestic Dimension – Sustainable Land Management

93 Forests and land use provide environmental services beyond just mitigation. Many activities which cause emissions are the result of productive land uses or other ecosystem services, such as the provision of wood, fibre, fuel and food, which produce wider social, economic and environmental benefit. Mitigation approaches which accommodate wider land management objectives will produce greater overall benefits and more cost-effective reductions, compared with pursuing mitigation in isolation.

94 Where international accounting incentives affect domestic policy, or are devolved through a price on carbon on forestry and land use, they have the potential to support more productive land use if they also accommodate broader land management objectives and support co-benefits, but also potential for perverse incentives where get direct clashes between mitigation and productive land use.

95 The creation of perverse incentives has been a particular concern with the Kyoto forestry accounting model, which does not distinguish between temporary carbon stock losses from sustainable harvest, and permanent losses from deforestation.

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96 Where devolved, the Kyoto CP2 approach creates a perverse accounting incentive to reduce the harvest of our sustainable production forests, even when their carbon cycle is neutral over the long-term, and the products of harvest contribute to mitigation across the broader economy (e.g., through material substitution, biofuels) or to broader sustainable land management objectives (e.g., sustainable sources of wood, erosion control or protection of indigenous conservation forests).

97 The ETS liabilities for forestry participants becomes a financial risk for them under high carbon prices if they don't hold enough units for their harvest liabilities. This creates a potential ETS default risk for the government.

98 The Kyoto model was also originally inflexible towards land use change, and required production forests to always be replanted in the same location. This issue was addressed by the CP2 rule for Flexible Land Use (FLU, referred to as Carbon Equivalent Forest Conversions (CEFC) in IPCC guidance).

99 It is outside the scope of this paper to analyse carbon pricing in the land sector. This paper therefore takes as its starting assumption that a price on carbon has the potential to contribute positively to land management decision making in New Zealand, provided the carbon price incentive has been designed to operate at the margin of existing productive land use, and work in concert with broader land use objectives.

Summary of Problem Dimensions

Table 8: Summary of Problems Observed with the Current Kyoto Approach to Forests and Land Use

Dimension	International	National	Domestic
Key Concern	Effective Global Agreement	New Zealand's contribution is Affordable	Sustainable & Productive Land management
Problems with Kyoto	• Low country participation • Major sources of global emissions excluded – deforestation in developing countries • High cost for countries with high deforestation • High complexity & low perceived integrity • 4 competing systems (KP-LULUCF, UNFCCC, CDM & REDD+)	• Imposes a large liability on NZ's production forests after 2020 – despite an overall net forest sink • Lack of carry over prevents banking for future liabilities • NZ penalised for fast growing forests planted before 2008 • Forestry offsetting regarded with suspicion – low fungibility of forestry units in ETSs	• Arbitrary, permanent division of pre- and post-1990 forests • Financial risks from ETS liabilities for small forest owners • Potential for perverse incentives from carbon liabilities imposed on sustainable forest harvest & tree weed control • Long term social & economic value of forest carbon not assured

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4 Objectives and Criteria

100 In the climate change negotiations, New Zealand is seeking the following main outcomes for its post-2020 treatment of forestry and land use:

a. Continued **crediting of new forest sinks** and other mitigation actions

b. Continuation of successful **Kyoto accounting principles** – HWP, BAU Reference levels, Flexible land use, natural disturbance exclusions, etc.

c. Continued use of accounting approaches which take into account our **uneven historical rates of forest planting** – e.g., through the use of BAU reference levels for forest management after 2020.

d. More **cost-effective treatment for sustainable harvest emissions**, which doesn't penalise sustainable production forestry – could potentially be achieved through extended use of BAU reference levels to cover all sustainable forest harvest.

101 Our INDC forestry and land use accounting settings ideally need to deliver on these specific negotiation objectives, which seek to maximise the benefits for New Zealand's, taking into account our national circumstances and policy objectives. But they also need to take into account broader considerations, such as Government's overall climate policy objectives, its broader domestic priorities for enhancing sustainable land management, the needs of stakeholders, as well as longer term strategic issues such as what would support an effective global agreement if applied globally, or send the best mitigation signals over the long-term if devolved under the ETS.

102 The objectives and criteria for our INDC forestry and land use settings are therefore based on the broader Paris Project objectives for New Zealand's INDC, but also include additional criteria to address specific considerations around land-use, the ETS, operational implications for LUCAS, and broader sustainable land management concerns.

103 Given these additional considerations, and the large number of forestry and land use accounting options to be assessed, some Paris Project criteria have also been combined. The table below shows how the FOLU option assessment criteria reflect the Paris Project objectives and criteria.

Table 9: Mapping of Paris Project Objectives & Criteria to FOLU Option Assessment Criteria

OBJECTIVE	PARIS PROJECT CRITERIA	FORESTRY & LAND USE CRITERIA
Our contribution is considered credible – by international and domestic audiences	International and Domestic Expectations	**International expectations**
	National circumstances:	
	Level of Ambition:	**Environmental effectiveness & integrity**
	Transparent:	
	Environmental integrity:	
Appropriately manages costs and impacts on society	Achievable:	[NA for FOLU Options as no implied ambition]
		International reporting feasibility
		ETS implementation feasibility

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	Affordable:	**Commitment is least cost**
		Risk & uncertainty
		Potential domestic & stakeholder impacts
	Co-benefits and trade-offs:	**Co-benefits & trade-offs**
	Cost effective:	**Cost effective mitigation and fungibility**
Guides New Zealand over the long term in the global transition to a low emissions world	Durable:	**Policy durability & certainty**
	Signals:	**Long-term mitigation signal**
	Strategic:	**Strategy for effective global agreement**

Forestry & Land Use Criteria

104 The forestry and land use objectives and criteria will be used to evaluate agriculture, forestry and land-use accounting options for New Zealand's intended post-2020 nationally determined contribution (INDC) under the new climate change agreement to be agreed in Paris in 2015.

105 The proposed FOLU criteria have been developed on the basis of the Paris Project INDC criteria, but differ in the following places:

- Where the Paris Project criteria refer to value judgements about the **economy-wide target as a whole** (e.g., ambition, affordability), these criteria have been interpreted in their most relevant way to deciding on land sector INDC settings. 'Affordable' has been interpreted to mean that our international liabilities under our commitment is 'least cost', while 'Ambition' – which is enhanced by the strength of accounting incentives and expanded coverage of sectors, categories or emissions – has been interpreted as 'Strength and effectiveness of mitigation incentives', together with 'Transparency' and 'Environmental integrity'.
- Where the Paris Project criteria **use terms in different ways** to how they are understood in the UNFCCC negotiations on the land sector. For example, Paris Project uses the 'National circumstances' to specifically mean that New Zealand's INDC will have credibility by effectively communicating 'New Zealand's story', and the challenges we face (e.g. already high renewable electricity) in reducing our emissions. In contrast, in a land sector context, specific accounting approaches take into account quantitatively certain specific national circumstances, such as the age-class profile of our forests. As this is a cost issue, not a credibility one, it has been included under the land sector criterion of 'Cost-effectiveness'. The credibility aspects of communicating New Zealand's national circumstances have been included under 'international expectations'.
- Where **additional criteria are needed** to assess unique considerations for land sector accounting, or to assess specific practical implications for LUCAS or the ETS. This is a land-sector specific issue, as it's the only sector where accounting differs from reporting. As a result, land sector accounting decisions may have significant implications for:
    - Whether they would create significant operational or research costs for LUCAS to implement them
    - Whether they would be feasible to devolve as ETS obligations (e.g., from an MRV and compliance perspective)

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- Whether they would impact significantly on existing property rights, carbon assets, etc. of ETS participants or on other stakeholder interests
- Whether they create effective incentives in the context of the special characteristics of land sector emissions (which unlike other sectors tend not to be on a steady decline/increase since 1990, but jump from source to sink and back due to legacy effects, natural disturbance, age class effects, etc.)
- The profitability of primary sector production, where unlike with fossil fuels, exports are not exempt from international emissions liabilities (production vs consumption approach) – forest harvest being especially vulnerable to pricing as a predominantly carbon based product.

- Where the Paris Project criteria are **valid for some land sector 'form' options** only – e.g., 'Achievability' is a valid consideration for setting an ambitious agricultural sectoral target, but may be less relevant to choosing an accounting baseline (where there's no implied ambition).

- Where additional criteria are need for a **specific land sector target form**, e.g. 'fungibility' is an important consideration for setting a separate agriculture/land sector target – though potentially this could be subsumed within the broader cost-effectiveness criterion.

The FOLU criteria are also intended for use in a **regulatory impact analysis** if necessary of the different accounting options, given their potential economic and fiscal implications on New Zealand. For this reason, the proposed criteria have been written so as to avoid any overlap of duplication between them and so minimise any 'double scoring' of the same traits.

Table 10: Condensed Set of FOLU Criteria

OBJECTIVE	FOLU CRITERIA	ASSESSMENT CONSIDERATIONS
1 Our contribution is considered credible by international audiences	**International expectations**	• Consistency with **international obligations** under the UNFCCC for our approach to land sector, including for inclusion, form, coverage, direction of travel, responsibility, 'no backsliding', etc., and transparency requirements. • Would be well regarded by informed observers and **achievable** under future rules.
	Environmental effectiveness & integrity	• Accounting incentives created are likely to be **effective**, by promoting direct, additional, human-induced mitigation action in the land-sector. • Accounting tracks changes in emissions and removals which are **real, permanent, verified** and additional to robust, verified and meaningful baselines.
2 Appropriately manages costs and impacts on society	**Commitment is least cost**	• **Minimises total economic and fiscal costs** imposed on New Zealand by the international commitment over the commitment period (2021-2030). • Supports emissions **mitigation at least cost** within New Zealand. • Minimises the risk of **loss of competitiveness**.
	Risk and uncertainty	• Avoids a **high risk of accounting liabilities** as a result of projecting baseline values incorrectly or revisions to estimates of emissions and removals, or enables these costs to be managed through technical corrections.

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	Cost effective mitigation & fungibility	• Promotes emissions reductions in the **most cost-effective manner** (for any given level of investment in mitigation, the mitigation outcome is maximised). • Approach is consistent with NZ's future ability to participate in international **carbon markets**, and does not put market access at risk.
	Co-benefits & trade-offs	• Mitigation incentives promote co-benefits and minimise trade-offs in **managing multiple land management objectives** both within the primary sector and wider management of the natural environment.
	International reporting feasibility	• Approaches are **feasible to implement** in **international reporting** from a technical and operational point of view, given the current state of knowledge, monitoring, measurement and reporting capacity; or, if costly to implement, are proportionate to potential gains to the Crown or the quality of accounting.
	ETS implementation feasibility	• International settings would be **feasible to implement** through domestic policy, including **through devolution into the ETS** and other PAMs, and minimise compliance costs.
	Potential domestic & stakeholder impacts	• Implementation in ETS settings or other domestic policy would minimise adverse consequences for individual's welfare, assets or current or future expected carbon liabilities or property rights under the ETS.
Guides New Zealand over the long term in the global transition to a low emissions world	**Policy durability & certainty**	• Supports policy durability, **predictable domestic policy** and business certainty. • Sets an effective long-term approach to NZ's future commitments.
	Long-term mitigation signal	• Supports meeting future international expectations on **environmental sustainability,** and is likely to strengthen New Zealand and primary sectors' resilience to international action on climate change. • Supports NZ's primary sectors to be economically productive and efficient, environmentally sustainable, low emissions or emissions-intensive, resilient to climate change effects, and market-acceptable on environmental grounds.
	Strategy for effective global agreement	• Consistent with a **viable common approach or rule set** for different types of economies and land sectors (applicable to all). • Supports the continued **use of sinks** as legitimate means for Parties to meet their GHG commitments, as a cost-effective source of global mitigation.

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Table 11: Full Set of FOLU Criteria

FOLU CRITERIA	FORESTRY & LAND USE ASSESSMENT CONSIDERATIONS
International expectations	**International expectations** • Meets **international obligations** under the UNFCCC for our approach to land sector, including for inclusion, form, coverage, direction of travel, responsibility, transparency, 'no backsliding', etc., and is consistent with UNFCCC upfront

FOLU CRITERIA	FORESTRY & LAND USE ASSESSMENT CONSIDERATIONS
	information requirements for INDCs. • NZ's land sector approach is likely to be seen as legitimate, having environmental integrity, supporting international accountability and comparability, and will be **realistically 'winnable'** and able to be maintained through any future rules negotiations.
	Credible in light of national circumstances • Approach is **credible** to informed observers **and defensible** on the basis that it accommodates New Zealand's particular land sector characteristics, challenges, opportunities and management practices, or particular challenges of the land sector in general.
Environmental effectiveness & integrity	**Strength and effectiveness of mitigation incentives** • Mitigation incentives created are likely to be effective, by promoting direct, additional, human-induced action in the land sector, targeting genuine, cost-effective mitigation opportunities within New Zealand, accommodating challenges realistically, and prioritise effort by focusing on significant sources of anthropogenic emissions and removals able to be influenced. • Predicted effect on New Zealand's emissions and removals.
	Environmental integrity • Accounting tracks changes in emissions and removals which are **real, permanent, verified and additional** to robust, verified and meaningful baselines. • Supports methodological consistency with the UNFCCC **TACCC principles**: Transparency, accuracy, completeness, consistency and comparability, and uses **verifiable** data sources and valid, robust or otherwise justifiable methodologies. • Includes significant **categories** of emissions and removals over 2021-2030 where justified on materiality and cost-effectiveness grounds. • Focuses on **anthropogenic** effects within the commitment timeframe, excludes non-anthropogenic and legacy removals (where possible), and avoids **arbitrary outcomes** in accounting, such as windfall gains/losses, or potential emissions leakage. • Recognises the variability, complexity and uncertainty of biological stocks, sources and sinks and the impacts of extreme events e.g., fire, drought, floods.
	Transparent: • Approach is easily understood, not complex, can be easily verified, as factors of transparency.
Commitment is least cost	**Commitment is least cost** • Minimises total economic and fiscal costs imposed on New Zealand by the international commitment over the immediate commitment period (2021-2030), and/or maximises fiscal savings. • Supports emissions mitigation at least cost within New Zealand, while avoiding punitive absolute emissions costs for emissions which are not feasible to reduce. • Minimises the risk of loss of economic competitiveness – including by ensuring any implicit price on emissions under NZ's approach consistent with that expected to be imposed by NZ's trade competitors.

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FOLU CRITERIA	FORESTRY & LAND USE ASSESSMENT CONSIDERATIONS
Risk and uncertainty is minimised	**Risk and uncertainty** • Supports the predictability and certainty of commitment costs and liabilities, or ensures that the level of accounting risk takes into account information availability and uncertainty, and risks are minimised or treated in a reasonable manner. • Avoids a high risk of accounting liabilities as a result of establishing and projecting baseline values incorrectly, or revisions to estimates of emissions and removals particularly with new scientific knowledge, or enables these costs to be managed through technical corrections. • Avoids a risk of high accounting liabilities arising from significant revisions to New Zealand's existing estimates of emissions and removals from particular land-use categories or activities, for example due to future data or methodological improvements.
Cost effective mitigation and fungibility	**Cost-effective mitigation** • The approach can support global emission reduction efforts to be achieved in an efficient and cost-effective way and lead to positive economic side effects. • Delivers emissions reductions in the most cost-effective manner (for any given level of investment in mitigation, the mitigation outcome is maximised). • New Zealand can use cost-effective sources of abatement in the land sector towards its commitment. • Accounting approaches take into account our national circumstances, including our uneven historical rates of forest planting, and the fast-growing nature of our plantation forests. • Accounting approaches accommodate the unique biophysical characteristics of the land sector (e.g., legacy effects, natural disturbance, extreme events), and exclude non-anthropogenic greenhouse gas emissions and removals from accounting where possible. • Accounting incentives target genuine, cost-effective mitigation opportunities within New Zealand. **Fungibility** • Approach is consistent with NZ's future ability to participate in international carbon markets, and does not put market access at risk. • Mitigation outcomes are likely to be fungible within and between sectors and countries. • Supports New Zealand's (both the Crown and ETS participants) ability to export emission units/carbon credits, and participate in the global carbon market for land sector offsets. • Supports the continued use of sinks as a legitimate means for Parties to meet their greenhouse gas reduction commitments, as a cost-effective source of global mitigation. • Low-integrity units which could put at risk the perceived integrity of land-based offsets are minimised, or treated consistently with other parts of the agreement where similar risks arise.

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FOLU CRITERIA	FORESTRY & LAND USE ASSESSMENT CONSIDERATIONS
Co-benefits are maximised and trade-offs minimised	**Co-benefits & trade-offs** • Mitigation incentives promote co-benefits and minimise trade-offs in managing multiple land management objectives both within the primary sector and wider management of the natural environment, including sustainable development. • Aligns with the Government's broader domestic policy objectives for land use and economic development in New Zealand, and supports the sustainable development of New Zealand's natural resources within national and global limits. • Incentives are efficient and consistent with sustainable productive land uses, and avoid penalising activities which deliver wider social goods (e.g., through absolute rather than marginal emissions pricing). • New Zealand's approaches are broadly consistent with our other international obligations and commitments *inter alia* biodiversity. • Negative environmental impacts are minimised and positive environmental impacts are promoted. • The approach provides flexibility to manage dynamic land use decisions through time, including for adaptation and optimal use of land, while maintaining environmental integrity of accounting. • The approach protects food security and productive potential of the land base.
International reporting feasibility	**International reporting feasibility** • Accounting approaches are feasible and non-burdensome to implement in New Zealand's international climate change reporting and accounting within the necessary time periods. • Significant implementation and operational costs are avoided, minimised, or proportionate to potential gains to the Crown or the quality of accounting (materiality and significance considerations). • New Zealand's international land sector reporting and accounting approach would be realistically feasible recognising national circumstances, e.g., significant hill country which is highly variable • Approaches are feasible to implement from a technical and operational point of view, given the current state of knowledge, monitoring, measurement and reporting capacity. • Cost-effectiveness is enhanced by building on current international reporting and accounting systems, guidance and rules, or supporting synergies between our international reporting and domestic data requirements.
ETS implementation feasibility	**ETS implementation feasibility** • International settings would be feasible to implement through domestic policy, including through devolution into the ETS and other policies and measures. • Approaches are compatible with existing approaches under the ETS, or if not, could be implemented in parallel or with minimal disruption to current systems, with minimal operational costs. • If approach is devolved to land managers, INDC settings would be consistent with least cost reporting and compliance under the ETS, and support administrative efficiency and effectiveness, by minimising administrative and implementation costs to Government.

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FOLU CRITERIA	FORESTRY & LAND USE ASSESSMENT CONSIDERATIONS
Potential domestic & stakeholder impacts	**Potential domestic & stakeholder impacts** • Implementation in ETS settings or other domestic policy would not have adverse consequences for individual's current or expected assets or liabilities. Approaches would not negatively affect current ETS participant or unit holders' current or future expected carbon property rights or entitlements under the ETS. • Stakeholder impacts from any domestic implementation are equitable. Equity between sectors and groups would be maximised. Risk-sharing between emitters and Government/ taxpayers is appropriate. • Approaches would support the development by Māori of their natural resources in ways that contribute to the development of the Māori economy, and which are consistent with their environmental values • Domestic implementation would not result in significant carbon cost differentials between New Zealand's trade exposed businesses and its trading competitors and partners. • Domestic implementation could be achieved with minimal competition distortions within and between sectors of the New Zealand economy. • Compliance costs to ETS participants are minimised.
Policy durability & certainty	**Policy durability & certainty** • Sets a viable long-term approach to NZ's future commitments – approach is expected to be durable under any future rules negotiation process, and the risks of needing to reverse or change our approaches are minimised in the first or subsequent cycles. • Supports policy durability, predictable domestic policy and business certainty. • International settings promote sectoral equity, and the durability of domestic settings. • Appropriately reflect the Crown's responsibilities as a Treaty partner and deliver on any relevant Treaty settlement obligations • Provides New Zealand primary sectors with certainty for future decision making. • Promotes understanding of international accounting and (where relevant) the ETS.
Long-term mitigation signal	**Long term mitigation signal** • If domestic measures are introduced that align with the accounting approach, then they would provide a carbon price signal to land owners and managers consistent with NZ's desired long-term mitigation pathway for the sector. • Promotes emissions reductions on the most cost-effective pathway, including by recognising the different temperature impacts of different gases for long term reductions, and by targeting long-lived gases, 'low hanging fruit' reductions and material mitigation opportunities on appropriate timescales • Maintains international export competitiveness of New Zealand's primary sector businesses over the long term. • Supports meeting future international expectations on environmental sustainability, and is likely to strengthen New Zealand and the primary sectors' ability to adapt and be resilient to the impacts of international action on climate change and climate change itself.

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FOLU CRITERIA	FORESTRY & LAND USE ASSESSMENT CONSIDERATIONS
	• Supports developing an economy with higher productivity, increased value-added to produced goods and reduced negative environmental and other impacts of production, including by supporting New Zealand's primary sectors to be economically productive and efficient, environmentally sustainable, low emissions or emissions-intensive, resilient to climate change effects, and market acceptable, including on environmental and carbon foot printing grounds. • Enhances New Zealand's clean and green reputation for New Zealand's exporters and minimises risks of trade sanctions.
Strategy for effective global agreement	**Strategy for effective global agreement** • Promotes NZ strategic interests for an effective global agreement, and the role of the land sector therein. • Supports our priorities for an effective and equitable post-2020 agreement, by demonstrating a globally applicable approach that addresses significant sources of emissions and removals in an effective way. • Consistent with a viable common approach or rule set that could be cost-effective for different types of economies and land sectors (applicable to all), and which could also be used by NZ's trade competitors to manage land sector emissions in a comparable way. • Increases New Zealand's influence on the outcome of international climate change negotiations. • Supports other New Zealand international objectives, e.g., around reducing deforestation and eliminating illegal logging.

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5 Post-2020 Modelling Project

MPI modelling project

106 Forest carbon models were developed by MPI to assess the effect of applying various accounting treatments to New Zealand's forestry and land use. This included modelling the impact of:

- Rolling over the Kyoto Protocol approach
- Accounting for all UNFCCC emissions and removals
- Using different base years and start years
- Using the reference level approach for some/all forests and other land uses
- Applying different accounting treatments relative to a base line or just summing the impact over the commitment period
- Crediting up to a steady state or long term average only, implications of land based accounting, including using the 'land converted' to 'land remaining' roll over rule.
- Assessing the value and importance of particular forestry accounting rules to New Zealand, like: FLU, ARDC and HWP.

107 The carbon model and projections developed by MPI were reviewed by Scion who judged them to be accurate and fit for purpose. Assumptions and projections of new planting and deforestation where also reviewed and agreed by forest stakeholders (FOA president: David Rhodes). While the data and assumptions used in the modelling were developed in close partnership with the LUCAS team at MfE.

Contracted Scion work

108 MPI contracted Scion to provide independent projections, and also to review MPI's projections, for the 2020 agreement. Like the work MPI has conducted in-house, Scion's modelling looked at the effects of different accounting rules under each scenario. Scion confirmed MPI's projections are robust and accurate. Scions also provided update harvesting projections that were later used by MPI in updating projections of wood supply.

Emission Projection Scenarios

109 For projecting future UNFCCC emissions and removals three different scenarios (Low, Mid-point and High emissions scenarios) have been modelled to address uncertainties relating to future rates of afforestation, deforestation and harvesting, rotation ages, and carbon prices. The results from the 2013 National Inventory Report (NIR) are used for the 'historic or actual' estimates from 1990 – 2013. A summary of the three projection scenarios is provided below.

Low emissions projections assume:

- Carbon prices over NZ$25 per tonne of CO_2-e
- Average annual rates of deforestation of around 2,400 hectares from 2014 to 2050.
- New planting rates ramping up gradually from around 3,000 hectares to 30,000 hectares, from 2014 to 2030, then 30,000 thereafter.

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- Post-1989 forest rotation ages of around 32 years.
- Assumes a high proportion (75%) of forest owners take up the option of Flexible Land Use when deciding to deforest.
- Assumes maximum benefit from HWP and consistent with 2013 NIR approach.

Midpoint emissions projections assumes

- Carbon prices of between $12.5 and NZ$25 per tonne of CO2-e
- Average annual rates of deforestation of around 5,000 hectares from 2013 to 2050.
- New planting rates ramping up gradually from around 3,000 hectares to 15,000 from 2014 to the mid 2020's, then 15,000 thereafter.
- This scenario assumes post-1989 forest rotation ages of around 30 years.
- Assumes 50% of forest owners take up the option of Flexible Land Use when deciding to deforest.
- Assumes future wood supply used for HWP forecasting is consistent with projections and deforestation is excluded from HWP.

High emissions projections assumes

- Very low carbon prices ranging from $0 to NZ$12 per tonne of CO2-e
- Average annual rates of deforestation of around 8,600 hectares from 2014 to 2050.
- New planting rates of around 5,000 hectares per year from 2015 onwards.
- This scenario assumes post-1989 forest rotation ages of around 28 years.
- Assumes a very small percentage of forest owners take up the option of Flexible Land Use when deciding to deforest.
- Assumes exported roundwood is not eligible to be included as a harvested wood product, future wood supply is consistent with projections and deforestation is excluded from HWP.

Effect of Sensitivity Analysis

110 An example of the sensitivity analysis undertaken is provided below. Low, midpoint and high emission scenarios are provided for Article 3.3 activities under the Kyoto Protocol.

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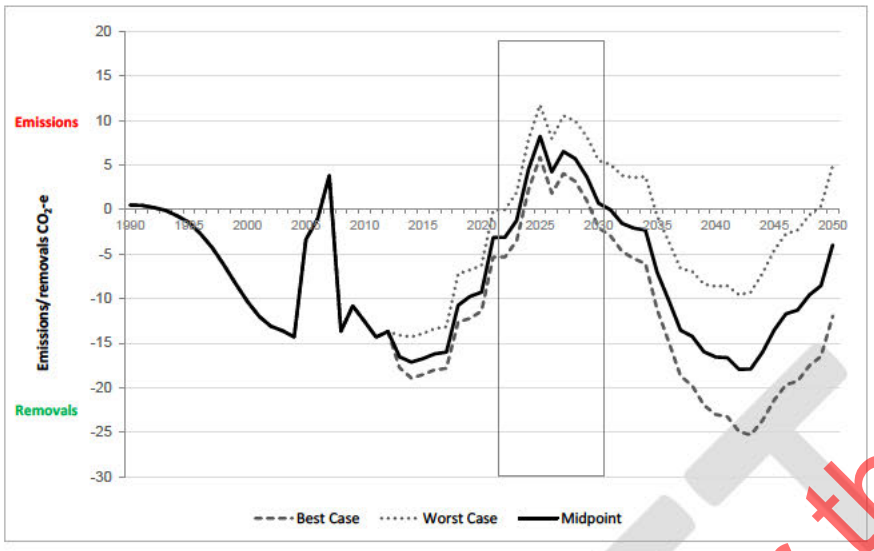
Figure 8: New Zealand's Net Kyoto Emissions Liability under Different Scenarios



Assumptions used for Projections

Harvesting

111 The projections of planted production forestry removals are particularly sensitive to harvest levels. The average rotation length in New Zealand is currently 28.6 years, and during the 1990s rates of afforestation in New Zealand were high. This means harvesting of production forests planted in the 1990s is expected to increase leading into 2020.

112 The main driver of forest emissions is the level and timing of harvest. This is why rotation ages of 28, 30 and 32 years are factored into the three projection scenarios to highlight the sensitivity of projections to harvest levels. Average rotation length can change due to log market conditions, forest owner objectives and (potentially) in response to the NZ ETS. Thus, land owners with forests planted after 1990 that are registered under the NZ ETS will not only consider log prices and harvesting costs, but also the carbon balance in the forest (e.g., whether it is better to continue to accrue units, or harvest and meet liabilities), and also the price of carbon, which could be a significant new factor that comes into harvesting decisions. Harvesting area data is sourced from analysis completed in late 2014 contracted to Scion.

Deforestation

113 Scenarios of future planted forest deforestation used in these projections are based on annual surveys of planted forest owners' intentions. However, planted forest owners' and investors' intentions to deforest can be influenced by a range of factors, such as:

- Perceptions of land-use economics
- Rates of return between forestry and other land uses
- Government policy
- The carbon emission unit price

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- The lease of land expiring.

114 Natural forest deforestation estimates are mainly based on the assumption that clearing of self-sown exotic tree weeds continues (exempt under the NZ ETS) and there continues to be small amounts of shrub land clearance.

Afforestation

115 New planting rates are based on the analysis completed by MPI in April 2015. Afforestation scenarios used in the projections are dependent on variables that can only be forecast with considerable uncertainty. These variables include:

- Government planting schemes
- Log prices
- Nursery capacity
- Rates of return between forestry and other land uses
- Land availability
- Forest/land owners future intentions,
- Future international and domestic accounting rules
- Current private sector interest in participating in forestry schemes administered by the government.

Major Uncertainties and Risks Areas for Future Emission Projections

Harvested Wood Products

116 Harvested Wood Products was reported for the first time in April 2015 under the UNFCCC and the Kyoto Protocol. This report will be reviewed by the UNFCCC later this year which will provide an indication on any likely future improvements in data collection and methodology.

117 Harvested Wood Products has a significant impact on delaying emissions from production harvest if verifiable data is available on the final wood product (i.e. wood panels). However, the true impact of Harvested Wood Products will only be realised once research is completed to determine the product mix for New Zealand's exported roundwoods and other future improvements in methodology and data collection.

118 As such, uncertainty in the degree that Harvested Wood Products can delay emissions from harvest is reflected in the three emission scenarios. The low emissions scenario assumes that New Zealand can delay emissions from all production harvest – being the maximum possible benefit. The midpoint scenario reflects a more conservative approach in determining future product mix and wood supply, while the high emissions scenario builds on the midpoint assumptions with the addition that New Zealand will not be able to delay emissions from exported roundwoods as the final product will be unknown.

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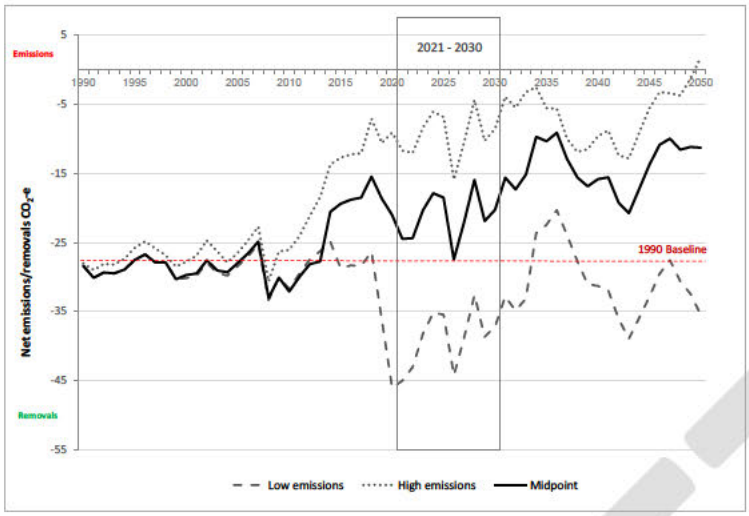
Figure 9: Uncertainties in UNFCCC Reporting. Includes emissions and removals from natural and planted forests.



Future emissions from New Zealand's Grassland Soils

119 New Zealand's UNFCCC reporting currently assumes that grasslands under constant management (i.e., 'high producing grassland remaining high producing', 'low producing grassland remaining low producing grassland', etc.) are steady state and carbon neutral, unless they are converted to a new category of grassland. This approach does not capture any carbon stock changes that might be occurring as a result of management changes within the grassland sub-categories, such intensification of fertilisation or irrigation of high-producing grassland.

120 Should LUCAS be required by the UNFCCC to improve on its current approach in future to pick up the carbon effects of management change, for example by more narrowly stratifying the current broad grassland sub-categories, and if some management practices are shown to deplete soil carbon, then a liability could be generated under any future accounting of grasslands. Given the scale of New Zealand's grasslands (currently 54% of New Zealand or around 15 kha), any future identified emissions (or removals) could potentially have a large effect on New Zealand's future emissions projections.

Modelling Options

121 The modelling project considered a large number of different combinations and variations on the following key components of forestry and land use accounting:

- Emissions and removals from specific activities
- Different accounting treatments/baselines
- Application of different accounting rules, under different assumptions and uptake rates
- Different base years
- Different crediting periods
- Under different emissions scenarios

122 A selection of the main variants are presented in the following table, together with their corresponding 'INDC option' number, where applicable.

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6 Modelling Results

Summary of Modelling Results

Table 12: 2020 Forestry and Land Use Projections Summary – NOTE: All projections are best estimates only and should be treated with caution

Accounting Scenario	Option #	Accounting Approach	Activity Start	Rule variations 1	Rule variations 2	Total Net Emissions over 2021 – 2030 by Emissions Scenario			Level of certainty (confidence) in projections
						Best Case - High C price	Mid Emissions - Mid C price	Worst Case - Low C price	
Deforestation only	1	Total net change over 2021 – 2030	1990	Without FLU	Gross-net	33	**56**	64	Good
		Total net change over 2021 – 2030	1990	With FLU	Gross-net	15	**35**	64	Good
		Total net change over 2021 - 2030 relative to 1990	1990	Without FLU	Net-net on 1990	27	**50**	58	Good
		Total net change over 2021 - 2030 relative to 1990	1990	With FLU	Net-net on 1990	15	**35**	64	Good
Kyoto Article 3.3 & 3.4 FM	3	Total net change over 2021 - 2030 - **Status Quo**	1990	CP2 rules (incl FLU and HWP)		2	**26**	64	Reasonable
	4	Total net change over 2021 - 2030 - **CP2 + ARDC**	1990	CP2 rules (incl FLU and HWP)	+ ARDC	-32	**-8**	29	Extremely poor
	5	Total net change over 2021 - 2030 - **New base year**	**2005**	CP2 rules (incl FLU and HWP)	+ New base year	-20	**4**	41	Reasonable
	8	Total net change over 2021 – 2030 – **Gross-net FM – No cap**	1990	No BAU RL – No cap	Gross-net / Zero RL for FM	-176	**-152**	-114	Reasonable
		Total net change over 2021 – 2030 – **Gross-net FM – 3.5% cap**	1990	No BAU RL – 3.5% annual cap	Gross-net / Zero RL for FM	-21	**-21**	--21	Excellent
		Value of KP Rules:							
		Total net change over 2021 –	1990	BAU RL	No HWP, FLU or	48	**75**	91	Reasonable

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		2030			ARDC				
		Total net change over 2021 – 2030	1990	BAU RL	Just FLU	29	**54**	91	Reasonable
		Total net change over 2021 – 2030	1990	BAU RL	Just HWP	20	**47**	64	Reasonable
	2	Total net change over 2021 - 2030 - **CP1 rules**	1990	BAU RL / No FM	Just ARDC	3	**30**	47	Reasonable
UNFCCC Reporting	6	Total net change over 2021 - **2030 relative to 1990**	1990	Net-net on 1990		-104	**71**	185	Extremely poor
	9	Total net change over 2021 - 2030 **- Gross-net**	1990	Gross-net		-388	**-213**	-95	Extremely poor
	7	Total net change over 2021 - 2030 relative to 2005	**2005**	Net-net on 2005		-104	**67**	171	Extremely poor
Simple BAU Reference Level	10, 11	Total net change over 2021 - 2030 **relative to BAU reference level**	1990	All land included in BAU RL		0/-	**0**	0/+	Good/ reasonable
Land in Transition (Credit/debit land in transition to steady state only, then transfer to BAU RL))	12, 13, 14	Total net change over 2021 – 2030	1990	All LUC (AR & D)	Harvest @20	-35	**-10**	26	Good/ reasonable
		Total net change over 2021 – 2030	1990	All LUC (AR & D)	Harvest @28	-100	**-74**	-38	Good/ reasonable
		Total net change over 2021 – 2030	**2005**	All LUC (AR & D)	Harvest @20	-32	**-6**	30	Good/ reasonable
		Total net change over 2021 – 2030	**2005**	All LUC (AR & D)	Harvest @28	-34	**-8**	28	Good/ reasonable
Differentiated forest treatment	15	Total net change over 2021 – 2030 - Land in Transition + non harvested indigenous forests	1990	All LUC (AR & D) and Non harvested indigenous forest	Harvest @20	-95	-70	-34	Good/ reasonable

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Notes:

- **Positive (+)** is an emission of CO_2 to the atmosphere
- **Negative (-)** is a removal of CO_2 from the atmosphere
- 'Total net change over 2021-2030' = **Gross-net** under Kyoto terminology
- 'Total net change over 2021 - 2030 relative to 1990' = **Net-net** under Kyoto terminology
- **'AR only (D & FM=> BAU RL)'** - While this may seem an unlikely scenario, it is equivalent to the REDD+ approach of accounting for deforestation relative to a BAU or historical reference level, or to the Kyoto Article 3.7 (Australia) rule, which allows net-net accounting of deforestation relative to base year emissions. This approach is more suited to developing countries emissions profiles, with high deforestation, so we have included it as a scenario that is more likely to support developing country participation.

Value of the Kyoto Protocol Rules

123 International forestry rules determine how carbon stocks and flows are accounted for under the Kyoto Protocol for CP1 and CP2. Understanding the value, or potential of these existing rules in limiting future liability, is important to assessing the best possible rule set for New Zealand. The potential impact of the rules for accounting is provided in Table X.

Table 13: Estimated Impact of various accounting rules in reducing emissions over 2021 to 2030 assuming no other accounting rules are applied

Kyoto Protocol Rules	Estimated impact in reducing emissions over 2021 to 2030
ARDC applied to post-1989 forest harvest	Reduces harvest emissions from post-1989 harvest as emissions are limited to removals received over the period.
HWP applied to post-1989 forest harvest	Impact depends on level of harvest, domestic and exported product mix
FLU applied to pre-1990 planted forest in avoiding deforestation liabilities	Impact on reducing (avoiding) pre-1990 planted forest deforestation is related to carbon price, land availability and other behaviour drivers.
Natural Disturbance	Unlimited impact depending on severity of disturbance.
Reference levels for pre-1990 planted forests – and could potentially be applied to other land uses	If applied would limit emissions and removals to projected BAU.
UNFCCC Rules	**Estimate impact in reducing emissions over 2021 2030**
HWP applied to pre-1990 and post-1989 harvest	Could have significant impact on delaying emissions, but has large uncertainty as the benefit depends on domestic and exported product mix.

Flexible Land-use (Carbon Equivalent Forest Conversion rule/'offsetting')

124 The Flexible Land-use rule was introduced as the Kyoto Protocol for the first commitment period unnecessarily limited the flexibility of land use for planted production forests that were established prior to 1990. Unlike 'new forests' these pre-1990 forests have not earned carbon

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credits under the Kyoto Protocol, but, if these forests are removed or even 'relocated' then they incur liabilities equal to the total carbon stored in them. These liabilities are very large at the individual and country level.

125 The rule effectively means that planted production forests (that is plantations) should be able to be harvested and replanted on another area of land with an "equivalent forest" without accounting for the temporary emissions that result.

126 The value of this rule in avoiding deforestation liabilities is naturally dependant on carbon prices, land use economics and forest owner behaviour. The annual Deforestation Intentions Survey reported in 2015 that some forest owners may consider using Flexible Land-use when the carbon price is around or over $10/NZU. Projections on the uptake of the Flexible Land-use in avoiding deforestation is included into the low, midpoint and high emissions scenarios.

Harvested Wood Products

127 Calculating emissions from harvested wood products has been reported in the inventory for the first time in 2015. But as current available data, particularly around product lifetime and finished product, for New Zealand is limited, our ability to project the effect of this rule is limited.

128 The harvested wood products rule recognises that harvest emissions are not instantaneous. These harvest emissions are just over half of the carbon sequestered in the forest prior to harvest. In 2010, approximately 42% of New Zealand's total harvest volume was exported as round wood. Currently we have insufficient data on the end use of our exported round wood to take full advantage of this rule. A high standard of verifiable information will be required and will need to be maintained for ongoing accounting purposes. MPI has identified this information gap with results due late 2015. The benefit to New Zealand is not realised by receiving additional credits, but through the accounting approach reflecting a delayed emissions profile; meaning that fewer units will need to be surrendered.

129 The benefit under Kyoto Protocol accounting is likely to become more significant in the early 2020's when post-1989 forests planted in the early 1990s are harvested. The benefit of the harvested wood products rule under the UNFCCC is likely to be significant in delaying future harvesting emissions, but whether under the Kyoto Protocol or the UNFCCC, the true benefit in delaying harvest emissions is uncertain as is dependent on future domestic and exported product mix.

The Afforestation/Reforestation Debit-Credit Rule (ARDC)

130 This rule was only applied to 'new forests' established after 1990 under CP1 of the Kyoto Protocol. The rationale behind the rule was that Parties are only credited for the amount of carbon that is removed by new forests since the start of the commitment period (2008) and not for all of the carbon that has accumulated in the forest since their establishment. For example, a new forest planted in 1995 accumulates carbon between 1995 and 2008 that is not credited under the Kyoto Protocol. The introduction of the A/R Debit-Credit rule for the post-2020 agreement would reduce New Zealand's projected liability from harvesting post-1989 forests.

131 The A/R Debit-Credit rule acted to limit liabilities that a Party faces as a result of harvesting activities in new forests. The rule limited liabilities to only the amount of carbon that was

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removed by the forest since the start of the commitment period (2008). Without this rule, liabilities from these new forests will be greater than the amount of credits that were received for the establishment of these new forests – this would retrospectively penalise Parties for having established forests prior to the start of the commitment period – a perverse and inequitable outcome.

Natural Disturbance

132 Under the Kyoto Protocol countries can now exclude emissions from natural disturbances in forests that are in excess of a predefined background disturbance level. A number of conditions need to be met, including identifying affected areas, ongoing reporting and monitoring, and not claiming a sink when the forests regrow. The rule primarily benefits countries with large inter-annual variability in natural disturbances (for instance, Australia and Canada).

133 New Zealand submitted a background disturbance level to the UNFCCC in 2015, as part of the inventory process. The rule could also be an important tool for any post 2020 agreement to manage risk to carbon stocks from future increases in natural disturbance, including increased fire and pest risks from a changing climate.

Reference Levels for pre-1990 forests

134 Projected reference levels provide advantages over other accounting treatments because they create cost-effective mitigation incentives for countries to manage large sources of emissions in the land sector, even where a large proportion of these emissions are either effectively unavoidable (e.g., due to historical factors) or projected to increase under BAU management – without the country facing an expensive accounting liability for the full sum of these emissions.

135 For accounting under the Kyoto Protocol for the second commitment period forest management is treated under a reference level (or business as usual projections of net emissions) approach that covers both natural and planted pre-1990 forests. Deviations from the reference level result in credits or debits. The reference level acts as a projected 'business as usual' overall carbon budget for forest management against which to compare actual performance.

136 In CP2 differences between the reference level and the actual emissions result in credits or debits. However, in CP2 debits are uncapped but credits are capped at 3.5% of 1990 emissions. This limiting of removals is likely to be an issue for New Zealand when determining the rule structure for the post 2020 agreement.

Modelling Results for Accounting Options

137 Please see table over page

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Forestry & Land Use Accounting Options	Activity Start	Rule variations	Rule variations 2	Total Net Emissions over 2021 – 2030 by Emissions Scenario			Level of certainty (confidence) in projections
				Best Case - High C price	Mid Emissions - Mid C price	Worst Case - Low C price	
Land use change only							
1. Deforestation only	1990	Without FLU	Gross-net	33	**56**	64	Good
2. Net Forest Area – Afforestation & Deforestation only (NZ Kyoto CP1)	**1990**	BAU RL / No FM	Just ARDC	3	30	47	Reasonable
Kyoto Protocol CP2-based							
3. Kyoto CP2 Status Quo – 3.3 ARD & 3.4 FM (BAU RL)	**1990**	**CP2 rules (incl FLU and HWP)**		**2**	**26**	**64**	**Reasonable**
4. Kyoto CP2 + ARDC	1990	CP2 rules (incl FLU and HWP)	+ ARDC	-32	**-8**	29	Extremely poor
5. Kyoto CP2 + New base year	**2005**	CP2 rules (incl FLU and HWP)	+ New base year	-20	**4**	41	Reasonable
UNFCCC reporting 'land-based'							
6. UNFCCC based accounting – No special rules – Net-net on 1990	1990	Net-net on 1990		-104	**71**	185	Extremely poor
7. UNFCCC based accounting – No special rules + New base year	**2005**	Net-net on 2005		-104	**67**	171	Extremely poor
Full carbon accounting of Forests							
8. Kyoto CP2 Rules + Zero-based FMRL (gross-net of all pre-1990 forest)	1990	No BAU RL, No cap	Gross-net / Zero RL for FM	-176	**-152**	-114	Reasonable
○ Kyoto CP2 Rules + Zero-based FMRL – 3.5% cap	1990	No BAU RL	3.5% cap	-21	**-21**	-21	Excellent
9. UNFCCC based accounting + Full carbon accounting of FOLU offset	1990	Gross-net, No cap		-388	**-213**	-95	Extremely poor
BAU Reference Level Approach to Land Sector							
10. Simple BAU Reference Level Approach to All forests/FOLU/AFOLU	1990	All land included in BAU RL		0/-	**0**	0/+	Good/ reasonable
11. Net-Net Reference Level Approach to the Land Sector	1990	All land included in BAU RL		0/-	**0**	0/+	Good/ reasonable
Land use transitions to BAU Reference Levels							
12. Kyoto CP2 activity-based + Land use transitions from Article 3.3 to 3.4	1990	All LUC (AR & D)	Harvest @20	-35	**-10**	26	Good/ reasonable
13. UNFCCC land-based accounting + in-built transitions + Kyoto CP2 rules	**1990**	**All LUC (AR & D)**	**Harvest @20**	**-35**	**-10**	**26**	**Good/ reasonable**
14. Dynamic reference level approach to all forests/entire land sector	1990	All LUC (AR & D)	Harvest @20	-35	**-10**	26	Good/ reasonable
Variations on Land in Transition							
• Transition at 28 years (proxy for inclusion of HWP)	1990	All LUC (AR & D)	Harvest @28	-100	**-74**	-38	Good/ reasonable
• Transition at 20 years + 2005 base year	**2005**	All LUC (AR & D)	Harvest @20	-32	**-6**	30	Good/ reasonable
• Transition at 28 years + 2005 base year	**2005**	All LUC (AR & D)	Harvest @28	-34	**-8**	28	Good/ reasonable
Differentiated forest treatment							
15. Differentiated forest treatment – Full carbon accounting of permanent non-harvested forests	1990	All LUC (AR & D) and Non harvested indigenous forest	Harvest @20	-95	**-70**	-34	Good/ reasonable

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7 INDC Options

138 For the purposes of identifying the key accounting choices for New Zealand's 2015 contribution, the following groups of options have been identified:

- Tier 1 Options – Overall treatment within the target
- Tier 2 Options – Forestry and land use accounting options
- Tier 3 Options – Accounting coverage

139 These options have been identified on the following basis:

- They are an internationally-recognised approach, either currently or previously in use by either developed or developing countries under the UNFCCC or its subsidiary arrangements
- They have been identified in informal international negotiations or by recognised experts as possible land sector accounting approaches, or
- They have been identified by MPI officials as combining elements of all of the above approaches.

140 A challenge in identifying possible post-2020 accounting approaches is the major uncertainty that exists as to what rules will be agreed under the new climate change agreement – and how other countries will respond to this uncertainty in formulating their 2015 INDCs.

Tier 1 Options: Overall Target Form

A) Overall treatment within the target

Options

1. Include forestry and land use within the quantified, economy-wide target[3]
2. Include forestry and land use under a separate quantified target
3. Exclude forestry and land use from New Zealand's post-2020 INDC

B) Treatment as an offset

Options

1. Treat FOLU as offset sector (overall gross-net + rules)
2. Treat FOLU like other sectors (net-net)
3. Treat entire 'land sector'/AFOLU as offset sector (overall gross-net + rules)

[3] Note: Cabinet Strategy Committee has agreed that a commitment 'equivalent' to this form is an appropriate post-2020 emissions reduction target (STR Min (15) 2/1). These options are included for completeness.

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C) Land vs Activity-based approach

Options

1. UNFCCC reporting 'land-based' approach
2. Kyoto 'activity-based' approach

Tier 2 Options: Forestry & Land Use Accounting

D) Forestry & Land Use Accounting Options

Land use change only

1. Deforestation only
2. Net Forest Area – Afforestation/Reforestation & Deforestation only (NZ Kyoto CP1)

Kyoto Protocol CP2-based

3. Kyoto CP2 Status Quo – 3.3 ARD & 3.4 FM (BAU RL)
4. Kyoto CP2 + ARDC
5. Kyoto CP2 + New base year

UNFCCC reporting 'land-based'

6. UNFCCC based accounting – No special rules – Net-net on 1990
7. UNFCCC based accounting – No special rules + New base year

Full carbon accounting of Forests

8. Kyoto CP2 Rules + Zero-based FMRL (gross-net of all pre-1990 forest)
9. UNFCCC based accounting + Full carbon accounting (gross-net) of FOLU offset

BAU Reference Level Approach to Land Sector

10. Simple BAU Reference Level Approach to All forests/FOLU/AFOLU
11. Net-Net Reference Level Approach to the Land Sector ('Full carbon stocks accounting') – Expected net emissions & removals added to carbon budget

Land use transitions to BAU Reference Levels[4]

12. Kyoto CP2 activity-based + Land use transitions from Article 3.3 to 3.4

[4] I.e., introduce land use transitions between categories at the long-term average to differentiate new from existing activities (LUC & project) and policies, and enable extension of reference levels to all existing BAU activity.

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13. UNFCCC land-based accounting[5] with in-built transitions + Kyoto CP2 rules
14. Dynamic reference level approach to all forests/entire land sector: Apply BAU reference levels to all existing activities and full carbon accounting to new actions

Differentiated forest treatment

15. Differentiated forest treatment – Variation on Land in transition options 11-13: BAU Reference Level for forest management + full carbon accounting of permanently protected, non-harvested forests

Tier 3 Options: Accounting Coverage

E) Accounting Coverage of Other land uses

Options

1. **Status quo** – Forest land and deforestation only
2. **Increased coverage** – Extend coverage to croplands and grasslands
3. **Comprehensive coverage of all lands** – Extend coverage to all land use categories – 100% of New Zealand
4. **Other options** – Provisional/conditional inclusion of Grasslands and Croplands?

F) Treatment of Other Land Uses

Options

1. **Kyoto status quo** – net-net against base year
2. **Reference level** – Include all other land use categories within a BAU reference level
3. **Combined reference level approach** – Account fully for conversions between categories but put remaining land under a BAU reference level

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[5] Note, UNFCCC land-based reporting already includes automatic transitions of land, from the 'land converted to' category to the 'land remaining land' category.

8 Assessment of INDC Options

141 Each option identified has been described in detail below, to enable them to be assessed against the criteria.

142 The Tier 1 and 3 options have been assessed on a qualitative basis only, reflecting their simpler nature, whereas the Tier 2 accounting options include a full quantitative assessment of modelled liability impacts, key accounting assumptions, a qualitative assessment against the criteria, as well as an initial analysis of potential ETS impacts, if the approach were directly devolved.

143 The assessment of each Tier 2 accounting option includes the following:

- Summary description
- Rationale, or supporting narrative
- Important sub-options, if any
- Accounting approach to each sub-category or activity
- Other relevant assumptions (e.g., special rules)
- Technical issues to be resolved
- Modelled emissions liability impact
- Potential ETS implications, if devolved
- Pros and cons against the criteria
- Overall assessment

144 **The discussion of potential ETS impacts should be treated with caution**, as there is no automatic requirement on the government to reflect international accounting rules in the design of ETS settings. The ETS is primarily a domestic policy instrument, and any future changes to its settings would be carefully assessed for their impact on and potential benefits for stakeholders and participants before being implemented.

145 Nonetheless, in considering a potential future international accounting approach, it is useful to consider to what extent it departs from the current international framework (which underpins the current ETS settings), and what potential impact it could have on those current settings if it were hypothetically devolved in full. This analysis is speculative only, and should not be taken as an indication of likely future ETS policy if the accounting approach was selected for our 2015 INDC.

TIER 1 – OVERALL TARGET FORM OPTIONS

A) Overall Treatment of the Land Sector within Target

146 Many form options are possible, and will likely be demonstrated in countries' 2015 INDCs. The three options assessed below address the main policy issues for forestry and land use, but over time other commitment forms may become more widely favoured, such as national BAU or intensity targets, direct action approaches, peaking year commitments, and carbon neutrality

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targets. As these were not amongst the forms considered for New Zealand's overall INDC, they have not been further analysed here.

Options

A.1: Include forestry and land use within the quantified, economy-wide target

- Forestry and land use would be included within New Zealand's quantified, economy-wide target, as under our CP1 and current 2013-2020 commitments. Emissions and reductions would count towards a single, national target, and any credits would likely be fully fungible with other sectors. No assumptions are made about whether New Zealand's target is a carbon budget, or whether FOLU is included within base year emissions or treated as an offset.

A.2: Include forestry and land use under a separate quantified target or policy approach

- Forestry and land use would be included within New Zealand's INDC, but excluded from the national quantified GHG target (so it would no longer be 'economy-wide'), and instead placed under a separate commitment form. This could be a sectoral GHG reduction target, e.g., 'reduce net FOLU emissions by 10% below BAU over 2021-2030', or a separate quantified but non-GHG target, e.g., 'Increases the net forest area by 10% by 2030', or a direct policies and measures approach, such as a national strategy comprising a range of policy interventions.

A.3: Exclude forestry and land use from New Zealand's post-2020 INDC

- Forestry and land use would be excluded within New Zealand's INDC altogether, potentially for a variety of reasons such as to better focus action on reducing fossil and industrial emissions; because the land sector as a whole (including agriculture) has been excluded on the basis that they offset each other; or because excluding a net sink makes the target more ambitious. A variation on this option is to only account for deforestation emissions, which has been included under the Tier 2 options on forestry accounting.

Discussion

- While it may seem a foregone conclusion,[6] the first question that applies to forestry and land use in our 2015 contribution is whether we include it all, and if so, whether we include it within the target bounds as part of an economy-wide target, under a separate, non-fungible GHG target, or even just a direct 'policies and measures' approach.
- These are all options for the overall 'target form' we apply to forestry and land use in our INDC. They are discussed here only briefly, mainly for completeness, but also because it is conceivable that future international rules may encourage Parties to treat the 'land sector' as a whole differently to other sectors, either out of concern for the impact of emissions pricing on food production, or the role of forest carbon in offsetting fossil emissions.
- There are separate rationales for applying a quantified approach to FOLU mitigation commitments, and for including it within the bounds of the broader, economy-wide quantified target.

[6] A commitment 'equivalent' to this form has now been agreed by Cabinet Strategy Committee as an appropriate post-2020 emissions reduction target (STR Min (15) 2/1).

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- Applying a quantified approach to FOLU make sense if we believe it is possible to quantify the results of mitigation actions. This is generally the case for afforestation, where we can accurately estimate the tonnes of carbon sequestered by one hectare of radiate pine at different ages. Where mitigation actions are less easily quantified, however (e.g., potentially in relation to soils, or non-measurable, non-verifiable behavioural changes), a non-quantified approach such as direct regulations, policies or measures may make more sense.
- Quantified approaches to emissions from a sector are generally considered a necessary first step to applying a carbon price on emissions, e.g., by including the sector in the ETS. A carbon pricing approach may be preferred where the government does not wish to 'pick winners' but instead use the carbon price signal to allow emitters to select where the most cost-effective emission reductions can be made (either by themselves or purchased from elsewhere).
- Assuming that it makes sense to place forestry and land use under a quantified GHG target, rather than a policies and measures approach, including forestry and land use within the wider, quantified, economy-wide GHG target would make sense if we want to ensure that mitigation within the sector will be fully fungible with other sectors and, under an international carbon market approach, potentially tradable with other countries. Fungibility enables mitigation to be sourced from the most cost-effective sources, nationally and internationally.

Technical issues and uncertainties

- Forestry and land-use accounting rules have yet to be agreed under the future agreement. These rules may closely mirror the current Kyoto rules, may be expanded to include additional options, or could allow Parties greater flexibility in future to define their own approaches, within bounds. As New Zealand's future international accounting liabilities from forestry and land-use are highly sensitive to the accounting assumptions and methodologies applied, this uncertainty in the rules makes it difficult to quantify the cost implications of including the sector within a quantified economy-wide target.
- There is also uncertainty on how future carbon markets will operate, and what prospects there are for the trading of international forest offset units. This makes it difficult to assess the benefits of Fungibility within the overall target form.
- Quantifying emissions and removals in the landscape can be complex and costly. Forestry and land use are complex biophysical systems. It is possible that New Zealand's accounting coverage under future international commitments will need to expand over time to include additional or all land use categories. The cost and benefits of quantifying land use emissions and removals, and potential devolution to the ETS, may need to be weighed against the benefits of direct investment in mitigation actions and management practices.

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Table 14: Key Pros & Cons of Options against Objectives

OBJECTIVE / OPTION	Our contribution is considered credible and effective by international audiences	Appropriately manages costs and impacts on society	Guides New Zealand over the long term in the global transition to a low emissions world	Score
1 Include FOLU within economy-wide target	✓ Consistent with the agreed Kyoto approach. ✓ Quantified approach measures results and makes commitments highly accountable. ✓ If based on similar rules, accounting is likely to be comparable with other countries' accounting. × Not supported by opponents to forests offsets.	✓ Reduced overall costs of target, by allowing sinks to be counted. ✓ Reductions are fungible with other sectors, supporting cost-effective mitigation. ✓ Supports carbon pricing/ETS inclusion ✓ Supports potential export of offsets. × Ability to support co-benefits of productive land use is uncertain and dependent on accounting rules. × Potential future accounting of other land uses could increase NZ's emissions liabilities, and have ETS implications.	✓ Enhances policy certainty by continuing NZ's current international approach. ✓ Supports long-term domestic and global carbon pricing approach to FOLU. ✓ Reinforces the equal legitimacy of land-based mitigation. × Puts long-term policy focus on quantitative accounting and emissions pricing, rather than taking direct action to reduce emissions.	10 ✓ 4 × **= 6**
2 Separate FOLU target/approach	✓ Could be credible if clear we were excluding a net sink, not a source. ✓ Could allow more relevant sectoral targets and accountability indicators for NZ's land based mitigation. × Might be seen as backsliding in the level of responsibility taken for emissions. × May not impose an effective international incentive on NZ to	✓ Could be significantly lower cost if separate target is aspirational or non-GHG rather than a GHG responsibility target. ✓ Low liability risk. ✓ Could allow ETS linking with EU. × May not promote cost-effective mitigation – risk of 'picking winners'. × Would prevent land owners from earning credits for forest sinks	✓ If effective, could demonstrate an alternative global mitigation approach to national GHG accounting, which could be more globally applicable. × Potential international reputational impacts, and/or lower influence in UNFCCC land negotiations. × Reduces domestic policy certainty. × Long-term risks for environmental sustainability standards unclear.	6 ✓ 9 × **= -3**

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	reduce emissions. × Unlikely to justify future high-cost improvements to GHG Inventory.	× Implementation feasibility would depend on approach.		
3 Exclude FOLU from INDC	✓ Could increase mitigation focus on fossil and industrial emissions. × Lower international credibility, could be seen as backsliding in coverage. × Likely perceived as getting out of Kyoto liabilities. × Would not support realising maximum mitigation opportunities.	✓ No international emissions liability cost on NZ. ✓ Potentially lower operational costs. × Could put international market access at risk, as NDC would not be economy-wide. × Likely no potential to earn international credits for forest sinks × Implementation feasibility would depend on approach.	✓ Could support long-term domestic focus on enhancing productive land use, independent of emissions effects. × Would not demonstrate an approach that takes responsibility for land-based emissions – a major global source. × Potential international reputational impacts. × Reduces domestic policy certainty. × Long-term risks for environmental sustainability standards unclear.	3 ✓ 10 × **= -7**

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Assessment

- Overall, Option A.1, including FOLU within the quantified economy-wide target is assessed as best meeting the objectives and criteria.

Draft Recommendation – A. Overall treatment within the target

A.1 In our post-2020 commitment, continue to include forestry and land use within the quantified, economy-wide target (Option A.1).

A.2 In our 2015 INDC, specify that net emissions and removals from FOLU (or AFOLU, if appropriate), estimated over the commitment cycle using the indicated approach to the land sector, will be excluded from the base year and carbon budget, and added or subtracted to accounting during the commitment period as appropriate.

B) Treatment as an offset

147 Amongst the INDCs of developed countries tabled so far, we are already seeing some divergence between countries in whether they intend to adopt an gross-net 'offsetting' approach to FOLU, or a 'net-net' approach. While New Zealand has to date adopted the gross-net approach, as required under Kyoto, there are some who argue that all countries should shift to a net-net approach for all sectors – including FOLU, on the basis that it should not be treated differently. This view fails to take into account the unique characteristics of the FOLU sector, which can be either a source or a sink, and transition from one to the other over time. As a result, net-net accounting can have a very arbitrary effect on accounting liabilities, and to date has been seen as a very high cost approach for New Zealand.

148 Given the lack of understanding around gross-net offsetting approaches, though, the merits for adopting it (or its alternative) have been briefly assessed here.

Options

B.1: Treat forestry & land use (or land sector) as an offset sector (gross-net)

- **Description:** FOLU emissions are excluded from base year emissions, for accounting purposes. The national carbon budget is based on gross emissions only, and net FOLU emissions and removals are added to accounting during the commitment period. This approach recognises net emissions and removals during the commitment period only, as a result of new activities and management since the base year. It ignores pre-existing emissions and removals from existing forestry and land use in the base year.
- **Origins/usage:** Current Kyoto approach, where LULUCF is a net sink in the base year. Could hypothetically be applied to the entire land sector, for example if the whole land sector was accounted for relative to reference levels. EU, Norway and Russian 2030 INDC approach.

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B2: Treat forestry & land use like other sectors (net-net)

- **Description:** FOLU emissions are included in base year emissions, along with gross emissions, and also in the economy-wide carbon budget. Accounting for FOLU during the commitment period is *relative* to the level of emissions and removals in the base year. A net sink in the commitment period is only a credit to the extent it is greater than the sink in the base year – likewise for emissions. If there is no activity start date, base year emissions will reflect historical management and legacy effects, including potentially in the HWP pool. Accounting includes emissions and removals from forestry and land use that was existing in the base year.
- **Origins/usage:** US 2030 INDC approach, [redacted]. Canada 2020 target approach.

Withheld under s9(2)(j), s6(a) and s9(2)(g)(i)

Discussion

149 A key principle of Kyoto is that action in the land sector which counted towards commitments should be **additional** to what was occurring already, in the base year. Kyoto accounting implemented this by excluding LULUCF from base year emissions (and the assigned amount carbon budget), and then 'adding' any net LULUCF removals to gross emissions during the commitment period. Net LULUCF removals under this approach are often described as an 'offset', because the counterbalance some of the gross emissions over the commitment period.

150 Accounting under a net-net approach, in contrast, is based on comparing net emissions and removals over the commitment period, or in a single year, with net-emissions in the base year.

151 Adopting a gross net/ offsetting approach to FOLU has the effect of **excluding any pre-existing forest sinks or sources** from the target accounting and carbon budget. A net-net approach, in contrast, includes the effects of pre-existing forestry and land use emissions and removals. Either approach can have either a positive or negative approach on any given country, depending on whether they are a sink or a source of emissions in the base year, how that changes in the commitment period, and what the relative difference is. This is referred to the 'forest lottery' effect of net-net accounting.

152 While both approaches are attempting to track progress in reducing emissions, only the net-net approach includes the emissions and removals resulting from actions taken prior to the base year. Depending on how far back the GHG Inventory gathers its data ('backcasting'), the emissions and removals reporting in 1990 may include the legacy emissions effects of actions taken decades before. This means that the removals from afforestation in

153 An outcome of taking a gross-net approach is that a country does not apply the **same accounting approach** in the commitment period that it does in the base year. Some observers see this as a form of gaming, because it excludes what was happening in forestry in the base year – and instead would only recognise the effects of actions after the base year. However, this is precisely the purpose of 'additionality' requirements – that emissions and removals counted towards the target should be additional to what was already occurring in the base year.

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Technical issues and uncertainties

- No major technical issues under either approach, though if a net-net approach were considered, it would be worth analysing how other countries treat backcasting, activity start dates and managed lands, as areas where we might potentially be disadvantaged under this approach by our particular methodologies.
- A major uncertainty is the effect of future HWP accounting on projected emissions and removals under either approach, and in particular, to what extent future accounting rules will be agreed for HWP accounting under net-net, GHG Inventory-based approach.

Key Pros & Cons of Options against Objectives

OPTION / OBJECTIVE	1 Treat forestry & land use (or land sector) as an offset sector (gross-net)	2 Treat forestry & land use like other sectors (net-net)
Our contribution is considered credible and effective	✓ Approach rewards mitigation resulting from activities since the base year only. × X	✓ Has credibility is-so-far as it's the approach adopted by the US, [redacted] × X Withhold under s9(2)(j), s6(a) and s9(2)(g)(i)
Appropriately manages costs and impacts on society	✓ Minimises arbitrary impacts on accounting as a result of legacy effects and pre-existing forest management in the base year. ✓ Ensures full crediting of new actions, rather than 'relative' crediting compared with 1990 rates. ✓ Allows RMUs to be produced. × X	✓ x × Forest lottery' approach creates arbitrary accounting outcomes. × Does not allow full crediting of new AR unless backcasting effects are excluded. × May not allow RMUs to be produced ✓ x
Guides New Zealand over the long term in the global transition to a low emissions world	✓ Provides policy certainty with NZ's existing, Kyoto-based approach. × X	✓ X × X
SUM	0 ✓ + 0 × **= 0**	0 ✓ + 0 × **= 0**

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Assessment

- Overall, Option B.1 – treating FOLU under a gross-net, offset approach – is assessed as best meeting the objectives and criteria.

Draft Recommendation – B. Treatment as an offset

B.1 In our post-2020 commitment, continue to treat forestry and land use as an overall offset counted towards the quantified, economy-wide target (Option B.1).

B.2 In our 2015 INDC, state that we will continue to treat FOLU as an offset, to be clear that our accounting will not apply the less favourable net-net approach.

B.3 If an accounting approach is applied to the entire AFOLU sector, and there is a strong preference to AFOLU in the base year emissions used to calculate the carbon budget, then further analysis could be done on the feasibility of the 'net-net' Land sector reference level approach (Options C.3 and D.11).

C) Measurement approach – Land-based or Activity-based

154 A key decision for New Zealand future accounting approach is whether to retain the existing Kyoto activity-based measurement and reporting framework, or move to the more universal UNFCCC 'land-based' framework as the basis for post-2020 accounting.

155 This decision would need to be made even if we chose to 'package up' our overall approach as a 'land sector reference level' – for example, if we wanted to apply a single, unified accounting approach to the entire land sector.

156 This option – whether to adopt a land or an activity-based approach – attempts to assess these two measurement approaches objectively, independent of the other accounting variables that can come to bear on either approach.

Options

C.1: UNFCCC reporting 'land-based' approach

- **Description:** Account using the GHG Inventory AFOLU/FOLU land-use categories as per 2006 IPCC Guidelines. Uses the common UNFCCC reporting framework for all Parties.
- **Origins/usage:** Announced US INDC approach. Also likely to be used by Australia, Canada and some developing countries in their INDCs

C.2: Kyoto 'activity-based' approach

- **Description:** Current Kyoto accounting approach for Annex 1 (developed) countries.
- **Origins/usage:** All Annex 1 Parties over CP1 except the US, and all Annex 1 CP2 Parties and New Zealand over 2013-2020. Also used under REDD+.

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Key Pros & Cons of Options against Objectives

Land-based measurement	Activity-based measurement
✓ Land-based accounting would build on LUCAS's current land-based reporting for the UNFCCC Inventory – though may require greater investment to bring it up to an accounting standard ✓ A land-based approach is seen as more comprehensive, and therefore having greater environmental integrity than the activity-based approach (which can sometimes be narrowly defined). ✓ A number of developed countries have indicated they will apply some Kyoto principles over the top of land-based categories, which may make hybrid approaches possible in future. ✓ As the basis for GHG Inventories, a land-based approaches may be adopted by more countries, and/or be a more viable approach for future common accounting rules. ✓ GHG Inventory land based definitions allow for land-use transitions over time, an important accounting functionality missing under Kyoto. × Some Kyoto accounting principles may not translate well to land-based categories. The lack of an activity start year, and the effects of backcasting, could bring historical and legacy effects into accounting × The carbon stock change of land-based measurement may be less effective at identifying anthropogenic management effects than an activity approach, and lead to more non-anthropogenic emissions being included in accounting. × A land-based approach may increase spatial accounting coverage and therefore costs. × If devolved, any system change would decrease understanding of the ETS and create transaction costs for stakeholders to learn the new rules. × Could create some additional complexity for aligning ETS and LUCAS reporting. × Would draw less closely on existing IPCC guidance and rules, which could reduce its perceived transparency and reviewability. × Land-based measurements may be more expensive, or if not – less accurate.	✓ By focusing on human effects, an activity-based approach is more effective at excluding non-anthropogenic emissions from accounting. ✓ An activity based approach supports greater controls on the 'additionality' of accounted emissions reductions, e.g., by requiring proof that the activities are 'direct human-induced'. It works well with an 'activity start date'. ✓ The existing Kyoto forestry accounting provisions, which increase the environmental integrity and cost-effectiveness of accounting, have been designed for an activity-based approach. ✓ An activity-based approach would continue the current approach for ETS and LUCAS reporting, avoiding compliance costs from any change. ✓ An activity-based approach may help to ensure that accounting incentives and disincentives map more directly to human behaviours it is desired to change, e.g., deforestation and grazing land management, rather than, e.g. a broad land-based category of 'grasslands'. ✓ Activity-based accounting can draw closely on existing IPCC accounting guidance, enhancing credibility and comparability. ✓ An activity-based approach is used under both Kyoto and REDD+, increasing understanding of the approach. ✓ An activity-based approach can be more cost-effective than land based approaches, as it can draw more on non-spatial data such as national statistics collected for other reasons. × Some countries define 'activities' very narrowly, contributing to incomplete accounting, 'cherry-picking', and loss of integrity and credibility. × Permanent activity definitions and hierarchies under Kyoto is likely to lead to perverse accounting effects over time. × Activity-based approaches are associated with some activities being left out, or treated as 'optional', compared to the 100% land cover of the Inventory. × Nationally-defined activities could potentially be subject to 'gaming' to maximise accounting returns.
5 + -7 = -2	**8 + -4 = 4**

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Assessment

- Overall, Option C.2 – the activity-based approach – is preferred based on its intrinsic suitability for accounting, independent of any wider considerations. However, a land-based approach may be a more pragmatic approach, given broader negotiation objectives and the value of forging a common, simple approach for all Parties.
- New Zealand should preserve its optionality if possible on adopting either a land or an activity-based approach after 2020, in order to promote positive elements of both, while minimising change from existing LUCAS reporting and ETS systems.

Draft Recommendation – C. Land vs Activity-based approach

C.1 In the ongoing negotiations, work towards an approach that combines the best of both systems – the anthropogenic and activity-focused approach of Kyoto, including its special provisions, combined with the principle of land use transitions from the UNFCCC land based approach – while seeking to minimise any cost and disruption from unnecessary change to existing reporting and ETS systems.

C.2 In the 2015 INDC, indicate that we will adopt either a land or an activity-based approach (as the EU have done), to preserve our options.

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TIER 2 OPTIONS: FORESTRY & LAND USE ACCOUNTING OPTIONS

D) Forestry & Land Use Accounting Options

Land Use Change Only

Option 1: Deforestation only

Summary description

- Net emissions and removals associated with deforestation events only.
- The deforestation definition would be critical to the effectiveness and carbon liabilities of this approach, both internationally and domestically.
- Within New Zealand's approach, the definition could potentially be limited to refer to natural, primary forests only, to target the major global source of forestry emissions without limiting land-use flexibility of currently productive lands.
- Ignores afforestation, forest management or degradation, or carbon changes on other land uses over time.

Rationale

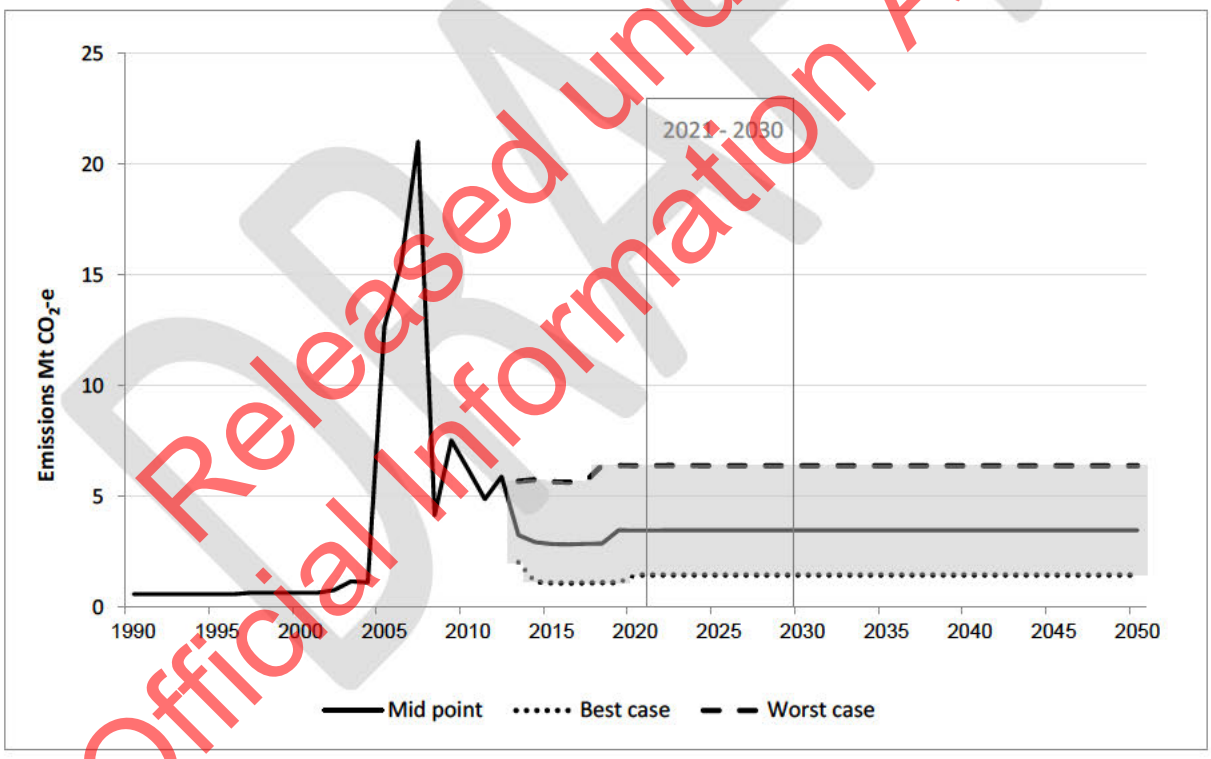
- An effective post-2020 agreement will need to include deforestation emissions. Over the period 2000 to 2009, FOLU accounted for about 12% of global anthropogenic CO2 emissions,[7] mostly from deforestation – the majority of which are occurring in developing countries. For the world as a whole, carbon stocks in forest biomass decreased by an estimated 0.5 Gt annually over the period 2005–2010, mainly due to a reduction in the global forest area.[8]
- This approach would focus on the major source of global forestry emissions. It would also support developing country participation by simplifying land sector accounting.

Precedence/usage

- Suggested by MfE as a means of simplifying accounting, ensuring its environmental integrity and focusing on the most important source of forestry emissions.

Illustration of emissions impact over 1990 – 2050

Figure 10: Projected Emissions from Deforestation – Low, Midpoint and High Emission Scenarios (Includes FLU)



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[7] IPCC WGIII AFOLU chapter, p 16.
[8] UNFCCC website April 2015: http://unfccc.int/land_use_and_climate_change/lulucf/items/1084.php

Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical rules	Activity start year	Baseline
Deforestation/	Option 1: Kyoto gross-net	With/without FLU	2021	0
Conversions from forest land	Option 2: UNFCCC net-net	With/without FLU	1990	1990 deforestation emissions

Other relevant assumptions

- If a gross-net approach was adopted, only deforestation events within the commitment cycle would be counted. If a net-net approach was adopted, accounting would be relative to historical levels of deforestation in the base year.
- If the Flexible Land Use rule applied, this would make a significant difference to international carbon liabilities at higher carbon prices.
- Assumes HWP accounting would not apply to harvest resulting from deforestation, as per the Kyoto rule.

Modelling results

Modelled emissions liability impact over CC1 and CC2

Deforestation Emissions Scenarios: With and Without FLU 2021-2030 (Mt CO_2)			
Rule variations	**Low Emissions**	**Mid-point**	**High Emissions**
With FLU from 2021 - 2030	15	35	64
Without FLU from 2021 - 2030	33	56	64

Emissions impact relative to Kyoto CP2 Status Quo

Deforestation Emissions Scenarios: 2021-2030 (Mt CO_2) – Midpoint Projection with FLU			
Commitment Period	**Deforestation**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	17	5	12
2026 -2030	17	21	-3
Annual mean	3	3	1
Total 2021-2030	35	26	9

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Commentary on liability impact

- This option produces an overall net liability for New Zealand, higher than the Kyoto CP2 Status quo. Liabilities depend strongly on deforestation rates, and the availability of the FLU rule.

Technical issues to be resolved

- Definition of deforestation – primary, natural indigenous forests, only, or all forests, including plantations?
- When to stop accounting – are soil carbon stock changes following deforestation included, or only the deforestation event itself?
- Would the approach still have the same level of environmental integrity if FLU applied?

ETS Implications

Departure from current settings

- If devolved to the ETS, this approach would significantly scale back the ETS forestry settings to cover deforestation only. This would mean no credits could be earned for existing or future afforestation, and would rule out extending carbon incentives to other activities in the land sector.

Potential ETS impacts if devolved

Current ETS provisions	Impact
Credit for registered post-1989 sinks	No more credits in future
Debits for harvest of registered post-1989 forest	No more debits in future
No credits for pre-1990 forest management	Continue to offer no credits
Compulsory liability for pre-1990 planted forest deforestation	All deforestation could potentially incur liabilities, not just pre-1990 planted forests as at present, or none, or only planted/natural forest deforestation only, depending on the degree of desired alignment with international liabilities and the benefits of ETS devolution.
Other land use	Continue to offer no credits

Key Pros & Cons against Criteria

Criteria	Pros	Cons
International expectations	✓ x	× Would not meet UNFCCC requirement for INDCs to be a progression on current undertakings. × Would not accord with expected

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		Paris principle that accounting becomes more comprehensive over time.
Environmental effectiveness & integrity	✓ X	× Would exclude most activities and land-uses from any accounting incentive. Excludes anthropogenic forest degradation which is a major global source. × Would incentivise deforestation being brought forward to before the start of the commitment cycle.
Commitment is least cost	✓ Cost would be relatively simple, predictable and manageable.	× By ignoring removals, this approach would always produce a net debit for NZ.
Risk and uncertainty	✓	×
Cost effective mitigation & fungibility	✓	× Excludes enhancement of forest sinks and other land-based mitigation from contributing to mitigation, from producing tradable units, or being used to offset fossil emissions. × Narrow FOLU coverage could limit market access.
Co-benefits & manages trade-offs	✓ Would not place any restriction on sustainable forest harvest.	× Could restrict land-use flexibility, if a high carbon price prevents land-use conversions.
International reporting feasibility	✓ Very simple, efficient, low-cost reporting approach.	×
ETS implementation feasibility	✓ Relatively simple and low cost to implement in ETS.	×
Potential domestic & stakeholder impacts	✓	× Significant change to ETS, and forest carbon value of forests. × Expectations by post-1989 forest owners to earn carbon units for their forests beyond 2020 might not be met. × Would not provide credits for carbon enhancement of natural forest.
Policy durability & certainty	✓	× Represents a significant departure from current approach, fuelling uncertainty. × Unlikely to be durable given international pressure to increase accounting coverage over time.
Long-term domestic pathway	✓ Could help to protect total forest area in New Zealand over time.	×

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Strategy for effective global agreement	✓ Supports a simple framework for all parties that focuses on the leading source of global forestry emissions.	× Would not support NZ to negotiate more effective treatment for the broader land sector in long term.
SUM	✓ **= 6**	× **= 14**

Assessment

- Overall, a 'Deforestation only' approach does not perform well against the criteria, and is not recommended as a future accounting approach.

Option 2: Net forest area only (New Zealand's Kyoto CP1 Article 3.3 approach)

Summary description

- This approach would include net emissions and removals from land-use change into and out of forests only (afforestation, reforestation and deforestation), as per New Zealand's Kyoto CP1 accounting, where we accounted for Article 3.3 only.
- The purpose of this approach would be to focus accounting on the net area of forest. Only activities which change the total area of forest (deforestation and afforestation) would be included, while forest management and degradation activities would be excluded.

Rationale

- The rationale for this approach would be to adopt a cost-effective accounting approach which focuses on the key carbon changes (into and out of forests), and uses existing LUCAS and ETS settings, but avoids the perceived pitfalls of using projected reference levels to account for mature forests (the CP2 forest management approach).
- This approach might be preferred if it was considered more important not to account for mature forests ('forest management'/pre-1990 forests), than incur the operational expense and liability risk of accounting against a projected baseline, against which both arbitrary/accidental debits and credits are possible (due to inaccurate projections), but which under CP2 rules only credits are capped.

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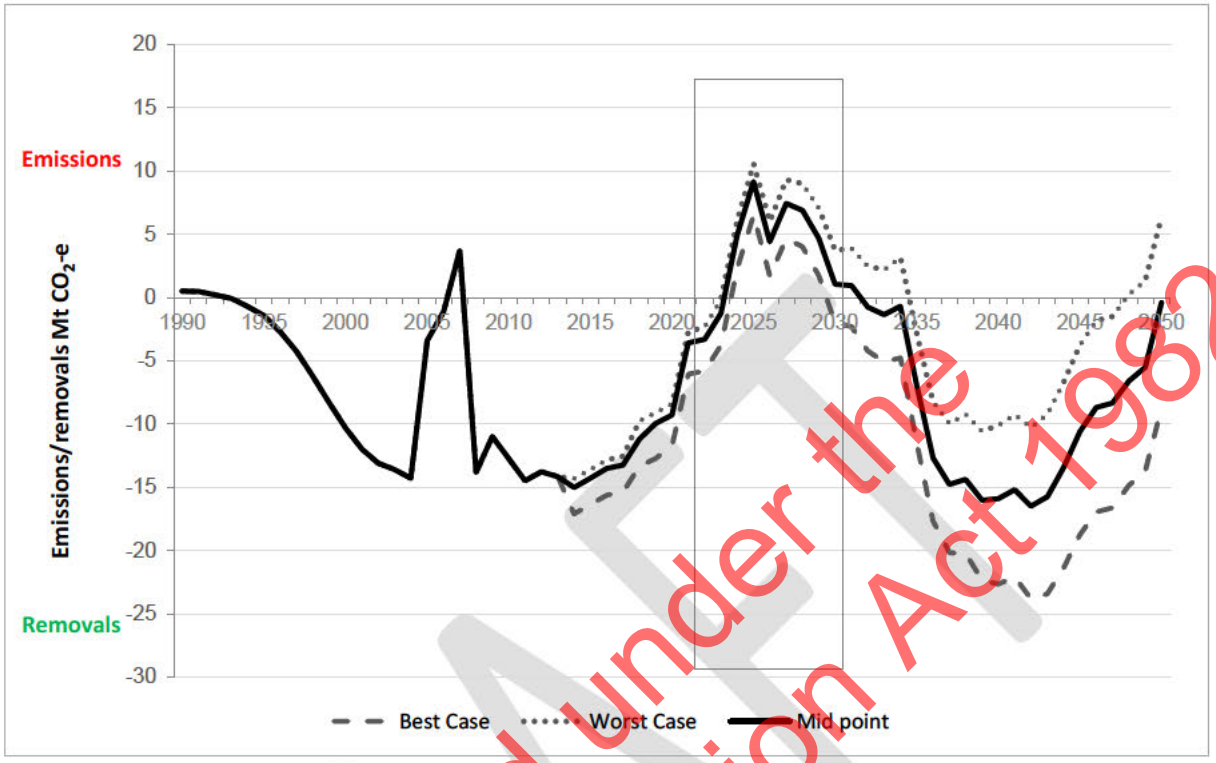
Illustration of emissions impact over 1990 – 2050

Figure 11: New Zealand's Projected Net Forestry Emissions assuming Kyoto CP1 rules apply - ARDC only



Precedence/usage

- New Zealand's CP1 accounting approach, which is currently reflected in the NZ ETS settings for forestry (with the exception of CP2 FLU rule which has been introduced under the ETS.)

Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical rules	Activity start year	Baseline
Afforestation/reforestation	Gross-net	With/without FLU	1990	0
Deforestation	Gross-net	With/without FLU	1990	0

Other relevant assumptions

- Assumes 1990 base year and start year.
- ARDC and any other CP1 rules would apply, but no CP2 rules, with the possible exception of FLU, which arguably could be applied to maintain consistency with current NZ ETS forestry settings.

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Modelling results

Modelled emissions liability impact over CC1 and CC2

CPI Rules – Emissions Scenarios 2021-2030 (Mt CO_2)			
	Low Emissions	**Mid-point**	**High Emissions**
CPI Rules – ARDC only	3	30	47

Emissions impact relative to Kyoto CP2 Status Quo

CPI Rules – Emissions Scenarios 2021-2030 (Mt CO_2) – Midpoint Projection			
Commitment Period	**CP1 Rules**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	6	5	1
2026 -2030	24	21	4
Annual mean	3	3	0
Total 2021-2030	**30**	**26**	**4**

Commentary on liability impact

- The projected emissions impact of this approach is only slightly higher than Kyoto CP2 Status Quo approach, due to the CP2 FLU rule not applying in CP1. ARDC has little impact as there is little harvest for it to apply to.

Technical issues to be resolved

- None identified.

ETS Implications

Departure from current settings

- If devolved to the ETS, the only impact from this approach would be that the ETS now contains the CP2 FLU rule. This approach would also in theory rule out future changes to the ETS to reflect other CP2 rules.
- The CP1 rules were the basis for the current ETS forestry settings, so no other ETS implications are identified under this option.

Key Pros & Cons against Criteria

[TO BE COMPELTED]

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Kyoto Protocol CP2-based (STATUS QUO)

Option 3: Kyoto CP2 Status Quo – 3.3 ARD & 3.4 FM (BAU RL)

Summary description

- This option would continue New Zealand' current approach over 2013-2020. The net LULUCF sink over 2021-2030 under Kyoto CP2 rules would be added to accounting during the commitment period.
- All CP2 LULUCF accounting rules would apply, as set out in the IPCC 2013 KP Supplement. The CP1 rule of ARDC would not apply.
- Accounting coverage would include the Article 3.3 activities of Afforestation/reforestation and Deforestation and the Article 3.4 activity of Forest management only. Forest management would be accounted for under a projected BAU reference level. It is assumed that none of the other, voluntary Article 3.4 activities would be elected.
- The Kyoto hierarchy of Article 3.3 and 3.4 activities would continue, as would their current accounting approaches (gross-net for Article 3.3, BAU RL for Article 3.4 FM). Once an activity is accounted for under Article 3.3, it would remain under 3.3 for all future commitment periods. This means that Article 3.3 AR land (post-1989 forests) would remain permanently under gross-net accounting.
- The Kyoto 'additionality' principle of distinguishing between forests that were in existence already, at the start of the base year ('Forest management' of pre-1990 forests), and new forest established (or deforested) subsequent to the base year (post-1989 'Afforestation/reforestation' and 'Deforestation') would continue to apply. When combined with the BAU reference level accounting approach applied to pre-1990 forest management, this means New Zealand would expect to receive no debits or credits for its large pre-1990 forest estate (including natural forests) under ongoing, current 'business-as-usual' management (defined by 2009 policies and practices).

Rationale

- The Kyoto CP2 LULUCF accounting approach is the internationally agreed approach for all Annex 1 countries taking on a binding commitment in the Kyoto Protocol second commitment period (CP2). This approach therefore represents the most developed or advanced form of FOLU carbon accounting currently in existence, due to its strict rules, detailed review and compliance procedures, and generally high-integrity approaches to recognising anthropogenic emissions and removals from human activities.
- While a number of criticisms have been made of the Kyoto LULUCF accounting approach, including that the different rules create 'loopholes' and reduce comparability across countries, the Kyoto rules were significantly tightened and improved for the second commitment period.
- Many of the specific Kyoto CP2 LULUCF rules provide useful and effective methods to address specific challenges in land sector accounting, and to better focus accounting on emissions reductions which are real, permanent, additional and human-induced, compared with UNFCCC LULUCF reporting.
- Continuing to apply a Kyoto CP2 approach after 2020 would help to ensure that Kyoto's successful accounting provisions continue to apply to New Zealand's FOLU accounting in

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future. It would promote efficiencies by building on current systems, and may provide policy certainty for domestic policy by continuing the current approach.

Illustration of emissions impact over 1990 – 2050

Figure 12: New Zealand's Projected Net Forestry & Land Use Emissions under Kyoto CP2 rules

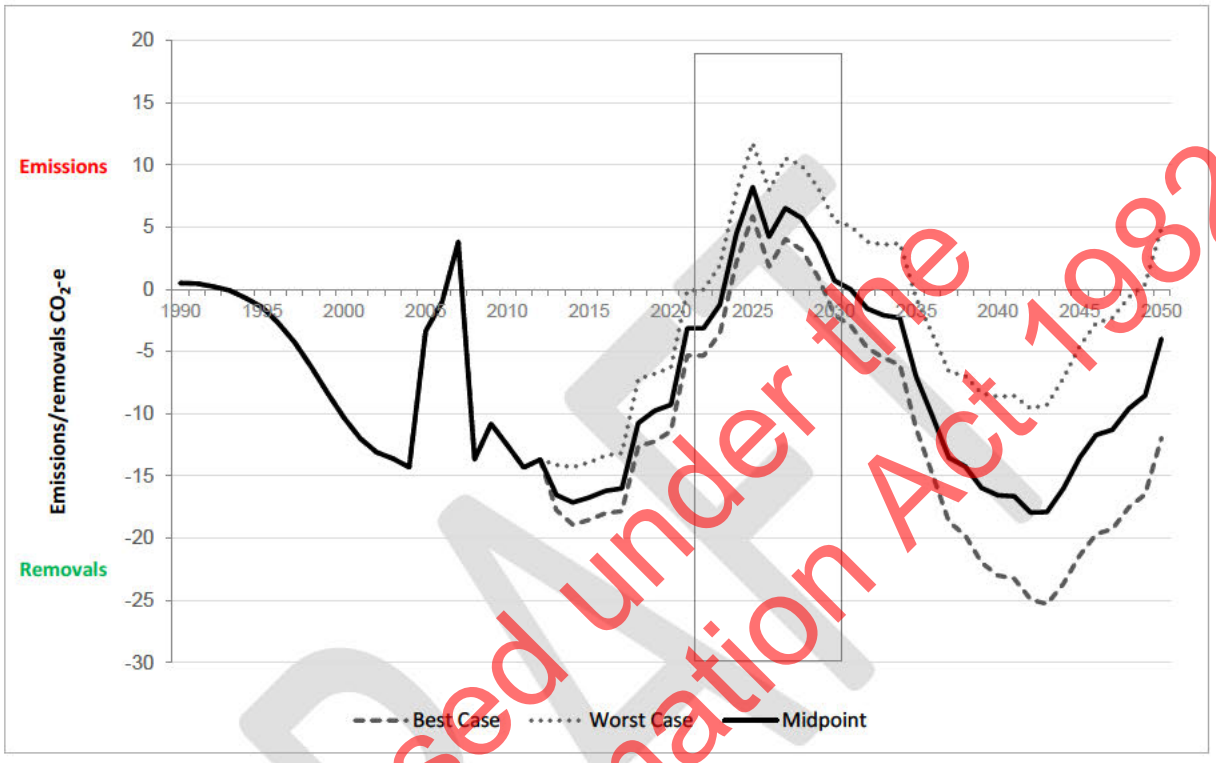

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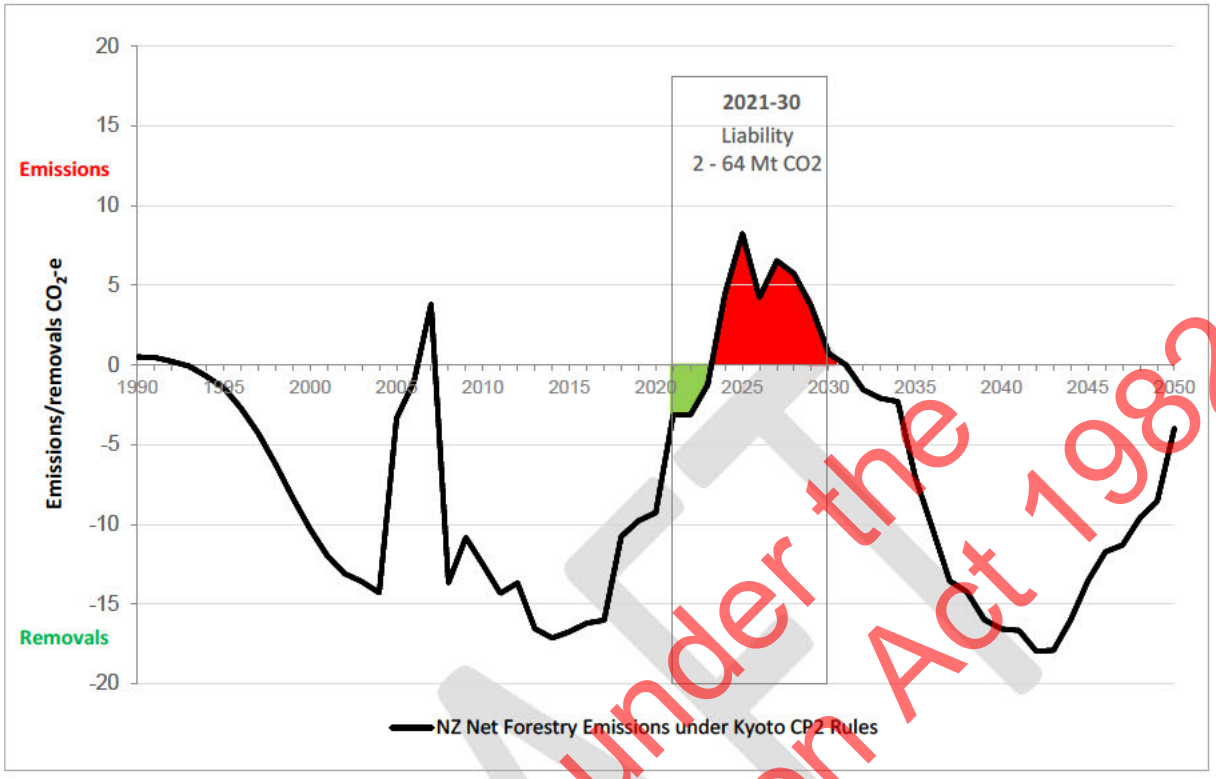
Figure 13: New Zealand's projected net forestry & land use emissions liabilities over 2021-2030 under Kyoto CP2 rules and midpoint scenario



- Over 2021-2030, New Zealand's post-1989 forests become a source of emissions under Kyoto CP2 accounting rules of approximately 26 (2-64) MT CO_2.
- Kyoto rules create an accounting liability for New Zealand over 2021-2030 because our Article 3.3 forest land (i.e., post-1989 forest) stays permanently under 'gross-net' accounting. This 3.3 gross-net approach fully credits the growth of new forests during the commitment period, but debits the subsequent harvest of these forests as if it were a permanent carbon stock loss (like deforestation), rather than only a temporary reduction – imposing a costly accounting liability on sustainable forest management.
- Only harvest from post-1989 forests creates a liability for New Zealand under Kyoto, because pre-1990 forests (planted and indigenous) are factored out under a BAU reference level.

Precedence/usage

- Status quo over 2013-2020. Internationally agreed approach for all Annex 1 countries taking on a binding commitment in the Kyoto Protocol second commitment period (CP2).
- New Zealand has agreed to apply this approach to its accounting for its 2020 target under the UNFCCC over 2013-2020.
- It is not yet clear whether any country will apply this option after 2020. [redacted] a version of this option, allowed under Kyoto rules, that applies gross-net to Fore Management (discussed under Option 8).

Withhold under s9(2)(j), s6(a) and s9(2)(g)(i)

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Accounting coverage and approach

Land use/activity	Accounting approach	Critical rules	Activity start year	Baseline
Afforestation/reforestation	Gross-net	AR must be dhi HWP	1990	0
Deforestation	Gross-net	FLU	1990	0
Forest management	BAU reference level	FMRL Cap on credits only	2009 policy base year	BAU projection over 2021-2030

Other relevant assumptions

- 1990 remains the activity start date for land use conversions.
- Kyoto CP2 LULUCF accounting provisions apply:
    - Natural disturbance emissions can be excluded as per IPCC Guidelines (2013 KP Supplement).
    - HWPs would be accounted based on the Kyoto production approach.
    - The Carbon equivalent forest conversions provisions allows certain deforestation events to be accounted for under Forest management (FLU rule)
    - FM credits are capped at 3.5% of 1990 gross emissions reported in the first Inventory report for the commitment cycle (CP2 rule).
- No optional Article 3.4 activities are elected.
- ARDC does not apply.

Modelling results

Modelled emissions liability impact over CC1 and CC2

Kyoto CP2 Rules – Status Quo – Emissions Scenarios 2021-2030 (Mt CO_2)			
	Low Emissions	**Mid-point**	**High Emissions**
CP2 rules – Status Quo	2	26	64

Technical challenges

- While a number of improvements are needed to LUCAS's systems over 2013-2020 to be able to report on Forest management against a reference level and implement other CP2 rules, no major new technical changes are expected to be needed to enable national-level reporting and accounting under this approach after 2020.
- An ongoing data challenge will be to source verified information on the end-product use of exported roundwoods, in order to be able realise the benefits of this rule for post-1989 forests over 2021-2030.

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ETS Implications

Potential ETS changes if devolved

Current ETS provisions	Implied ETS changes
Credit for registered post-1989 sinks	**Continues ETS status quo.** New forest establishment would be eligible for credits. Large areas of existing, registered post-1989 forest are expected to incur harvest debits in the 2020s.
Debits for harvest of registered post-1989 forest	**Continues ETS status quo,** [redacted] Withhold under s9(2)(g)(i) and s6(e)(iv)
No credits for pre-1990 forest management	**Option to change to ETS status quo.** Current ETS settings are based on NZ's CP1 approach (when FM was not elected). Under NZ's CP2 approach, FM is accounted under a BAU RL and nationally, no net debits or credits are expected. However, if FM accounting was devolved to the ETS, forest owners could be eligible to earn credits or debits for change in forest management emissions relative to a definition of 'BAU'. The international cap on credits, and the ability to measure carbon stock changes beyond BAU at a project area level, may need to be considered in any devolution.
Compulsory liability for pre-1990 planted forest deforestation	**No implied change to ETS status quo, but potential fiscal misalignment after 2020.** The ETS currently only applies to pre-1990 deforestation. Any deforestation of post-1989 forests before 2008 removes these forests from accounting in CP1, making it internationally cost neutral. After 2020, assuming no carryover of units from CP2, both pre-1990 and post-1989 deforestation will incur international liabilities.
Flexible Land Use rule	**Continues ETS status quo.** Owners of pre-1990 plantation forests would continue to be able to take advantage of the FLU rule.
Other land use	**Continues status quo** – no credits/debits for other land use activities.

Feasibility of ETS Implementation

- This option is feasible to devolve to the ETS, with potentially no or moderate changes only. It would continue New Zealand's current international accounting approach, and therefore any misalignment with the current ETS settings would be fairly moderate, and limited to (1) the current misalignments, arising from the ETS still mainly reflecting CP1 rules, and (2) any changes to the broader international accounting system after 2020, such as restarting accounting without any carryover of surplus achievement from previous commitment periods, or a collective agreement to use a new base year.
- Current differences between the CP1-based NZ ETS forestry settings, and the CP2 LULUCF rules which New Zealand will account by over 2021-2030, include that the CP2 rules on natural disturbance, HWP accounting and pre-1990 forest management accounting are still in the process of being introduced into New Zealand's international reporting, and not yet been assessed or determined to be beneficial for roll out to the ETS.

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Key Pros & Cons against Criteria

Criteria	Pros	Cons
International expectations	✓ Has high short-term international credibility (even if the future of Kyoto principles are uncertain under the New Agreement) and meets political expectations that developed countries maintain current or better accounting standards after 2020. ✓ Uses an existing agreed international accounting approach.	× Might not have environmental credibility over the long term, when NZ's early 1990s post-1989 forests are fully credited for a second time. × Overall Kyoto framework has not met expectations of developed countries who did not join CP2. × Would not meet expectations that developed countries progress towards a more comprehensive, land-based approach after 2020.
Environmental effectiveness & integrity	✓ Additionality standards and full crediting/debiting for AR & D. ✓ Activity-based approach focuses on human effects. ✓ Based entirely on an existing agreed international accounting 'rulebook' – the 2013 IPCC KP Supplement – supporting transparency and review.	× Full credits and debits for the growth and harvest cycles of second and subsequent rotations of post-1989 forests does not incentivise new afforestation. × Fixed base line of 1990 doesn't incentives new actions × Forest crediting under Article 3.3 does not reflect permanent long-term storage of carbon. × Accounting coverage is limited to forest and forest conversions (i.e., deforestation).
Commitment is least cost	✓ Avoids potential high cost of UNFCCC net-net accounting approaches which compare against 1990, when our forestry removals were higher. ✓ May enable New Zealand to earn significant forestry credits from its post-1989 forests for a second time round, once these attain full growth in the 2040s (provided other rules remain the same and 1990 stays the starting year for eligible mitigation activity). ✓ Retains the current Kyoto CP2 forestry rules accounting rules that limit inappropriate liabilities (e.g., Flexible Land Use, Harvest Wood Products, Natural Disturbance, Reference Levels) – by adhering to 'pure' Kyoto approach, may help to keep them in their exact current form and protect them from future modification (though similarly, may prevent improvement in other areas, such as post-1989 forests, or agriculture).	× Imposes high liability costs on New Zealand, due to our fast growing forests, and inability to carry over surplus achievement from pre-2021. × Imposes high liability costs due to NZ's high rates of new forest planting between 1990 and the start of the first crediting period (CP1), combined with the discontinuation of the ARDC rule. × Does not credit regeneration of natural forests resulting from new management and/or legal protection prior to 2009 RL policy base year.

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Risk and uncertainty	✓ CP2 debits and credits from pre-1990 forest harvest are limited to departures from BAU. ✓ Natural disturbance provisions limit the potential liabilities from *force majeure* events in forests.	× Misalignment of forest growth & harvest cycles with commitment crediting periods creates fiscal risk for the Crown. × Without carryover of international units from pre-2020, Crown faces a fiscal risk from deforestation liabilities for post-1989 deforestation after 2020. × Potential debits under the FMRL are unlimited, but credits are capped. × It might be unwise to stick with Kyoto CP2 on the assumption that, even though we pay a large debit over the 2020s and 2030s, in the 2040s we will again accrue a large credit for post-1989 forests. By 2040, it is quite possible that the 1990 start year will be changed as too old, and our early 1990s planting boom would no longer earn credits in the 1990s. × Some potential for accidental credits/debits from incorrectly projecting the BAU FMRL, but less than if account against base year. × Potential risk to Crown that post-1989 foresters will default on their harvest liabilities after 2020 under high carbon prices.
Cost effective mitigation & fungibility	✓ Only the most material categories are included – forest and forest conversions. ✓ Net removals under Kyoto rules would be expected to remain eligible mitigation towards our commitment. ✓ Exportability and fungibility of NZ units should be retained under any Kyoto like international carbon market.	× The Article 3.3 full debiting (gross-net) approach to harvest could severely restrict the affordability of sustainable forest harvest at high carbon prices – particularly on second and subsequent rotations of post-1989 forest. × Restricting sustainable harvest risks increasing emissions by driving up emissions elsewhere (fossil, cement) that are most expensive to abate. × Mitigation opportunities in agricultural soils are not captured or incentivised.
Co-benefits & manages trade-offs	✓ BAU FMRL allows sustainable harvesting of pre-1990 forests without penalty. ✓ FLU rules allows land-use flexibility for pre-1990 forests. ✓ All deforestation remains fully debited, consistent with supporting biodiversity values of extant natural forest.	× Post-1989 forest harvest is fully debited, creating a perverse accounting incentive to reduce a positive and sustainable source of renewable fibre and fuel. × Forestry accounting does not recognise biodiversity (e.g., tree weed exemptions), forest permanence (non-harvest) or protection values. × Land use accounting does not incentivise more sustainable pasture management practices.
International reporting	✓ Existing activity-based approach is continued.	× Carbon stock changes due to Forest management effects, accounted

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feasibility	✓ Existing coverage is continued and not expanded. ✓ Continues the status quo – no major changes are required to New Zealand's current international forestry and land use accounting systems.	for under a BAU RL, are difficult and costly to measure and verify.
ETS implementation feasibility	✓ No major additional changes required to current NZ ETS systems, beyond those that have already arisen from the CP2 rules, or will arise from the loss of carry over beyond 2020.	× Potential for increase in fiscal misalignment between international and ETS deforestation liabilities under any post-2020 framework which does not recognise NZ's pre-2020 surplus.
Potential domestic & stakeholder impacts	✓ Would continue to provide NZ with full credits for new afforestation, which can then be passed down vis the ETS. ✓ Would enable NZ ETS participants to continue earning credits on second subsequent rotations of post-1989 forest, enabling them to potentially benefit from changing carbon prices or reduced harvest. ✓ Activities to enhance existing forest carbon stocks, including pre-1990 indigenous forests, are eligible for international credits, and could potentially be devolved to ETS participants. ✓ Low risk that land owners would face liabilities for other land uses or agricultural soils under the ETS.	× The long time lag between when ETS participants can earn credits for new forest sinks, and when they need to pay them back on harvest, creates a fiscal risk for forest owners from future carbon price rises, which de-incentivises them to keep their forests in the ETS and benefit from their future carbon sequestration.
Policy durability & certainty	✓ Enhances policy by continuing current Kyoto framework that underpins the ETS forestry settings. ✓	× Not clear if the Kyoto approach will be internationally durable beyond CP2. × The high-risk, cyclical crediting/debiting approach of Kyoto to AR may not incentivise long-term ETS participation.
Long-term mitigation signal	✓ Creates incentives on the Government to maintain and enhance the existing area and current carbon stocks of our forests.	× Does not incentivise carbon management across entire landscape.
Strategy for effective global agreement	✓ Positions our international support behind what is currently the most recognised and strongest alternative accounting approach to UNFCCC GHG Inventory based net-net accounting against 1990, which would likely impose a much higher cost on New Zealand.	× Unlikely to be an acceptable common accounting approach for all Parties. × Would not demonstrate or support future improvement to the current Kyoto land sector approach (including for post-1989 forest harvest, permanent forests of agriculture).
SUM	✓ **= 27**	× **= 30**

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Assessment

- Continuing to apply a Kyoto CP2 approach after 2020 would help to ensure that Kyoto's successful accounting provisions continue to apply to New Zealand's FOLU accounting in future. (See the modelling results chapter for more detail on the value of the individual Kyoto rules.)
- It would continue the international status quo, and require no direct changes to New Zealand's current international accounting systems, beyond those that arise under the new CPO2 rules or the restarting of the accounting framework (without carry over) after 2020.This would help to maintain domestic policy certainty by continuing current Kyoto framework that underpins the ETS forestry settings.
- In future, provided that other rules remain the same and 1990 stays the starting year for eligible mitigation activity, continuing a Kyoto CP2 approach may enable New Zealand to earn significant forestry credits from its post-1989 forests for a second time round, once these attain full growth in the 2040s ().
- However, the Kyoto CP2 accounting rules for forestry however impose high emissions liabilities on New Zealand in the nearer term, over 2021-2030, when liabilities are more certain that possible future credits in the 2040s. These liabilities arise due to the poor suitability of the Kyoto approach to our particular national circumstances (high new planting rates in the early 1990s, and fast growing forests), and the likely inability to carry-over from the 2013-2020 period.
- Over the long term, the Kyoto CP2 accounting approach could have lower credibility and environmental integrity, as it re-credits and debits the same post-1989 short-rotation forests over and over again. It may also create significant financial liability risks for ETS participants, for limited ongoing carbon revenue, and result in sub-optimum levels of harvest from our sustainably managed planted production forests. Any uncertainty over whether New Zealand can continue to use a 1990 activity start year beyond 2030 could also limit the Government's ability to devolve 2nd rotation credits in future.
- From a long-term, strategic perspective, continuing to use the Kyoto CP2 accounting rules may limit New Zealand's opportunities to improve on the Kyoto framework and introduce more effective forestry and broader land sector rules.
- Adopting a Kyoto accounting approach, which is unlikely to be suitable for countries with fast growing forests or increasing land-based production, could also create barriers to developing countries advancing to full land sector accounting, and perpetuate the Kyoto two-track approach to binding commitments.
- The decision to continue the current Kyoto CP2 approach, or shift to a more effective approach for New Zealand's national circumstances, must therefore weigh the immediate, inertial benefits of conserving the status quo, against those of taking this opportunity now to limit accounting penalties for productive land use over the 2020s and improve the overall framework for the long-term benefit of land sector accounting.
- This may not be a decision that the New Zealand Government can make in isolation of other countries – or independent of domestic stakeholders. However, sticking with the status quo may not be a preferred option either. If all other developed countries adopt non-Kyoto CP2 approaches, then we may have to be 'quick and nimble' in the negotiations to promote our preferred alternative, and avoid being shoe-horned into a worse option.

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- It is recommended that the current Kyoto status quo approach be weighed against the best alternative option, and the approach to our INDC decided based on a full consideration of the broader objectives, as well as strategic, tactical and domestic considerations.

Option 4: Kyoto CP2 + ARDC

Summary description

- As per Kyoto CP2 rules, with the only exception being that the CP1 Afforestation/ reforestation-debit/credit (ARDC) rule is reinstated.

Rationale and 'negotiability'

- The ARDC rule removed the harvesting emission liability of carbon sequestered by post-1989 forests between 1990 and 2008. The rule is of particular importance for New Zealand, because of the large spike of new forestry plantings that occurred in the early 1990s, and the fast growth rate of our production forests.
- The ARDC rule justifiably recognizes that all forests grown since 1990 comprise 'additional' mitigation action since the base year, and therefore it makes no sense for these forests to incur a net debit during the commitment period. The debit arises purely as an accident of accounting, as a result of a short 5-year commitment period commencing 18 years after the base year, which fails to take into account the cyclical nature of production forests. This was not an issue for most countries, as they did not have the major planting boom which NZ experienced in the 1990s, and their forests are not as fast-growing as NZ's.
- For these reasons, ARDC can be considered a justifiable and principled rule for post-1989 forests, that is of particular importance for New Zealand, at least until around 2040-45, when it will no longer have any effect on our accounting.
- Nonetheless, it not a widely known or understood rule, and is seen by some as a 'LULUCF loophole'. The fact that it was discontinued after CP1 may make it difficult to reinstate under any future prescriptive rules regime that applies to developed countries only. Under a future common accounting approach that applies to all countries and is based on Kyoto rules, however, the ARDC rule would likely have relevance for developing countries, who are also likely to have high rates of new plantation establishment between any base year and commitment cycle. In this situation, the ARDC rule might be much more achievable in any future negotiations.

Illustration of emissions impact over 1990 – 2050

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Figure 14: New Zealand's Projected Net Forestry Emissions Comparing Status Quo (CP2 rules) with the addition of ARDC (Midpoint scenario)

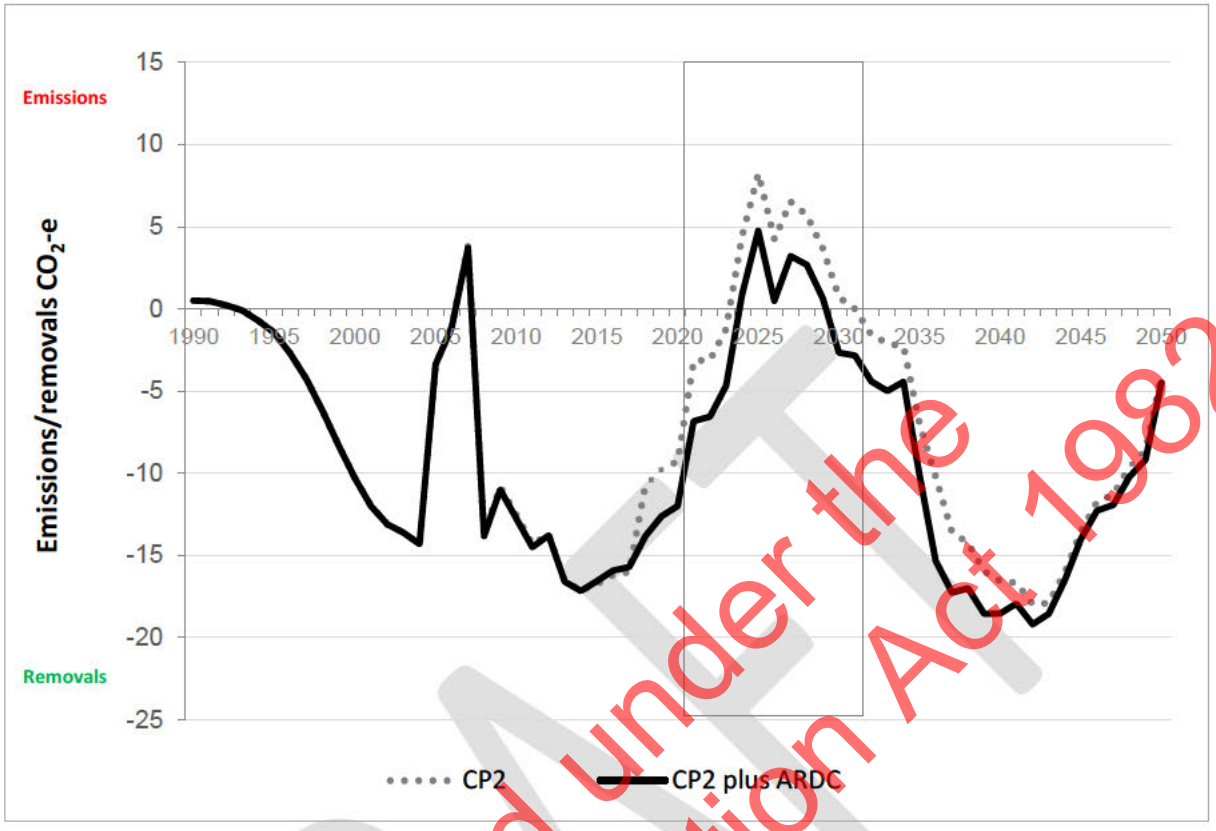

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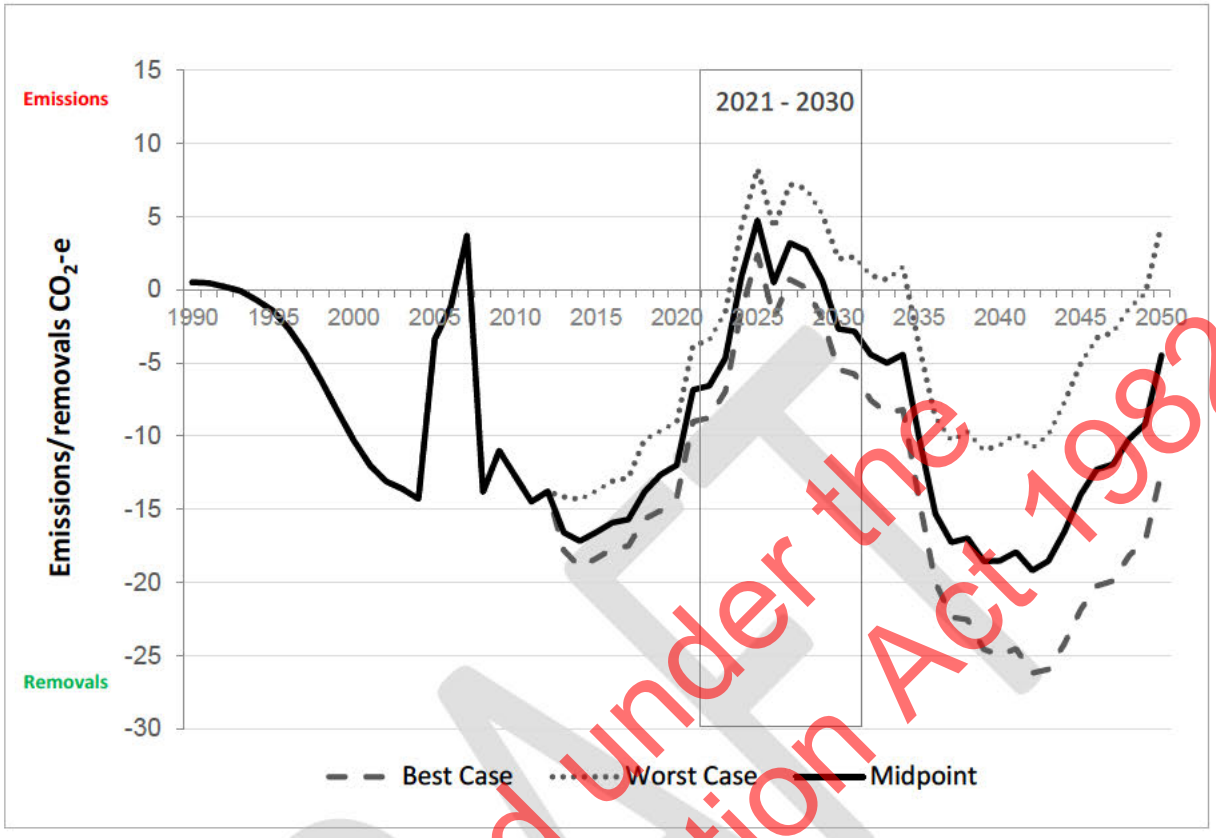
Figure 15: New Zealand's Projected Net Forestry Emissions – Kyoto CP2 rules with the addition of ARDC under Emissions Scenarios



Precedence/usage

- No precedent for picking-and-mixing different Kyoto CP rules, but consistent with New Zealand's negotiating position to date, and the condition associated with our 2020 conditional target range that there is an effective set of rules for LULUCF.

Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical rules	Activity start year	Baseline
Afforestation/reforestation	Gross-net	ARDC	1990	0
Deforestation	Gross-net	FLU	1990	0
Forest management	BAU reference level		2009 policy base year	BAU projection over 2021-2030

Other relevant assumptions

- As for the Kyoto CP2 option above (Option B.3), but ARDC also applies. The ARDC discount on harvest liabilities is applied prior to applying HWP accounting.

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Technical issues to be resolved

- ARDC creates complexities for HWP accounting, as they are both different types of discounts on harvest liabilities.

Modelling results

Modelled emissions liability impact over CC1 and CC2

Emission Scenarios: CP2 Rules and ARDC over 2021-2030 (Mt CO_2)			
Option:	**Low Emissions**	**Mid-point**	**High Emissions**
CP2 and ARDC	-32	-8	29

Emissions impact relative to Kyoto CP2 Status Quo

CP2 Rules and ARDC over 2021-2030 (Mt CO_2) – Midpoint Scenario			
Commitment Period	**CP2 rules + ARDC**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	-12	5	-18
2026 -2030	4	21	-17
Annual mean	-1	3	-3
Total 2021-2030	**-8**	**26**	**-34**

Commentary on liability impact

- The additional of ARDC to the current CP2 rules reduced New Zealand's projected liabilities over 2021-2030 by approximately 34 MT CO2-e. This could make New Zealand's total forestry and land use a small, overall net sink over 2021-2030 under this option.

ETS Implications

- If devolved to the ETS, the impact from this option are identical to those of the current Kyoto CP2 Status Quo option, with the exception that there would no longer be the misalignment that exists currently from having ARDC in the ETS, but not in our international accounting.
- No other ETS implications are identified under this option.

Key Pros & Cons against Criteria

Note to Reviewers: The following table will be completed if there is sufficient interest in this option to warrant a detailed analysis. The table template however has been provided for any specific comments by reviewers on this option against the assessment criteria.

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Criteria	Pros	Cons
International expectations	✓	×
Environmental effectiveness & integrity	✓	×
Commitment is least cost	✓	×
Risk and uncertainty	✓	×
Cost effective mitigation & fungibility	✓	×
Co-benefits & manages trade-offs	✓	×
International reporting feasibility	✓	×
ETS implementation feasibility	✓	×
Potential domestic & stakeholder impacts	✓	×
Policy durability & certainty	✓	×
Long-term mitigation signal	✓	×
Strategy for effective global agreement	✓	×
SUM	✓ = 27	× = 30

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Initial Assessment

- ARDC can reasonably be argued to be a justifiable and principled rule for post-1989 forests, that is of particular importance for New Zealand due to our high rates of new forest plantings in the period between the Kyoto 1990 base year, and the start of the forest crediting commitment cycle, combined with our fast rates of forest growth.
- However, the ARDC rule removes only a portion of the post-1989 harvesting liability – albeit a significant one over the 2020s – and is time limited: after about 2040-45, the rule would have little effect on New Zealand's forestry emissions.
- Of broader concern is that under the current Kyoto CP2 rules, Parties continue to remain liable for all of the sustainable harvesting emissions of their Article 3.3 (post-1989) forests. This is inconsistent with the agreed treatment of Article 3.4 forests (pre-1990 forests), whose BAU harvesting emissions are able to be factored out using the reference level approach.
- A further issue is the problematic interaction that occurs under this option between ARDC and HWP accounting, as the two harvest discount rules overlap from 2013. This raises some doubts over how viable it would be internationally to apply both of these rules at the same time.
- Regaining ARDC would certainly help New Zealand's liabilities over the 2020s, but it does not provide a solution to other issues with the Kyoto CP2 approach, or an effective accounting framework for forestry and land-use over the long term.
- This option is not recommended for New Zealand's post-2020 FOLU accounting.

Option B.5: Kyoto CP2 + New base year

Summary description

- Alternative base year options of 2005. The 1990 activity start date for Article 3.3 and 3.4 activities would be changed to reflect the new base year.
- Applying ARDC makes no significant difference to New Zealand's liabilities over 2021-2030 under this option, and has therefore not been modelled separately. Applying ARDC would however reduce post-2005 forest harvest liabilities after 2030, when these forests reach maturity, and could therefore be included as an additional rule assumption – noting however that combining ARDC with HWP produces a number of accounting complexities.

Rationale and 'negotiability'

- A new base year could be justified on the basis that it would bring us in line with the US, Australia and Canada, as well as some developed countries.
- However, a new base year would require a new activity start year, which would be a major change on the Kyoto Article 3.3 and 3.4 architecture, which is all based on 1990.

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Precedence/usage

- Theoretical option under the Kyoto framework, which could be a practical necessity if a broader range of countries adopted Kyoto-style accounting after 2020 (who may not have land-use records back to 1990). The INDCs tabled so far that leave open a Kyoto approach (EU, Norway and Russia all use 1990 as a base year).

Illustration of emissions impact over 1990 – 2050

Figure 16: New Zealand's Projected Net Forestry Emissions under Kyoto CP2 Rules with 2005 Base Year - with Emissions Scenarios

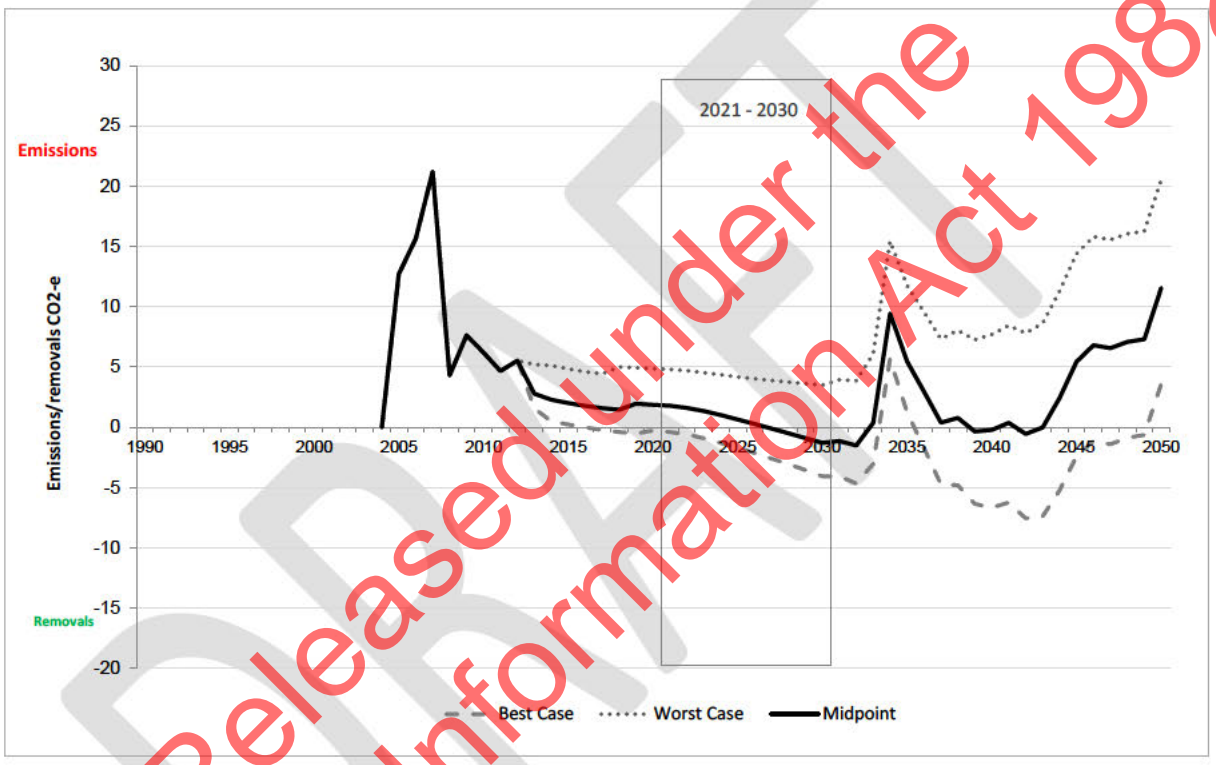

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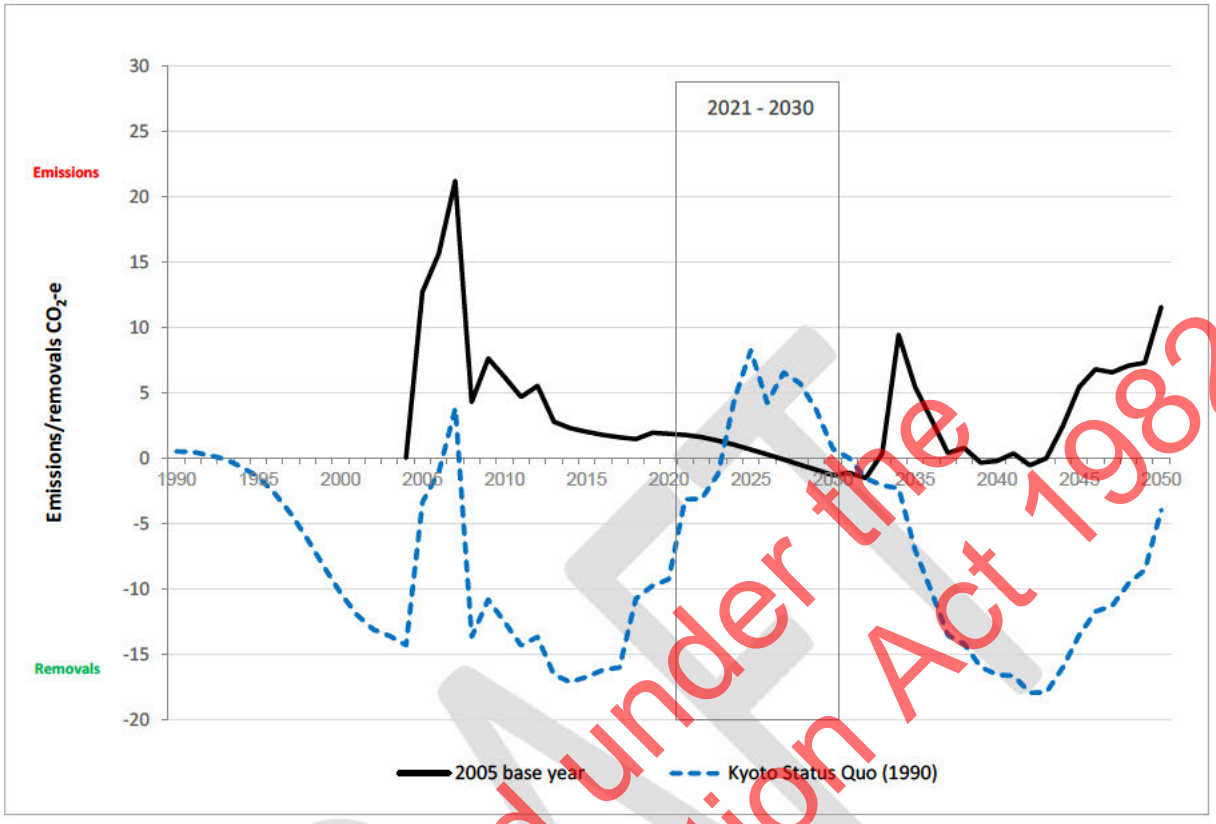
Figure 17: New Zealand's Projected Net Forestry Emissions under Kyoto CP2 Rules with 2005 Base Year – Compared with CP2 Status Quo (1990 base year) – Midpoint Emissions Scenarios



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Commentary on liability impact

- Changing the base year from 1990 to 2005 (with its implied equivalent change to the activity start date) significantly reduces emissions over the 2020s, by effectively removing the bulk of our post-1989 forests – and their harvest – from the accounting.
- By 'resetting the clock', this option pushes forward Kyoto harvest liabilities until around 28 years after 2005 – so beyond the first 2021-2030 commitment cycle. These future liabilities would be lower than over the 2020s under a 1990 base year, though, we have not again experienced the same peak in forest plantings since we did in the 1990s.

Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical rules	Activity start year	Baseline
Afforestation/reforestation	Gross-net	HWP	2005	0
Deforestation	Gross-net	FLU	2005	0
Forest management	BAU Reference Level		2009 policy base year	BAU projection

Other relevant assumptions

- None identified.

Modelling results

Modelled emissions liability impact over CC1 and CC2

CP2 Rules with 2005 Base Year – Emissions scenarios over 2021-2030 (Mt CO_2)			
Option:	**Low Emissions**	**Mid-point**	**High Emissions**
CP2 with 2005 base year	-20	4	41

Emissions impact relative to Kyoto CP2 Status Quo

CP2 Rules with 2005 Base Year vs Status Quo – 2021-2030 (Mt CO_2) – Midpoint Scenario			
Commitment Period	**CP2 + 2005 Base Year**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	6	5	1
2026 -2030	-3	21	-23
Annual mean	0	3	-2
Total 2021-2030	**4**	**26**	**-22**

Technical issues to be resolved

- A 2005 base year and activity start year could create reporting and mapping issues for LUCAS.

ETS Implications

Potential ETS impacts if devolved

- A new base year would re-set the Kyoto activity start date to the new base year – eg, 2005. All else being equal, this would have the effect of converting the bulk of our early 1990s 'Kyoto' forests into effectively 'pre-1990' forests, which would no longer earn credits under the ETS. This would create a major and ongoing misalignment with the current ETS settings.

Key Pros & Cons against Criteria

Note to Reviewers: The following table will be completed if there is sufficient interest in this option to warrant a detailed analysis. The table template however has been provided for any specific comments by reviewers on this option against the assessment criteria.

Criteria	Pros	Cons
International	✓	×

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expectations		
Environmental effectiveness & integrity	✓	×
Commitment is least cost	✓	×
Risk and uncertainty	✓	×
Cost effective mitigation & fungibility	✓	×
Co-benefits & manages trade-offs	✓	×
International reporting feasibility	✓	×
ETS implementation feasibility	✓	×
Potential domestic & stakeholder impacts	✓	×
Policy durability & certainty	✓	×
Long-term mitigation signal	✓	×
Strategy for effective global agreement	✓	×
SUM	✓ = 27	× = 30

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Initial Assessment

- By 'resetting the clock', this option pushes forward Kyoto harvest liabilities until around 28 years after 2005 – so beyond the first 2021-2030 commitment cycle. These future

liabilities would be lower than over the 2020s under a 1990 base year, though, as we have not again experienced the same peak in forest plantings since we did in the 1990s.

- An arguably positive aspect of this option is that it would permanently remove the forests planted in the early 1990s from the full, gross-net crediting treatment under Kyoto. This could be seen increasing environmentally integrity, but only counting forests that are 'additional' since 2005.
- A new base year however does not solve the inherent problems that arise under Kyoto, as a result of using any 'fixed' year to define what is new action (and fully credited or debited) and what is BAU – and therefore largely factored out.
- This option in therefore does not provide a lasting, cost-effective accounting framework beyond 2030, and is not recommended on its own.
- A new base year however could be applied to other assessed accounting options – noting any change in base year may have implications for the ETS.

UNFCCC Reporting 'Land-Based' options

Option 6: UNFCCC based accounting – no special rules – net-net on 1990

Summary description

- Under this approach, accounting would reflect the emissions and removals reported in the UNFCCC GHG Inventory, based on comparing reported net emissions and removals in the commitment period against emissions and removals in the base year (a 'net-net' approach).
- Accounting would use the same land-based reporting categories used in the GHG Inventory, rather than the Kyoto Article 3.3 and 3.4 activity-based approach (i.e., would use 'Land converted to forest' instead of 'Afforestation/reforestation'). As a result, accounting would potentially include all land-use categories and be 100% comprehensive of New Zealand's total land area.
- No special forestry and land-use accounting rules would apply, instead the sector would just be treated like all other sectors. As a result, the Kyoto principle of additionality since the base year would not apply, and there would not be any specific activity start year (i.e., 1990 under Kyoto). This means that the 1990 accounting baseline would include the legacy emissions effects of activities from prior to 1990 (i.e., from 1962, called 'backcasting'). Other Kyoto CP2 forestry rules would also not apply.
- The future GHG Inventory approach to reporting HWP – in particular, whether exported roundwoods are included – is a significant uncertainty in determining New Zealand's future liabilities under this approach. This is because the Inventory approach to HWP data verification requirements is less strict than Kyoto (enabling exports to be fully counted) but could conceivably be tightened under future COP decisions on Inventory-based accounting.

Rationale

- This approach would be adopted if the UNFCCC GHG Inventory was considered to be the best and most accurate estimate of actual emissions and removals from the land sector,

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closest to 'what the atmosphere see', and therefore the most appropriate benchmark for accounting.

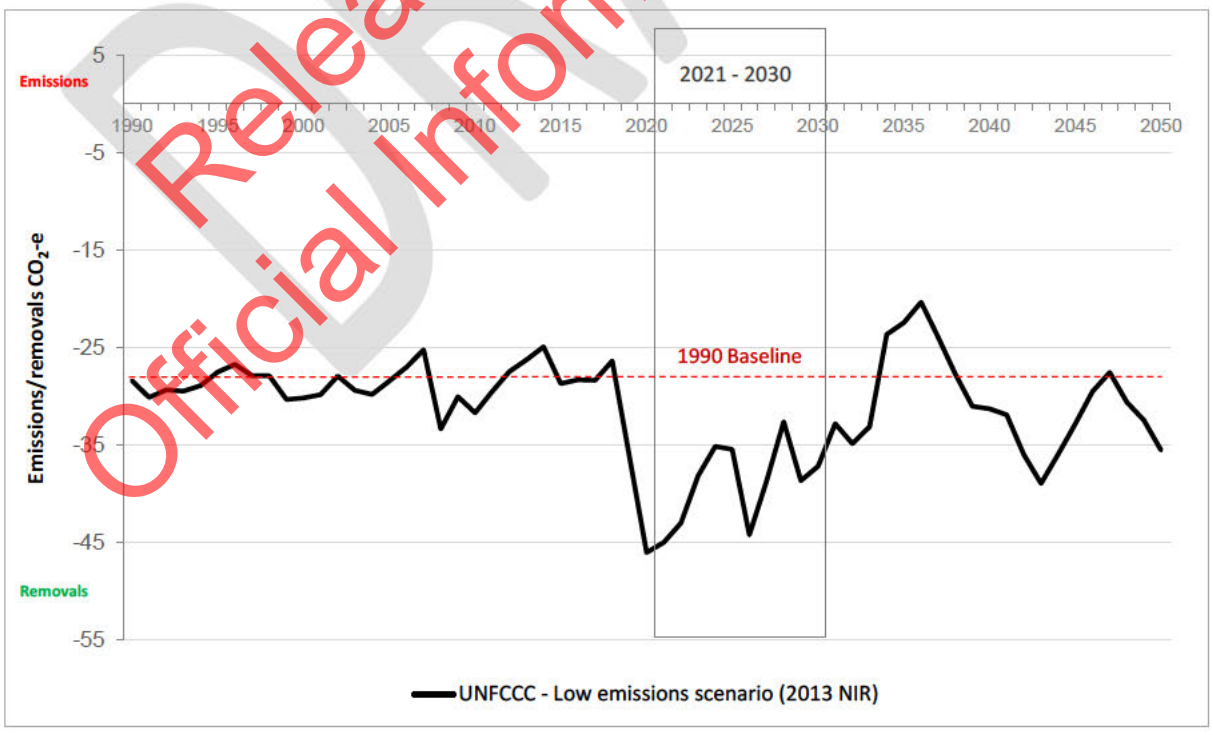
- As the closest we have to a common reporting framework for all Parties under the UNFCCC, it might also be considered the best platform for a common accounting approach.
- Those countries or observers who may prefer this approach include:
    - Those who disagree with treating the land sector differently to other sectors and consider special land sector rules to be accounting 'loopholes', and
    - Those whose net emissions from land are declining from historical levels (including from deforestation or through inclusion of HWPs) and would earn accounting credits under a net-net approach.

Precedence/usage

- Inventory-based accounting is the implied default approach for developed countries if they don't adopt a Kyoto approach (e.g., US, Canada). Is preferred by some environmental NGOs.
- Approach adopted by the US in their post-2020 INDC.
- After 2020, currently tabled INDC suggest that countries who account on the basis of UNFCCC reporting will also seek to apply at least one or more Kyoto forestry rule (e.g., exclusion of natural disturbance).

Illustration of emissions impact over 1990 – 2050

Figure 18: New Zealand's Projected Net Forestry & Land Use Emissions under the UNFCCC assuming HWP treated consistent with 2013 NIR



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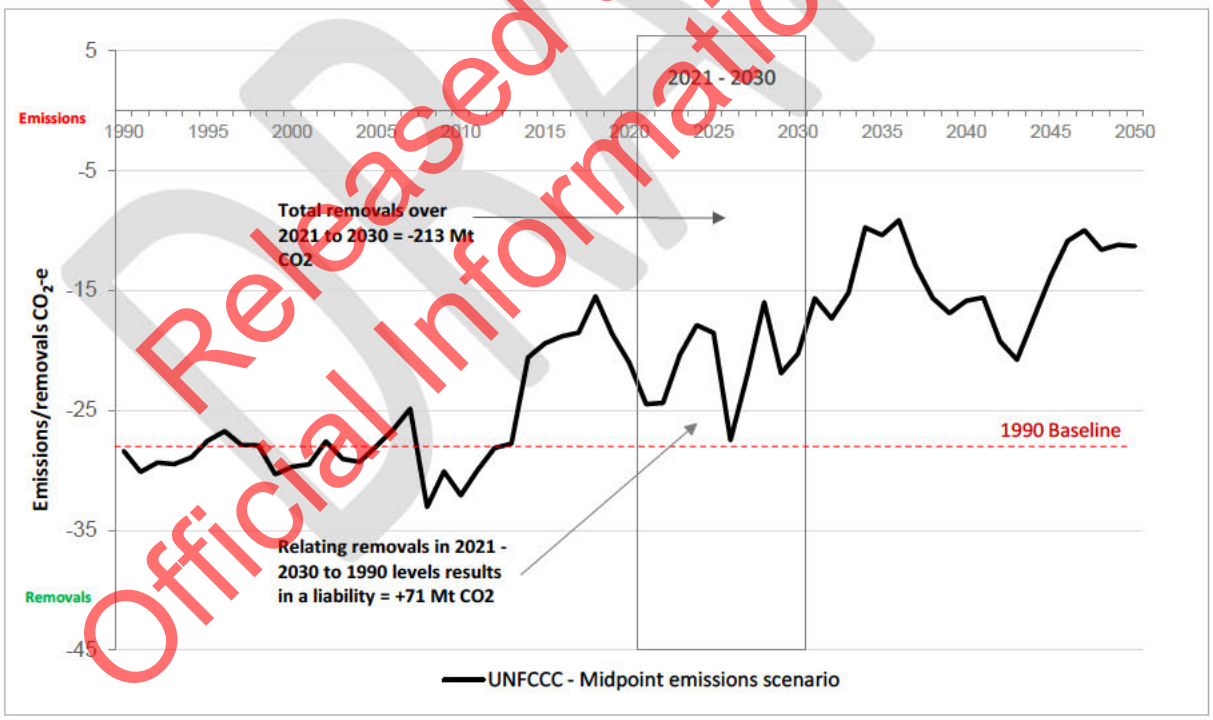
Commentary on liability impact

- In this graph New Zealand's total net forestry removals since 1990 appear to remain at approximately the same level. Under this scenario, New Zealand faces quite moderate liabilities over time – and would actually receive a credit over 2021-2030, due to total net emissions temporarily being lower than 1990 levels.
- This graph is the first time we have seen the projections of New Zealand's net emissions under the new HWP assumptions included in the GHG Inventory for the first time in April 2015 (20013 NIR). These assumptions assume that all exported roundwoods can be accounted for based on the same product mix as reported domestically. This may not be the actual product mix of our exported roundwoods – and as yet we do not have very detailed and verified data on how exported roundwoods are in fact used overseas.
- Where HWP is done under the Kyoto Protocol, stricter verification requirements apply to determining the product mix of exported roundwoods. As there is currently no IPCC guidance on how Parties should account using GHG Inventories, it is possible that should such guidance be produced in the future, it would contain similar standards as the Kyoto accounting guidance.
- This means that projections of New Zealand's future emissions and removals based on the current 2013 NIR may be optimistic. The graph below adjusts the HWP assumptions to better reflect likely future HWP accounting.

Figure 19: New Zealand's Projected Net Forestry & Land Use Emissions under the UNFCCC - Midpoint Scenario (HWP adjusted to better reflect future harvest and production)



- This graph shows a projection closer to that which was reported in New Zealand's last UNFCCC Biennial Report, based on the mid-point scenario.
- Under this projection, the UNFCCC net-net accounting approach against 1990 produced a net debit for New Zealand, even though total forestry and land-use still comprises a large overall net sink.

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- The projected emissions liability is around 71 MT CO2-e over 2021-2030, which is similar to our total Kyoto sink over CP1. However, the gradual upward trajectory of emissions suggests that, all else being equal, New Zealand would face a larger liability over the 2030s.
- The projected liabilities under this scenario however are still not as high as previously estimated, due to the introduction of HWP reporting, and other factors. [TO COMPETE.]

Figure 20: New Zealand's Projected Net Forestry & Land Use Emissions under the UNFCCC under Emissions Scenarios

- This graph shows all the projections under all three emissions scenarios. The worst-case scenario, where exported roundwoods are excluded altogether, could create significant liabilities for New Zealand through to 2050 and beyond.
- This graph illustrates the high liability risks around net-net accounting against an historical base year, given uncertainties in long-term emissions trends and accounting rules.

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Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical assumptions	Activity start year	Baseline
Forest land	Net-net	HWP assumptions on exported roundwoods	None – continuous	1990 emissions
Cropland				

Grassland				
Wetlands				
Settlements				
Other land				

Other relevant assumptions

- Historical effects start from 1962, except for HWPs, which are backdated to 1900.
- That moving to land-based accounting means that all land-use categories must be accounted for. However it could be possible to adopt this approach but retain New Zealand's existing 2013-2020 coverage of forest and forest conversions only, or only expands it to include Croplands and Grasslands for the first commitment cycle (the EU INDC approach). The difference for future emissions projections is minor (based on current inventory estimates of emissions from the other land uses), therefore, the projections included here are for forest land and conversions only.
- Future inventory improvements that could significantly change the emissions level and profile of the other land-use categories (grassland, croplands, etc.) have not been taken into account.

Modelling results

Modelled emissions liability impact over CC1 and CC2

UNFCCC Net-Net on 1990 Liabilities over 2021-2030 (Mt CO_2) under Emissions Scenarios			
Scenario	**Low Emissions (Best case)**	**Midpoint**	**High Emissions (Worst case)**
	HWP treated as in 2013 NIR	Adjusted HWP to better reflect future harvest and products	Excluding exported roundwoods
UNFCCC Net/Net relative to 1990	-104	71	185

Emissions impact relative to Kyoto CP2 Status Quo

UNFCCC Net-Net on 1990 Liabilities over 2021-2030 (Mt CO_2) – Midpoint Scenario			
Commitment Period	**UNFCCC Net/Net relative to 1990**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	36	5	31
2026 -2030	34	21	13
Annual mean	7	3	4
Total 2021-2030	**71**	**26**	**45**

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Key uncertainties and technical issues

- Estimating New Zealand's future emissions liabilities under this approach with any certainty would require determining whether or not New Zealand's UNFCCC-based accounting over 2021-2030 would include exported roundwoods (as per the current 2006 IPCC Guidelines), or exclude exported roundwoods in the absence of verified data on their product end-use, consistent with Kyoto CP2 accounting standard (IPCC 2013 KP Supplement).

ETS Implications

Departure from current ETS settings if devolved

Current ETS provisions	Implied changes
Credit for registered post-1989 sinks	**Significant change**. New AR would not be fully credited. Only rates of 'land converted to forest' over-and-above national 1990 levels of conversion would be credited internationally, unless a 1990 'start year' was also introduced into our international accounting (setting AR rates to zero in the base year). It is not clear how this 'relative crediting' could be devolved at an individual land owner level. Partial crediting of AR could be one option.
Debits for harvest of registered post-1989 forest	**Significant change.** Harvest emissions from all forests would be treated the same, and accounted for on a relative basis cf. 1990 harvest emissions. Both 1990 and post-1989 forests would be liable for harvest emissions over-and-above 1990 levels of harvest. Not clear how this relative crediting could be devolved at an individual land owner level.
No credits for pre-1990 forest management	**Potential change.** A net-net approach to forest remaining forest would imply that NZ would incur a debit for its overall forest harvest being higher over 2021-2030 than in 1990. Not clear how this national 'relative' debit could be devolved at the level of individual forest owners, but conceivably some could fall on harvesting pre-1990 forests owners.
Compulsory liability for pre-1990 planted forest deforestation	**Significant change.** Emissions from all forest conversions would be accounted for relative to 1990. Only deforestation over-and-above 1990 levels would incur a national debit. Not clear how this could be devolved at an individual land owner level.
Other land use	**Significant change.** NZ would become liable for relative changes in net emissions from other land uses. Not clear how this could be devolved at an individual land owner level.

Feasibility of ETS Implementation

- This approach is not feasible to implement in its current form. If devolved to the ETS, it would introduce significant changes to land owners' ability to earn credits or liabilities for land use activities. The major changes include a shift to 'relative' crediting/debiting (instead of full crediting/debiting) for AR and D, and the extension of this 'relative' approach to other land use activities: forest harvest and management, and potentially non-forest land uses as well (Cropland and Grassland).
- Unless an activity start year were introduced, which would avoid the 'relative crediting' created under a net-net approach and instead allow full crediting/debiting of new actions (either on an absolute basis or relative to projected BAU), it is difficult to see how this international accounting option could be effectively implemented in the ETS.

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Key Pros & Cons against Criteria

Criteria	Pros	Cons
International expectations	✓ Meets countries' expectations that developed countries maintain equal or better accounting standards after 2020. ✓ Meets expectations that developed countries progress towards a more comprehensive (possibly land-based) approach after 2020. ✓ Would be perceived by some as a highly credible approach.	× Accounting on the basis of the Inventory's not very strict HWP approach could attract criticism.
Environmental effectiveness & integrity	✓ Transparent and uses existing IPCC guidance. ✓ Accounting coverage is expanded to all land uses.	× Poor additionality component to accounting. × Land-based approach could capture non-anthropogenic and legacy effects, including BAU sinks. × Potential for large-scale debits and credits due to arbitrary factors impacting differently on the base year compared to the commitment period.
Commitment is least cost	✓ A nominal target expressed as a reduction of base year emissions would require a slightly smaller quantum of reductions to meet if removals were included in the base year.	× Net-net accounting against 1990 would potentially impose a very high liability cost on NZ, depending on reporting methodologies, including assumptions on natural forest and grassland soils. × Potential extension of forestry accounting approaches to agricultural would be ruled out under this approach.
Risk and uncertainty	✓ Fixed level of 1990 emissions baseline would somewhat increase certainty around liabilities.	× Cost of target under this approach is highly uncertain (more so than other options) due to future HWP reporting rules. × Lack of IPCC provisions on excluding natural disturbance could create potential liabilities from *force majeure* events in forests.
Cost effective mitigation & fungibility	✓ Does not permanently divide forests into two different categories under different accounting incentives. ✓ Mitigation opportunities in agricultural soils and other land uses would be captured and incentivised.	× Relative crediting and debiting of new mitigation actions only. Only net reductions against 1990 rules would be eligible towards our commitment. × Not clear that issuance and exportability of NZ RMUs would be retained under this approach – may only have RMUs. × Includes all land-use categories, even minor one where the reporting costs may outweigh mitigation gains.

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Co-benefits & manages trade-offs	✓ Could support a more holistic approach to carbon in the entire landscape.	× Emission reductions do not recognise forest permanence (non-harvest) or protection values. × Increases in sustainable forest harvesting over 1990 levels incur an accounting penalty. × Deforestation would be only partially debited (relative to 1990 levels), undermining retention of high-value, extant natural forest.
International reporting feasibility	✓ Continues existing GHG Inventory-based approach.	× Existing GHG Inventory reporting on all land-based categories (100% of NZ) may not be sufficiently accurate for accounting purposes, and may require significant new investment in activity data and emission factors.
ETS implementation feasibility	✓	× Creates significant fiscal misalignment between international and ETS entitlements and liabilities. × Would not provide full rewards for new actions, if devolved, and could impose inequitable debits. × Net emissions from management activities on all land-use categories would be difficult and costly to measure and verify at the land owner level.
Potential domestic & stakeholder impacts	✓ Emissions reductions from all land uses and land management activities could potentially become eligible to earn at least some international credits, and could potentially be devolved to ETS participants.	× The historically-based, 'relative crediting' approach of net-net accounting would not be easy to devolve to individual land-owners, may prevent full crediting of AR, and would likely create inequities. × Pre-1990 forest harvest would no longer be internationally exempt from liabilities (as it is under Kyoto) which could suggest devolving a carbon price on some sustainable harvest of pre-1990 forest. × Fiscal risks for forest owners from future carbon price rises, arising from the long time lag between earning credits for forest sinks and needing to pay them back on harvest, would likely remain under this approach.
Policy durability & certainty	✓	× The complete system change implied by shifting from Kyoto to GHG Inventory-based international accounting could create policy uncertainty.
Long-term mitigation signal	✓ Creates incentives on the Government to increase the overall sink of our landscape relative to historical levels, across all land uses and pools.	× Over the long term and even under strong mitigation policies, this accounting approach would inevitably produce a net accounting debit for lands, as carbon pools become saturated and no longer absorb at same rate.
Strategy for effective	✓ Would support the use of GHG Inventories as a common reporting	× Would not promote an effective common accounting approach

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global agreement	framework for all parties (which we agree with).	consistent with NZ's objectives.
SUM	✓ **= 14**	× **= 24**

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Assessment

- For the reasons outlined above, a GHG Inventory net-net based approach is not recommended for New Zealand's post-2020 accounting

Option 7: UNFCCC based accounting + New base year

NOTE – PARTIAL OPTION ANALYSIS ONLY

- This approach is exactly the same as Option 6 above (UNFCCC based accounting – no special rules – net-net on 1990), except that a different base year (2005) would apply. The analysis is therefore limited to what would be **different from Option 6**, only.

Summary description

- Under this approach, accounting would be identical in all respects to UNFCCC based accounting based on 1990, the only difference being that emissions and removals in the commitment period would be compared against 2005 for accounting purposes.

Rationale

- A more recent base year for accounting under the new agreement may be more suitable for an agreement that is to be 'applicable to all Parties' – in particular developing countries, who may still be developing their GHG inventory systems and may not have accurate emissions estimates for 1990. A more recent base year might therefore provide a better platform for a common accounting approach.
- Using 2005 would bring us into line with the US and Canadian base years, making our targets more directly comparable.
- Using a more recent base year would make any given reduction level sound more ambitious, when expressed against a higher baseline. This would be true for New Zealand, where our emissions were higher in 2005 than in 1990.

Precedence/usage

- The US and Canada are expected to use 2005 for their post-2020 UNFCCC-based accounting, and other countries probably will as well. The EU, Norway and Switzerland INDCs however use 1990.

Illustration of emissions impact over 1990 – 2050

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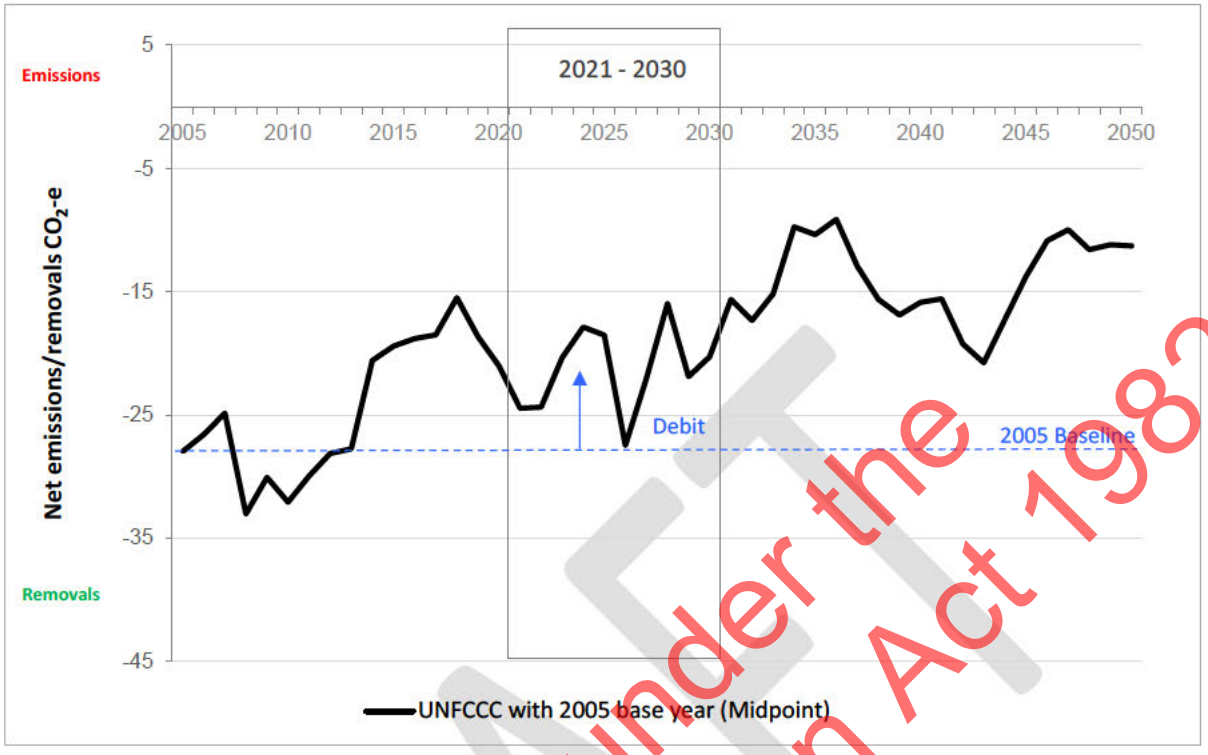
Figure 21: New Zealand's Projected Net Forestry & Land Use Emissions under the UNFCCC assuming 2005 base year - Midpoint emissions scenario



Commentary on liability impact

- Under the midpoint emissions scenario, shifting to a 2005 base year for UNFCCC GHG Inventory-based accounting has very little difference – only about 5 MT CO2-e – compared with the 1990 base year.
- Under either the low or high emissions scenarios (see below), New Zealand could either have a large sink or a large net liability under this approach. (See option 6 for an explanation of the variations.)

Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical assumptions	Activity start year	Baseline
Forest land	Net-net	HWP assumptions on exported roundwoods	None – continuous	**2005** emissions
Cropland				
Grassland				
Wetlands				
Settlements				
Other land				

Other relevant assumptions

- As for Option 6.

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Modelling results

Modelled emissions liability impact over CC1 and CC2

UNFCCC with 2005 base year over 2021-2030 (Mt CO_2) – with scenarios			
Option:	**Low Emissions**	**Mid-point**	**High Emissions**
UNFCCC 2005 base year (removals relative to 2005)	**-104**	**67**	**171**

Emissions impact relative to Kyoto CP2 Status Quo

UNFCCC with 2005 base year over 2021-2030 (Mt CO_2) – Midpoint Scenario			
Commitment Period	**UNFCCC 2005 base year**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	34	5	29
2026 -2030	32	21	11
Annual mean	7	3	4
Total 2021-2030	**67**	**26**	**40**

Key uncertainties and technical issues

- As for Option 6.

ETS Implications

Departure from current ETS settings if devolved

- As for Option 6.

Feasibility of ETS Implementation

- As for Option 6.

Key Pros & Cons against Criteria

- As for Option 6

Initial Assessment

- As for Option 6

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Full carbon accounting of forests

Option 8: Kyoto CP2 Rules + Zero-based FMRL +/- Cap (gross-net of all pre-1990 forest)

Summary description

- This option would use an existing flexibility under the Kyoto CP2 rules which allows countries to select what type of reference level they apply to their Forest Management (pre-1990 forest) category, to apply a 'zero reference level' to forest management over the commitment period. This has the identical effect to applying full gross-net accounting of all pre-1990 forests over 2021-2030.
- The analysis of this option assumes that no cap on credits would apply, as under current Kyoto rules, to explore its full implications – but notes that this is a major risk. In practice, a cap would likely be imposed under any accounting rules agreed under the new agreement.
- New Zealand has opted to account for its Forest Management over 2013-2020 using a BAU Reference Level. The Kyoto CP2 rules also allowed Parties to apply either a zero (gross-net) or historical (net-net) approach, with each subject to the same 3.5% cap.
- On this basis, a Kyoto-style gross-net approach could in theory be applied to our Forest Management accounting after 2020, to take advantage of the fact that we now know that around 10% of our natural forests – mostly on private land – are a sink.
- This approach would also apply gross-net, full carbon (or 'absolute') accounting to our pre-1990 planted forests. The growth of these forests comprise the bulk of the credits earned under this approach over 2021-2030. The approach would also mean that New Zealand would face an international emissions liability for all planted forest harvest, regardless of whether the forest was replanted again or not, and the effects were permanent or temporary. In total, however, New Zealand's total forest estate could be a large net sink towards accounting over 2021-30 (though declining thereafter) – depending on other rules.
- In particular, the imposition of any overall cap on Forest Management credits (as applied in both CP1 and CP2) would severely limit the potential cost savings of this option – while potentially leaving the downside risks and costs unchanged.

Rationale and 'negotiability'

- Under Kyoto, where forests are a net sink in the base year, and a net sink over the commitment period, 'gross-net' accounting of the LULUCF sector as a whole applies – which means that the net emissions and removals from LULUCF are added to accounting during the commitment period. (This offsetting meaning of 'gross-net' should not be confused with 'gross-net accounting, or full carbon accounting.)
- The rationale for this approach is that as any overall sink is a positive mitigation contribution (regardless of whether it is smaller or larger relative to the base year), it should count towards the target. One this basis, New Zealand would choose to count its entire forest sink towards its target.
- The justification for this approach would need to contend that all emissions and removals from managed forests represent real, additional and anthropogenic carbon stock changes,

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and should therefore be counted towards targets. This would also justify why three should be no cap on accounting credits. In practice, this position would be very hard to maintain.

- Under this approach, emissions and removals during the commitment period which are due to the legacy effects of actions or disturbances before the base year, such as regeneration from historical logging, would also be counted, on the basis that regeneration is only possible because the land is now being sustainably managed. This is a contentious idea, as the forests would also regenerate naturally, without any human intervention. Should this count as additional mitigation? Similar legacy effects are captured in accounting under the net-net approach, producing arbitrary accounting outcomes for different countries referred to as the 'forest lottery'.
- This option might be adopted if the purpose of accounting was to (1) maximise credits towards the target, in the national interest, or (2) to place all forests under the strongest form of accounting incentive (full carbon accounting or gross-net), which would ignore long-term effects or policy outcomes and instead debit harvest as strongly as deforestation, and seek to minimise all emissions from forests. Sustainable forest harvest emissions would be seen as much to be avoided as fossil or industrial emissions. It therefore could be seen as reflecting more closely what 'the atmosphere sees', irrespective of broader economic or environmental benefits.
- Despite the fact that Japan applies a version of this option to their CP2 accounting, it is unclear how credible or achievable it would be under any post-2020 rules negotiation if we sought to have no cap. It is clear an uncapped approach would provide a very large offset against emissions from elsewhere in the economy. Its environmental integrity would need to be established, domestically and internationally, and the risks – both for sustainable forest management and long term accounting liabilities – would need to be carefully considered.

Precedence/usage

- Current rule option under CP2, but with a cap on credits of 3.5% of base year emissions per annum.
- Currently used for a narrow definition of forest management [redacted]. No other Annex 1 country has adopted a zero reference level.

Withhold under s9(2)(j), s6(a) and 9(2)(g)(i)

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Illustration of emissions impact over 1990 – 2050

Figure: New Zealand's Projected Net Forestry & Land Use Emissions - Full Carbon Accounting of Kyoto CP2 Rules + Zero-based FMRL (gross-net of all pre-1990 forest) - Midpoint scenario (line shows 3.5% cap)

Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical rules	Activity start year	Baseline
Afforestation/reforestation	Gross-net		1990	0
Deforestation	Gross-net		1990	0
Forest management	Zero Reference Level (gross-net)	Any cap Natural disturbance No FLU	1990	0

Other relevant assumptions

- Key assumption is whether a cap on credits applies. A cap of 3.5% of 1990 base year emissions applies to Forest Management in CP2 under the Kyoto Protocol. An absolute cap applied in CP1.
- The FLU rule would no longer have any effect if Forest Management was accounted for on a gross-net basis. This means shifting the location of a plantation forest would incur debits as for deforestation.

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- The extent to which the LUCAS estimates of future removals from regenerating indigenous forest on private land depend on current legislation and management practices may need to be considered, is assessing how likely it is these removal rates will be maintained over time.
- The natural disturbance exclusion rule would be critical under gross-net accounting to avoiding paying full liabilities for any major events.
- Assumes that the FMRL 2009 policy base year would no longer apply, as accounting would not be against a projection. Eligible forest management activities for debits and credits would commence from 1990.
- Any change to a different base year, away from 1990, may not be compatible with the Kyoto Protocol Article 3.3 and 3.4 accounting architecture, and therefore with this approach.

Modelling results

Modelled emissions liability impact over CC1 and CC2

Kyoto full crediting of forests over 2021-2030 (Mt CO_2) under Emissions Scenarios			
Option:	**Low Emissions (Best case)**	**Midpoint**	**High Emissions (Worst case)**
Kyoto full carbon accounting – Zero FMRL – No cap	-176	-152	-114
Kyoto full carbon accounting – Zero FMRL – with 3.5% cap	-21	-21	-21

Emissions impact relative to Kyoto CP2 Status Quo

Kyoto full crediting of forests over 2021-2030 (Mt CO_2) – Midpoint Scenario			
Commitment Period	**Kyoto full carbon accounting – Zero FMRL**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	-73	5	-79
2026 -2030	-79	21	-99
Annual mean	-15	3	-18
Total 2021-2030	**-152**	**26**	**-178**

Commentary on liability impact

- Modifying the existing Kyoto CP2 approach by changing our BAU Forest management reference level to a 'Zero' reference level, and assuming that no overall cap applies on credits, would gain New Zealand a large overall accounting sink over 2021-2030, and likely beyond.

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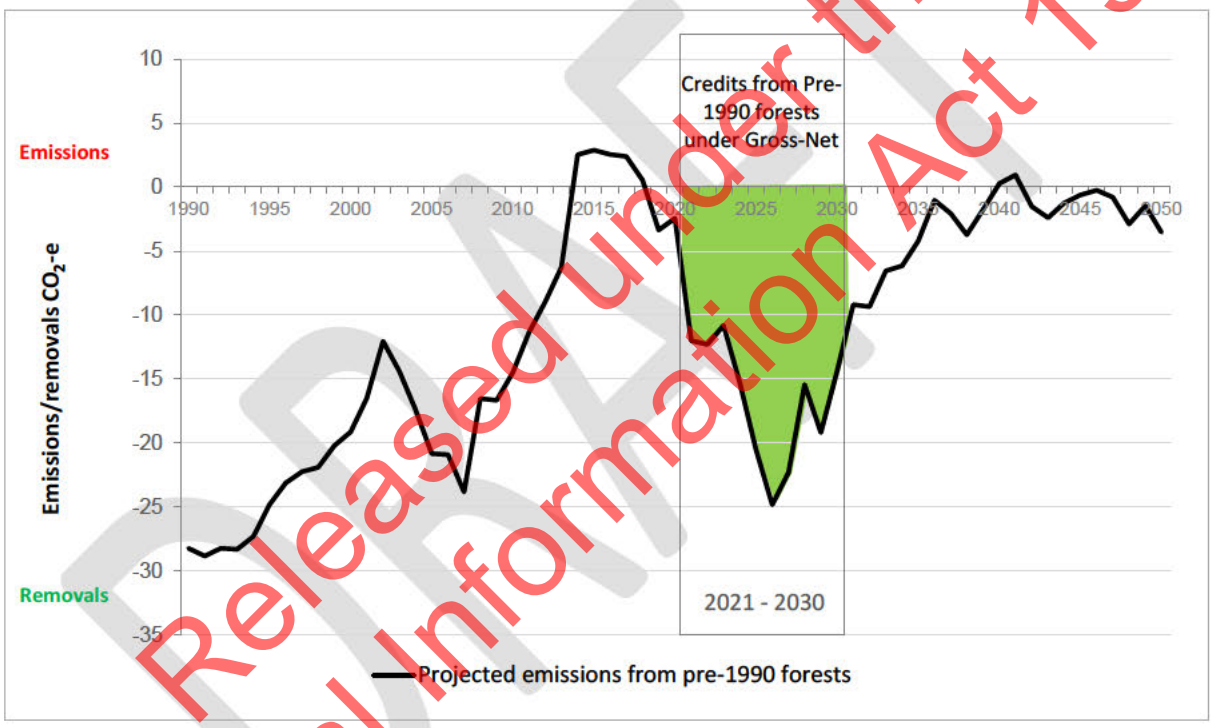
- Credits under this approach would be vulnerable to any international decision that the total contribution of any forestry and land use sink towards a target should be capped. Such a cap currently applies to forest management accounting under Kyoto CP2 rules (set at 3.5% of 1990 national gross emissions per annum).
- The national liability effect should also be distinguished from the Government's fiscal liability. This is because most of the observed credits under this approach are from planted credits (only 6 MT per year are from that small portion of indigenous forest land that is regenerating), and yet the credits from post-1989 forests are able to be privatised under the ETS. This means that the while the overall level of forestry removals seems reasonably even over time, the Government's liabilities for harvest emissions could continue to show cyclical effects. This is illustrated by the graph below, of projected pre-1990 planted forest emissions.

Figure: Projected net emissions from pre-1990 forests (midpoint scenario) – demonstrating cyclical emissions and rem ovals from an uneven age-class distribution



- What this could mean is that the Government would receive less benefit from gross-net accounting of forest management over time, unless it also holds the 'crediting rights' to post-1989 forests and natural forests as well, with which to offset pre-1990 harvest emissions in future. This could require that the Government nationalises all forest carbon. An alternative option is that it brings all pre-1990 forests into the ETS, and requires pre-1990 forest owners to surrender units on harvest. Either way, New Zealand's total forests are projected to be a net sink over the entire period to 2050. The point is that any 'windfall gain' to New Zealand from this approach could still create fiscal risks for the government across multiple commitment periods, depending on how carbon property rights are devolved.

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Technical issues to be resolved

- A full carbon accounting approach would likely require our natural forest inventory measurement system to be improved, eg, to capture management changes, localised or area-based effects and private indigenous forest harvest practices.

ETS Implications

Departure from current settings

- If devolved to the ETS, this approach would imply a major change to forest carbon property rights and crediting incentives in New Zealand, as well as potentially to the total quantity of forestry credits issued under the ETS.
- Pre-1990 forests would earn New Zealand international forestry credits, which could lead to demand for pre-1990 forests to have the option to enter the ETS (or risk accusations that the government has 'nationalised' the carbon).
- The incentives for afforestation may diminish, as more credits would be issued to pre-existing forests than to new forests, reducing market demand overall for forestry units (due to increased liquidity) but also for afforestation units in particular, which would likely be produced at a higher cost (as required new action).
- [redacted] Withhold under s9(2)(g)(i) and s6(e)(iv)
- The technical, operational, fiscal and legal implications of any mandatory or voluntary expansion of the ETS to privately-owned pre-1990 indigenous forests would be considerable.

Potential ETS impacts if devolved

Current ETS provisions	Impact
Credit for registered post-1989 sinks	**No direct impact, but potential loss of market demand.** Post-1989 forests could retain their existing ability to earn credits; however, internationally, pre-1990 forests would also be earning credits for their existing levels of removals. If these pre-1990 credits were devolved to land owners, then post-1989 forest owners would face carbon market competition for the sale of their units, and may not receive the same price as otherwise. Perceived environmental integrity issues around pre-1990 forest units could also affect the demand for post-1989 forestry credits.
Deforestation liabilities for post-1989 forests	**No implied change.** [redacted] Withhold under s9(2)(g)(i) and s6(e)(iv)
Debits for harvest of registered post-1989 forest	**No implied change.**
No credits for pre-1990 forest management	**Major change.** Internationally, pre-1990 forests (both planted and natural) would become eligible for credits and debits for all carbon stock changes, including for temporary carbon stock changes associated with harvest and regrowth, and for regrowth of regenerating natural forest. If devolved, this would suggest pre-1990

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	forest owners would also be able to earn credits, and debits, for their forests that were already in existence in 1990. Credits would therefore potentially be awarded for the legacy effects of land use change decisions prior to 1990. Providing credit for early (ie, pre-1990) action would be inconsistent with the treatment of other sectors under the ETS.
Compulsory liability for pre-1990 planted forest deforestation	**No implied change except FLU.** The FLU rule would no longer be available (because there would no longer be an option to account for deforestation and replanting in a new location under a BAU reference level).
Other land use	**No implied change.**

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Key Pros & Cons against Criteria

Criteria	Pros	Cons
International expectations	✓ This approach could be defended on the basis that it uses (selectively) elements of the existing Kyoto rule set. ✓ Could be used to support a 'net zero CO2'/carbon neutrality goal for NZ, under which 100% of emissions from other sectors are also accounted for (noting that land-based sinks eventually decline to zero on saturation).	× An uncapped gross-net Forest Management approach would attract significant international criticism, and lead to calls for a compulsory cap on credits (as under Kyoto in both CP1 and CP2), or a compulsory reversion to a straight GHG Inventory-based net-net approach without any special accounting rules (a much more expensive option for NZ). × NZ's achievement of its post-2020 target would not be comparable to other countries' efforts, and would need to be translated to a non-gross-net approach for accurate international comparisons. × NZ would be seen to be taking advantage of the greater flexibility around the INDC process to cherry pick amongst elements of existing Kyoto rules, ignoring that a cap is inherently linked to any accounting approach to Forest Management (such as gross-net) that risks crediting legacy removals from actions prior to the base year. × [redacted] Withhold under s9(2)(g)(i) and s6(e)(iv) × Use of this approach would be too costly for most developing countries, as it produces a large debit for countries whose forests are still a net source from deforestation and degradation. This approach would therefore mostly only to be viable for developed countries, who have already converted their forests and/or can afford to get their wood supplies from elsewhere. This means its overall global effect would be to reduce developed country emission reductions, which would not show the expected first world leadership.
Environmental effectiveness & integrity	✓ This approach would fully debit all deforestation, and fully credit all new forest planting and management actions. (The strength of AR incentives though could be diminished, if there is an over-supply of low-quality forestry units.)	× A gross-net approach to pre-existing forests would credit removals which would not be considered to result from additional action, because they would largely reflect management changes prior to 1990. This goes against the environmental integrity principle that reductions should be additional, which NZ is promoting internationally as part of a 'rules-based' regime. × This approach would credit non-anthropogenic removals, because it would

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	✓ New Zealand's international accounting for forests would strongly prioritise their mitigation role over the other social, environmental sustainability and economic functions of forests. ✓	capture regeneration from natural disturbances from before 1990, which would occur in the absence of any human intervention. × This approach would credit non-permanent carbon stock increases from our pre-1990 planted forests, which are mostly in their peak growth period over 2021-2030. × If adopted universally, this approach would significantly reduce mitigation by developed countries (whose forests are mostly net sinks) (possibly in the order of about 10-20%), assuming targets are not altered. × This approach could have earned significant credits for almost all developed countries in CP2, but was not adopted by any [redacted] ×
Commitment is least cost	✓ Would significantly reduce the total cost of NZ's target over 2021-2030, by around 150 MT CO2-e, provided an international cap on credits was not imposed.	× Cost reductions may become smaller over time, as pre-1990planted forest come back into their harvest cycle. × By taking an 'absolute' approach to 100% of emission and removals in forests, this approach would appear to undermine the approach adopted for other sectors, where developed countries are only liable for their emissions above 1990 levels (minus their target), and instead supports the more costly argument that developed countries should take 100% responsibility for all of their emissions from all sectors – not just forests (ie, the idea that rich countries have already used up 100% of their atmospheric allowance). ×
Risk and uncertainty	✓ Reducing the cost of NZ's post-2020 target through maximising credits from forestry could reduce the risk that the Government will later consider our Paris commitment too expensive to meet.	× Applying such a low integrity approach could put at risk the continued use of forest sinks towards our target in future commitment cycles, which would increase the cost of future targets. × This approach could increase international calls (eg, by Greenpeace) that forests should no longer be allowed to offset fossil emissions, and be fungible towards national targets, put at risk NZ's long-term ability to use low cost domestic forestry abatement towards its target. × Credits under a gross carbon accounting approach to FM would be highly uncertain due to the high risk that an international cap were applied – most likely to credits only, and not debits (as under Kyoto). The downside risks would then be greater than the upside ones.

Withhold under s9(2)(j), s6(a) and s9(2)(g)(i)

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		× Any change to the natural forest inventory estimates would impact on predicted credits under this option. × Any change to legislation governing the management of harvest of privately owned regenerating natural forest (eg, to allow more sustainable harvest) would reduce credits under this option. × The uneven age-class of our pre-1990 planted forests, and expected cyclical harvest emissions, could create fiscal risks for the government across multiple commitment periods, depending on how carbon property rights and obligations are devolved.
Cost effective mitigation & fungibility	✓ NZ would be able to claim forestry removals towards our target that required no additional mitigation action or expenditure.	× This approach makes it more likely that NZ will one day lose the ability to count forests – a cost-effective source of domestic abatement – towards its targets. × Perceived environmental integrity issues around pre-1990 forest units could affect the demand for and exportability of post-1989 forestry credits. × The potential for large quantities of low integrity 'hot air' credits could put at risk our future ability to carry over any surplus units between commitment periods. × It could also prevent us from justifying the exclusion from our ETS of low integrity units from other countries, eg, on the basis that their units don't represent 'real and additional' reductions. ×
Co-benefits & manages trade-offs	✓ Biodiversity benefits could potentially arise as the NZ government would be additionally incentivised to protect privately-owned regenerating natural forest from deforestation or harvest (as it would be a source of credits under BAU). If devolved under the ETS, planted forest owners might also be incentivised not to harvest their forests, and eventually these could revert to non-harvested native forests.	× If devolved, all sustainable forest harvest would face a carbon price. This could limit harvest at high carbon prices, reducing the supply of wood products and production forestry activity in NZ. × Prioritising the mitigation role of forests over sustainable timber production could have negative consequences for employment and broader social, environmental sustainability and economic co-benefits of NZ's production forests. × If faced with compulsory harvest liabilities under the ETS, planted forest owners would be incentivised not to harvest their forests, and instead just to allow them to become abandoned, permanent forests, reducing their social and economic benefits. × Any announcement of new government limits on the harvest or clearance of reverting natural bush on private land (which would limit credits under this

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		option) could potentially create a perverse incentive for pre-emptive clearance of these lands, unless it was carefully managed. × Whereas only about 10% of NZ's indigenous forests are regenerating (and so earning credits under this approach), all sustainable harvest of indigenous forest in NZ would incur international liabilities. This means that currently allowed levels of sustainable harvest of indigenous forests would incur a liability cost to the government.
International reporting feasibility	✓ NZ's GHG Inventory now includes national estimates of natural forest emissions and removals, which would support capturing the current national level of removals under this approach (if not future behavioural changes). ✓ Estimating the total (gross) carbon change from forest management in a localised area may be easier than estimating change relative to BAU.	× NZ's international reporting would need significant further investment if it were to be capable of capturing management changes on sub-national, regional or project-based areas of pre-1990 forest, in a way that could capture carbon effects at a local level, support devolution to the ETS and incentivise behavioural change. × Improved estimates of emissions from harvest of privately-owned indigenous forest may be required to avoid over-estimating removals.
ETS implementation feasibility	✓ The government could avoid ETS implementation impacts by not devolving pre-1990 forest credits and debits under the ETS, but instead keeping these credits to offset emissions from other sectors. (This would leave the government paying the bill for pre-1990 harvest in the 2030s.)	× This approach would be very costly to devolve to the ETS, and yet might be required to avoid accusations that the Government is 'nationalising' private carbon benefits. × Additional complexity would arise from bringing in both pre-1990 planted as well as indigenous forests into the ETS, as natural forests will have less uniform carbon growth profiles. (This would also arise under other options where pre-1990 forests could come into the ETS, but with likely much lower uptake rates.) × Any credits devolved for regenerating natural forest on private land may need to be matched by compulsory liabilities for harvest or any management changes which reduced carbon sequestration. Whereas only about 10% of NZ's indigenous forests are regenerating (and so earning credits under this approach), all sustainable harvest of indigenous forest in NZ would need to incur ETS liabilities. (Is not clear whether these two areas are the same.). × Providing credits to private owners of natural forest suggests that the deforestation liability should also be extended to them, [redacted] × If the government were to devolve credits for pre-1990 forest growth, this suggests it would also need to devolve liabilities for all pre-1990 harvest, or else

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		face a fiscal cost. × Where the government devolved credits to pre-1900 forests, those forests would need to surrender credits on harvest, in future commitment periods. This could raise a number of fiscal and default risks for the government in future commitment cycles. × [redacted] Withhold under s9(2)(g)(i) and s6(e)(iv) × The technical, operational, fiscal and legal implications of any expansion of the ETS to privately-owned pre-1990 natural forests would be considerable. × The Flexible land use rule for pre-1990 planted forest owners would no longer be available in our international accounting, and if maintained in the ETS, could create fiscal liabilities for the Government at higher carbon prices (ie, when we might see greater uptake).
Potential domestic & stakeholder impacts	✓ Private owners of regenerating pre-1990 forests could potentially be able to earn credits and debits for these forests, if substantial investments were made to bring these forests into the ETS. ✓ Owners of pre-1990 planted forests (currently mostly a sink) could potentially receive significant credits for these forests over 2021-2030, provided they also took on future harvest liabilities (and the government was confident forest owners will be able to carry over units beyond 2030 to pay these liabilities).	× Carbon incentives for afforestation may diminish, as more credits would be issued to pre-existing forests than to new forests, reducing market demand for forestry units. × Providing credit for early (ie, pre-1990) action would be inconsistent with the treatment of other sectors under the ETS. × Pre-1990 forest owners would likely only be able to receive credits if they also took on harvest liabilities. As these forests are already established, it's likely that harvest liabilities would closely match any credits earned, unless harvest was avoided. At high carbon prices, the profitability of forest harvest would be diminished, as it would incur a carbon opportunity cost of not harvesting. × Increased supply of forestry credits could mean post-1989 forest owners would not receive as high a price for their units (but would need further analysis). × Land use flexibility for planted forests in NZ may be diminished at high carbon prices, as the FLU rule would no longer be available (because there would no longer be an option to account for the deforestation and replanting of a forest in a new location under a BAU reference level, as currently available under the ETS).

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		× Could create an equity issue with other emitters under the ETS, whose liabilities do not factor in pre-1990 'early action'.
Policy durability & certainty	✓	× Would represent a major departure from the ETS status quo, and the purpose of forest carbon incentives in NZ (ie, to encourage net increase in forest area). × Would put at risk the long-term value and fungibility of forest carbon over the long term. Could damage investment certainty in the future carbon values of current post-1989 forests. × The strong likelihood of a cap eventually being imposed on credits (or gross-net being ruled out entirely) would reduce the benefit of this approach for NZ and therefore its likely durability in future commitment periods. ×
Long-term mitigation signal	✓ If this approach were internationally durable, could incentivise the Government to impose stricter controls and harvest restrictions on planted production forests as well as privately-owned regenerating indigenous forest land.	× Could weaken the relative carbon price signal for new forest establishment in NZ, as the maintenance of existing, regenerating forest might earn equal carbon credits (either for the Government, of forest owners, if devolved). As a result, new forest establishment and management actions may be less strongly incentivised. ×
Strategy for effective global agreement	✓	× By fully pricing sustainable forest harvest, this approach undermines NZ's current international negotiation objectives for the land sector, which are to seek mitigation incentives that are environmentally effective but also cost-effective in the context of broader sustainable land management objectives, such as productive land use. × This approach would not promote the kind of cost-effective rules for land-based emissions that will be vital to secure developing country participation in future climate agreements, which would work for land-based economies, and would help to reduce competitiveness effects on NZ of implicit or explicit pricing of land-based emissions. × It would not support a direction of travel towards a common accounting approach for all Parties, as it would result in arbitrary outcomes for different countries based on national circumstances, and be impossibly expensive for large, forested developing countries such as Brazil, Indonesia and many African countries who are still experiencing high forest carbon losses. × If universally applied, this approach would discourage developing countries

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		from taking on quantified GHG targets.
SUM	✓ **= 14**	× **= 51**

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Assessment

This option performs poorly against all assessment objectives and criteria.

If the approach could be maintained in an uncapped form, and be both credible and durable internationally, then it would score highly in terms of its cost savings in emissions liabilities over 2021-2030.

In the absence of detailed accounting rules for the first commitment cycle under the new post-2020 agreement, it is possible that New Zealand could maintain its right to apply this approach, at least for its first commitment.

The likely international backlash against this low-integrity approach to forest crediting however could rebound on New Zealand either in the lead up to Paris, or in subsequent negotiations on future commitment period rules, with potentially greater costs on New Zealand than a continuation of the current Kyoto status quo option would have incurred. The greatest international risks are that New Zealand could be forced to apply net-net accounting to its forests (because this is the more appropriate accounting approach where legacy effects are incorporated – which would undermine full crediting for new forests), or that we incur an international backlash against developed countries having the right to claim BAU forest sinks towards their targets. This right is already contested, and is why BAU approaches – where no credits are rewarded without additional action – are regarded as having the greatest integrity for forests.

Domestically, the risks are even greater, as this approach would threaten our sustainable production forest industry, and all the benefits that brings, while reducing effective incentives for real mitigation actions, such as afforestation. Domestic ETS implementation would also be highly problematic.

For these reasons, this approach is not recommended for New Zealand's post-2020 forestry and land-use accounting.

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Option 9: UNFCCC based + Full carbon accounting (gross-net) of entire FOLU offset

Summary description

- This option applies full carbon accounting to net forestry and land use emissions and removals over 2021-2030, and the net effect is counted as an offset against the rest of the economy.
- In its effect on our international liabilities, this approach is very similar to the option described above, under Option 8 (Kyoto CP2 rules plus gross-net accounting of forest management, without a cap).
- The key differences under this approach are that it would:

- Be based on the GHG Inventory's land based categories (rather than Kyoto's activity-based approach), which include historical (backcasting) effects.
- As a result, would bring the carbon stored in historically harvested wood products (harvested and produced prior to 1990) into accounting.
- Would not automatically include the special Kyoto forestry and land use accounting rules and principle, such as additionality since the base year, caps, or the natural disturbance exclusion rule.
- Imply expanding accounting coverage to include other, non-forest land uses (such as grasslands or croplands) and potentially to all land use (100% of New Zealand. This would bring agricultural soils into accounting.

- Like the Kyoto full carbon accounting option described above (Option 8), this approach would capture the removals from the 10% of our natural indigenous forests – mostly on private land – that are regenerating as a result of management changes (such as the cessation of logging) prior to 1990.
- As described above, this approach would also apply full carbon accounting (or 'gross-net' accounting) to our pre-1990 planted forests. The growth of these forests comprise the majority of the removals captured under this approach over 2021-2030.
- A gross-net approach to our entire land sector would mean that New Zealand would face a full international emissions liability for all carbon stock changes on all lands, including from all harvest, even where the forest is replanted. It would not distinguish between temporary and permanent carbon effects, or between activities with greater or less co-benefits, in the way that business-as-usual reference levels are able to do, by factoring out BAU management.
- This approach would also impose a full liability for any soil carbon changes captured in the GHG Inventory, in the event that the LUCAS estimates are improved in future to capture soil carbon changes on managed lands that remain in the same land-use sub-category over time. At present, these areas comprise around 50% of New Zealand's total land area, and are reported as having zero carbon changes, which may not be accurate.
- Using current GHG Inventory estimates, however, New Zealand's total forestry and land use could be a large net sink towards accounting over 2021-30 (though declining thereafter) – if it can be assumed that not cap on credits would apply (as it does to the current Kyoto gross-net option). If an overall cap on forestry and land use credits were applied, this would severely limit the potential removals under this option.

Precedence/usage

- Applying a gross-net approach to the entire FOLU sector is a hypothetical accounting option. It has been included for completeness because it would deliver the greater level of overall removals. We are not aware of any country that has applied this approach to their international UNFCCC accounting to date.
- It could potentially be used by developing countries who wish to adopt a 'carbon neutrality' goal, and believe that all managed sinks are legitimate mitigation action towards the target.

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Rationale and 'negotiability'

- Some highly forested developing countries may argue that this option is the most appropriate accounting approach for 'net zero CO2' or carbon neutrality targets.
- Instead of looking backwards at changes relative to base years, it would measure whether the economy as a whole is carbon neutral right in the target year (or period). The accounting objective would be for absolute removals to exactly balance absolute emissions – making a country 'carbon neutral'.
- The rationale for the approach would be that the GHG Inventory is a legitimate measure of all anthropogenic emissions and removals across the entire economy, in all sectors.
- The potential problem with this approach is that it exploits a weakness in the GHG Inventory methodology – the 'managed land proxy' – to capture both naturally occurring and legacy effects towards accounting. The risk of the managed land proxy is that it can count part of the natural carbon cycle towards the meeting of commitments. As natural carbon fluxes vastly exceed anthropogenic emissions, any counting of them towards targets will reduce global mitigation.
- A stronger justification of this approach would be to claim that all of the accounted emissions and removals over the commitment period are anthropogenic in origin, even if they reflect historical management choices, and therefore should count towards targets. This could be reinforced by excluding removals resulting from recovering from previous natural disturbance effects.
- A remaining issue with the approach – as for the Kyoto-based full carbon accounting approach, is that it would still capture emissions and removals resulting from actions from before the base year. Any reductions under this approach would not be considered full additional, and would lack international credibility and environmental integrity.
- A further challenge under this approach is that all land-based sinks should in theory eventually reach carbon saturation – meaning they are no longer a sink, but a carbon reservoir – meaning that accounting would very gradually become more challenging and ambitious over time. But in theory it could be argued that this would be in keeping with the development of technologies and the gradual transformation of the economy towards a low-carbon state.

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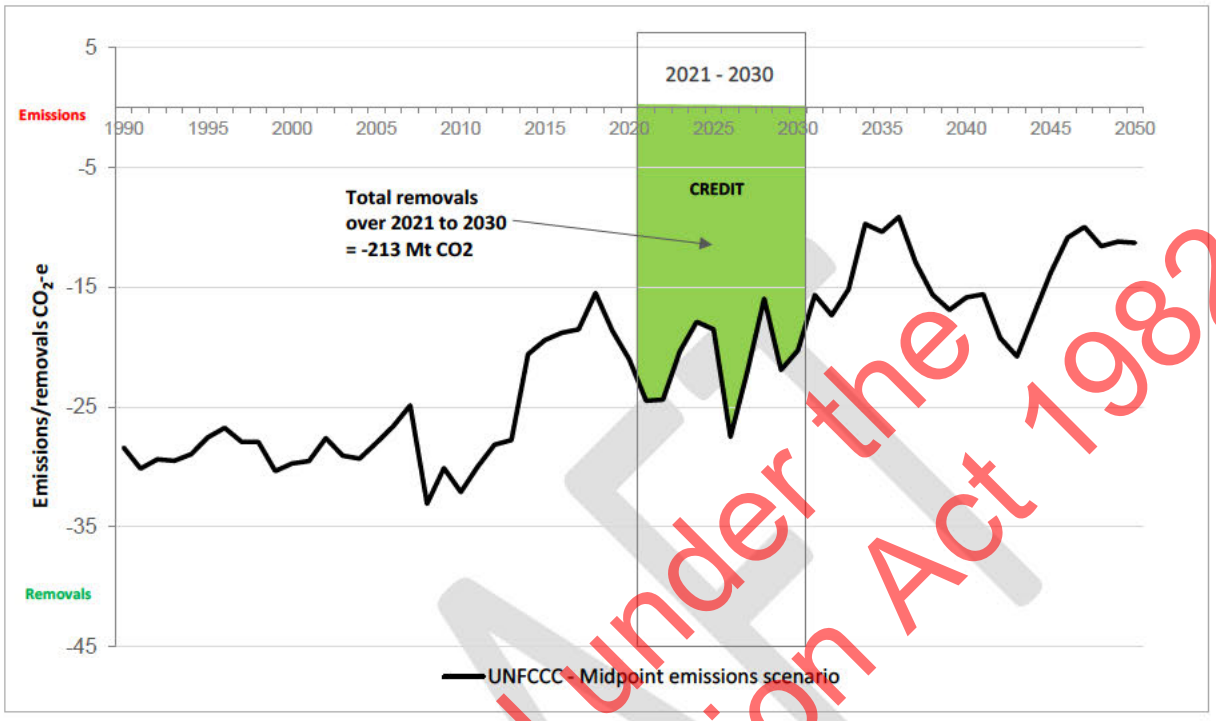
Illustration of emissions impact over 1990 – 2050

Figure: New Zealand's Projected Net Forestry & Land Use Emissions under the UNFCCC Full Carbon Accounting - Midpoint Scenario (HWP adjusted – Assumes no cap on credits)



Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical assumptions	Activity start year	Baseline
Forest land Cropland Grassland Wetlands Settlements Other land	Gross-net	• HWP approach • No cap on credits • Tier 1 steady state soil carbon default • Managed land proxy • No activity start year • Natural disturbance treatment	NA	0

Other relevant assumptions

- As per table above, and Option 6 (GHG Inventory-based net-net accounting).

Modelling results

Modelled emissions liability impact over CC1 and CC2

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UNFCCC Gross-net accounting over 2021-2030 (Mt CO_2) under Emissions Scenarios			
Scenario	**Low Emissions (Best case)**	**Midpoint**	**High Emissions (Worst case)**
	HWP treated as in 2013 NIR	Adjusted HWP to better reflect future harvest and products	Excluding exported roundwoods
UNFCCC Gross-Net	-388	-213	-95

Emissions impact relative to Kyoto CP2 Status Quo

UNFCCC Gross-net accounting over 2021-2030 (Mt CO_2) – Midpoint Scenario			
Commitment Period	**UNFCCC Net/Net relative to 1990**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	-106	5	-111
2026 -2030	-108	21	-129
Annual mean	-21	3	-24
Total 2021-2030	**-213**	**26**	**-239**

Commentary on liability impact

- This option provides the greatest potential net sink towards New Zealand's accounting over 2021-2030, of all the options considered.
- Credits under this approach would be vulnerable to any international decision that the total contribution of any forestry and land use sink towards a target should be capped. Such a cap currently applies to forest management accounting under Kyoto CP2 rules (set at 3.5% of 1990 national gross emissions per annum).

Technical issues to be resolved

- National estimates for pre-1990 natural forests may need to be improved if they are to pick up sub-national or area-based management effects.
- It would be important to resolve the uncertainty around HWP exported roundwood accounting.
- Gross-net accounting would likely increase the requirement for accurate national estimates of carbon stock changes across the entire landscape, including for agricultural soils.
- Uncertainty around whether New Zealand's agricultural soils will be determined under future Inventory improvements to be an overall net sink or a source of anthropogenic emissions, nationally, creates major uncertainty around the potential benefits and risks of this approach. MPI has a current external research contract on this, to be completed later this year.
- It may also recreate global pressure to improve the 'managed land proxy' used by GHG Inventories to exclude non-anthropogenic emissions and removals from accounting.

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ETS Implications

Departure from current settings

- If devolved to the ETS, this gross-net, land-based approach would be a total departure from the Kyoto Article 3.3 and 3.4 activity-based framework on which the ETS is based.
- In terms of potential impacts if international credits and debits were devolved under the ERTS, the impacts would be very similar to those for the Kyoto full carbon accounting options for forests (Option 8) – with the core difference being the slightly higher risks around retaining Kyoto forestry rules, and the inclusion of agricultural soils.
- It is assumed that the Kyoto-based activity 'framing' under the ETS (eg, afforestation, deforestation) would be maintained, even if these would be termed 'Land converted to forest' and 'Forest land converted to other land-uses' in our international accounting.

Potential ETS impacts if devolved

Current ETS provisions	Impact
Credit for registered post-1989 sinks	**Need not impact directly, but potential loss of market demand.** Post-1989 forests could retain their existing ability to earn credits; however, internationally, pre-1990 forests would also be earning credits for their existing levels of removals. If these pre-1990 credits were devolved to land owners, then post-1989 forest owners would face carbon market competition for the sale of their units, and may not receive the same price as otherwise. Perceived environmental integrity issues around pre-1990 forest units could also affect the demand for post-1989 forestry credits.
Deforestation liabilities for post-1989 forests	**No implied change.** However, as under all post-2020 scenarios where there is no carry over from pre-2020, the Government will start to face international liabilities for all post-1989 forest deforestation after 2020 (unlike in CP2), which will create a misalignment with current ETS settings.
Debits for harvest of registered post-1989 forest	**No implied change.**
No credits for pre-1990 forest management	**Major change.** Internationally, pre-1990 forests (both planted and natural) would become eligible for credits and debits for all carbon stock changes, including for temporary carbon stock changes associated with harvest and regrowth, and for regrowth of regenerating natural forest. If devolved, this would suggest pre-1990 forest owners would also be able to earn credits, and debits, for their forests that were already in existence in 1990. Credits would therefore potentially be awarded for the legacy effects of land use change decisions prior to 1990.
Compulsory liability for pre-1990 planted forest deforestation	**No implied change except FLU.** The FLU rule would no longer be available (because there would no longer be an option to account for deforestation and replanting in a new location under a BAU reference level).
Other land uses / Agricultural soils	**Potential major change.** If New Zealand expanded its international accounting to all land use in the GHG Inventory, this would bring agricultural soils into accounting, in the cropland and grassland Inventory categories. The gross-net approach would mean that New Zealand would be 100% liable for any anthropogenic soil carbon stock changes (compared with the net-net approach under Kyoto). If the Inventory captured significant soil emissions from these categories in future, these emissions could be devolved to under the ETS, and potentially be added to any agriculture liabilities.

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Key Pros & Cons against Criteria

Note:

- The pros and cons of this 'full carbon accounting' option, and the Kyot-0based version (Option 8) described above, are almost identical. Considerations which are unique to this option are highlighted in bold in the table below (ie, indicating where changes have been made to the assessment for Option 8).
- The specific pros and cons of expanded accounting coverage are considered under Option 6 (GHG Inventory-based net-net accounting), and are not considered here except where they touch on agricultural soils.

The pros and cons of a Kyoto activity-based versus GHG Inventory land-based framework are consider under the Accounting Form options (Option C), and in the assessment of the Kyoto versus land-based variations of the Land in Transition options (Options D.12-14), and are not repeated here.

Add in soils and HWP

Criteria	Pros	Cons
International expectations	✓ The approach could be used to support a 'net zero CO2'/carbon neutrality goal for NZ, under which 100% of emissions from other sectors are also accounted for (noting that land-based sinks eventually decline to zero on saturation). ✓	✓ **This theoretical approach has no international precedent.** × An uncapped gross-net full carbon accounting approach would attract significant international criticism, and lead to calls for a compulsory cap on credits (as under Kyoto in both CP1 and CP2), or a compulsory reversion to a straight GHG Inventory-based net-net approach without any special accounting rules (a much more expensive option for NZ). × NZ's achievement of its post-2020 target would not be comparable to other countries' efforts, and would need to be translated to a non-gross-net approach for accurate international comparisons. × NZ would be seen to be taking advantage of the greater flexibility around the INDC process to apply an approach which maximised credits, ignoring that a cap was considered necessary under Kyoto to address risks of crediting legacy removals from actions prior to the base year. × [redacted] Withhold under s9(2)(j), s6(a) and s9(2)(g)(i) × Use of this approach would be too costly for most developing countries, as it produces a large debit for countries whose forests are still a net source from

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		deforestation and degradation. This approach would therefore mostly only to be viable for developed countries, who have already converted their forests and/or can afford to get their wood supplies from elsewhere. This means its overall global effect would be to reduce developed country emission reductions, which would not show the expected first world leadership.
Environmental effectiveness & integrity	✓ This approach would fully debit all deforestation, and fully credit all new forest planting and management actions. (The strength of AR incentives though could be diminished, if there is an over-supply of low-quality forestry units.) ✓ New Zealand's international accounting for forests would strongly prioritise their mitigation role over the other social, environmental sustainability and economic functions of forests. ✓	× A gross-net approach to pre-existing forests would credit removals which would not be considered to result from additional action, because they would largely reflect management changes and **harvested wood products produced prior to 1990**. This goes against the environmental integrity principle that reductions should be additional, which NZ is promoting internationally as part of a 'rules-based' regime. × This approach would credit non-anthropogenic removals, because it would capture regeneration from natural disturbances from before 1990, which would occur in the absence of any human intervention. × This approach would credit non-permanent carbon stock increases from our pre-1990 planted forests, which are mostly in their peak growth period over 2021-2030. × If adopted universally, this approach would significantly reduce mitigation by developed countries (whose forests are mostly net sinks) (possibly in the order of about 10-20%), assuming targets are not altered. × This approach could have earned significant credits for almost all developed countries in CP2, but was not adopted by any [redacted] ×
Commitment is least cost	✓ Would significantly reduce the total cost of NZ's target over 2021-2030, by around 150 MT CO2-e, provided an international cap on credits was not imposed**, or other rules introduced, and NZ doesn't turn out to have net soil carbon losses from agricultural soils**	× Cost reductions will become smaller over time, as pre-1990 planted forests come back into their harvest cycle. × **Projected cost savings would be reduced it were found that NZ's agricultural soils were a net source of emissions, and the Inventory was updated to reflect this.** × By taking an 'absolute' approach to 100% of emission and removals in all forests **and land use**, this approach would appear to undermine the approach adopted for other sectors, where developed countries are liable only for their emissions above 1990 levels (minus their target), and instead supports the more costly argument that developed countries should take 100% responsibility for all of

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		their emissions from all sectors – not just forests (ie, the idea that rich countries have already used up 100% of their atmospheric allowance). ×
Risk and uncertainty	✓ Reducing the cost of NZ's post-2020 target through maximising credits from forestry could reduce the risk that the Government will later consider our Paris commitment too expensive to meet.	× Applying such a gross-net, **'maximum crediting'** approach could put at risk the continued use of forest sinks towards our target in future commitment cycles, which would increase the cost of future targets. × This approach could increase international calls (eg, by Greenpeace) that forests should no longer be allowed to offset fossil emissions, and be fungible towards national targets, put at risk NZ's long-term ability to use low cost domestic forestry abatement towards its target. × Credits under a gross-net, GHG Inventory-based accounting approach to all land would be highly uncertain due to the **high risk that international guidelines will be agreed after Paris for how countries should account using their GHG Inventory – as opposed to merely report. Such guidelines would likely introduce at least some, if not all, of the accounting principles that underpin Kyoto accounting, such as an activity start year (which would reduce forest and HWP removals) or a cap on credits.** × Any change to the natural forest **and agricultural soil carbon** inventory estimates would impact on predicted credits under this option, as would any change to legislation governing the management of harvest of privately owned regenerating natural forest (eg, to allow more sustainable harvest). × The uneven age-class of our pre-1990 planted forests, and expected cyclical harvest emissions, could create fiscal risks for the government across multiple commitment periods, depending on how carbon property rights and obligations are devolved.
Cost effective mitigation & fungibility	✓ NZ would be able to claim forestry removals, **including in the historical HWP pool**, towards our target that required no additional mitigation action or expenditure.	× This approach makes it more likely that NZ will one day lose the ability to count forests – a cost-effective source of domestic abatement – towards its targets. × **New Zealand could end up liable for significant soil carbon emissions under agricultural soils, for which it may have limited cost-effective abatement options in the near term.** × Perceived environmental integrity issues around pre-1990 forest units could affect the demand for and exportability of post-1989 forestry credits. × The potential for large quantities of low integrity 'hot air' credits could put at

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		risk our future ability to carry over any surplus units between commitment periods. × It could also prevent us from justifying the exclusion from our ETS of low integrity units from other countries, eg, on the basis that their units don't represent 'real and additional' reductions. ×
Co-benefits & manages trade-offs	✓ Biodiversity benefits could potentially arise as the NZ government would be additionally incentivised to protect privately-owned regenerating natural forest from deforestation or harvest (as it would be a source of credits under BAU). If devolved under the ETS, planted forest owners might also be incentivised not to harvest their forests, and eventually these could revert to non-harvested native forests. ✓ **Full accounting of agricultural soil carbon stock changes, if able to be captured in the Inventory on managed lands, could create strong incentives for better soil management.**	× If devolved, all sustainable forest harvest would face a carbon price. This could limit harvest at high carbon prices, reducing the supply of wood products and production forestry activity in NZ. × Prioritising the mitigation role of forests over sustainable timber production could have negative consequences for employment and broader social, environmental sustainability and economic co-benefits of NZ's production forests. × If faced with compulsory harvest liabilities under the ETS, planted forest owners would be incentivised not to harvest their forests, and instead just to allow them to become abandoned, permanent forests, reducing their social and economic benefits. × Any announcement of new government limits on the harvest or clearance of reverting natural bush on private land (which would limit credits under this option) could potentially create a perverse incentive for pre-emptive clearance of these lands, unless it was carefully managed. × Whereas only about 10% of NZ's indigenous forests are regenerating (and so earning credits under this approach), all sustainable harvest of indigenous forest in NZ would incur international liabilities. This means that currently allowed levels of sustainable harvest of indigenous forests would incur a liability cost to the government.
International reporting feasibility	✓ NZ's GHG Inventory now includes national estimates of natural forest emissions and removals, which would be able to be counted towards the target under this approach (if not future behavioural changes). ✓ Estimating the total (gross) carbon change from forest management in a localised area may be easier than estimating change relative	× NZ's international reporting would need significant further investment if it were to be capable of capturing management changes on sub-national, regional or project-based areas of pre-1990 forest, in a way that could capture carbon effects at a local level, support devolution to the ETS and incentivise behavioural change. × Improved estimates of emissions from harvest of privately-owned indigenous forest may be required to avoid over-estimating removals.

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	to BAU.	
ETS implementation feasibility	✓ The government could avoid ETS implementation impacts by not devolving pre-1990 forest credits and debits under the ETS, but instead keeping these credits to offset emissions from other sectors. (This would leave the government paying the bill for pre-1990 harvest in the 2030s.)	× This approach would be very costly to devolve to the ETS, and yet might be required to avoid accusations that the Government is 'nationalising' private carbon benefits. × Additional complexity would arise from bringing in both pre-1990 planted as well as indigenous forests into the ETS, as natural forests will have less uniform carbon growth profiles. (This would also arise under other options where pre-1990 forests could come into the ETS, but with likely much lower uptake rates.) × Any credits devolved for regenerating natural forest on private land may need to be matched by compulsory liabilities for harvest or any management changes which reduced carbon sequestration. Whereas only about 10% of NZ's indigenous forests are regenerating (and so earning credits under this approach), all sustainable harvest of indigenous forest in NZ would need to incur ETS liabilities. (Is not clear whether these two areas are the same.). × Providing credits to private owners of natural forest suggests that the deforestation liability should also be extended to them, [redacted] Withhold under s(2)(g)(i) and s6(e)(iv) × If the government were to devolve credits for pre-1990 forest growth, this suggests it would also need to devolve liabilities for all pre-1990 harvest, or else face a fiscal cost. × Where the government devolved credits to pre-1900 forests, those forests would need to surrender credits on harvest, in future commitment periods. This could raise a number of fiscal and default risks for the government in future commitment cycles. × If owners of pre-1990 natural forest owners were to have the ability to earn credits, [redacted] Withhold under s(2)(g)(i) and s6(e)(iv) × The technical, operational, fiscal and legal implications of any expansion of the ETS to privately-owned pre-1990 natural forests would be considerable. × The Flexible land use rule for pre-1990 planted forest owners would no longer be available in our international accounting, and if maintained in the ETS, could

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		create fiscal liabilities for the Government at higher carbon prices (ie, when we might see greater uptake).
Potential domestic & stakeholder impacts	✓ Private owners of regenerating pre-1990 forests could potentially be able to earn credits and debits for these forests, if substantial investments were made to bring these forests into the ETS. ✓ Owners of pre-1990 planted forests (currently mostly a sink) could potentially receive significant credits for these forests over 2021-2030, provided they also took on future harvest liabilities (and the government was confident forest owners will be able to carry over units beyond 2030 to pay these liabilities).	× Carbon incentives for afforestation may diminish, as more credits would be issued to pre-existing forests than to new forests, reducing market demand for forestry units. × Providing credit for early (ie, pre-1990) action would be inconsistent with the treatment of other sectors under the ETS. × Pre-1990 forest owners would likely only be able to receive credits if they also took on harvest liabilities. As these forests are already established, it's likely that harvest liabilities would closely match any credits earned, unless harvest was avoided. At high carbon prices, the profitability of forest harvest would be diminished, as it would incur a carbon opportunity cost of not harvesting. × Increased supply of forestry credits could mean post-1989 forest owners would not receive as high a price for their units (but would need further analysis). × Land use flexibility for planted forests in NZ may be diminished at high carbon prices, as the FLU rule would no longer be available (because there would no longer be an option to account for the deforestation and replanting of a forest in a new location under a BAU reference level, as currently available under the ETS). × Could create an equity issue with other emitters under the ETS, whose liabilities do not factor in pre-1990 'early action'.
Policy durability & certainty	✓	× Would represent a major departure from the ETS status quo, and the purpose of forest carbon incentives in NZ (ie, to encourage net increase in forest area). × Would put at risk the long-term value and fungibility of forest carbon over the long term. Could damage investment certainty in the future carbon values of current post-1989 forests. × The strong likelihood of a cap eventually being imposed on credits (or gross-net being ruled out entirely) would reduce the benefit of this approach for NZ and therefore its likely durability in future commitment periods. ×
Long-term mitigation signal	✓ If this approach were internationally durable, could incentivise the Government to impose stricter controls and harvest restrictions on	× Could weaken the relative carbon price signal for new forest establishment in NZ, as the maintenance of existing, regenerating forest might earn equal carbon credits (either for the Government, of forest owners, if devolved). As a result,

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	planted production forests as well as privately-owned regenerating indigenous forest land.	new forest establishment and management actions may be less strongly incentivised. ×
Strategy for effective global agreement	✓	× By fully pricing sustainable forest harvest, this approach undermines NZ's current international negotiation objectives for the land sector, which are to seek mitigation incentives that are environmentally effective but also cost-effective in the context of broader sustainable land management objectives, such as productive land use. × This approach would not promote the kind of cost-effective rules for land-based emissions that will be vital to secure developing country participation in future climate agreements, which would work for land-based economies, and would help to reduce competitiveness effects on NZ of implicit or explicit pricing of land-based emissions. × It would not support a direction of travel towards a common accounting approach for all Parties, as it would result in arbitrary outcomes for different countries based on national circumstances, and be impossibly expensive for large, forested developing countries such as Brazil, Indonesia and many African countries who are still experiencing high forest carbon losses. × If universally applied, this approach would discourage developing countries from taking on quantified GHG targets.
SUM	✓ **= 14**	× **= 54**

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Assessment

- This theoretically possible accounting approach treats all reported carbon stock changes on land as eligible mitigation for accounting purposes.
- By using gross-net accounting to claim all net forestry and land use removals towards the target, crediting under this approach makes no distinction between reductions resulting from new, anthropogenic actions, and those resulting from the dynamic effects of differing age-class structures across forests resulting from past activities and practices, as well as natural disturbances. In New Zealand's case, this approach would capture the regeneration of natural forests logged or disturbed before 1990.
- It would also include within accounting a large residual pool of historical harvested wood products – including for example carbon stored in roundwoods exported overseas since 1900.
- This weakening of the 'additionality' principle of accounting lowers the overall environmental integrity of the approach, and increases the chances that either a cap will be applied, or that forest offsets in general will lose international credibility, fungibility and legitimacy. The approach also risks counting some portion of natural carbon fluxes towards the achievement of the target. If applied globally, such an approach would reduce the total emission reductions achieved under national contributions.
- The projected large net credit for New Zealand under this approach would be highly vulnerable to any change in the Inventory's reported estimates for land use emissions – particularly on natural forests and agricultural soils – as well as to the development on any international accounting guidance on how countries should account after 2020, where they choose to base this on the GHG Inventory. There is currently no such guidance, [redacted] it is likely there will be seen to be a need for it.

Withhold under s9(2)(j), s6(a) and s9(2)(g)(i)

- It would be reasonable to assume that any future guidance for Inventory-based accounting would expect Parties to respect the basic integrity principles that reductions should be real, additional, permanent, anthropogenic, and verifiable. (It was to address these issues that the Kyoto activity-based approach and specialised rules were developed in the first place). If accounting rules are agreed under the new agreement, it is possible that a cap on credits would be applied to gross-net accounting of forest management in particular, as a high risk area for 'hot air' credits.
- The domestic implications of this approach could be severe, as well as very complex. As well as placing a full carbon price on sustainable forest harvest, the gross-net approach to the entire FOLU sector risks that an international cap would also apply to the entire sector - which could reduce the credits afforded to new actions, such as afforestation. This would reduce the strength of incentives under this option for new actions, and make it costly for the Government to devolve full and unlimited credits for AR under the ETS.
- Even worse, an international backlash against this approach could risk all countries being required to adopt a simple, 'no rules' GHG Inventory-based approach – which would imply net-net accounting against the base year. This would disadvantage New Zealand more than almost all other developed countries, because of our unique forestry emissions profile, where removals peaked in 1990.
- Overall, however, the key concern with this approach is not the risks and uncertainty around future credits and liabilities; it's the fact that accounting would no longer reflect or fully incentivise mitigation efforts.

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- For these reasons, this approach is not considered likely to be an effective accounting approach for New Zealand over the long term, nor or a durable one unless it was internationally endorsed and adopted by other developed countries. Despite the significant cost savings it offers towards any national target, it is not recommended for New Zealand's future forestry and land use accounting after 2020.

BAU Reference Level Options

Option 10: Simple BAU Reference Level Approach to all Forestry & Land Use/AFOLU

Summary description

- Under this option, a BAU reference level applies to the entire FOLU offset sector, covering all land-uses/activities, so that the net expected debits and credits over 2021-2030 is zero in the absence of additional actions or policies since the policy base year. This approach does not provide full credits for afforestation, or full debits for deforestation – only changes relative to BAU levels under current policies incur debits or credits.

Rationale

- The rationale for this approach is that, given the potential scale and uncertainty of land sector emissions and removals, and concerns around the additionality of forest offsets counted towards targets, only mitigation over BAU levels would be counted towards targets.
- This would avoid any risk of hot air credits, and be seen by some as ensuring high environmental integrity.
- This would have the effect of putting all countries on the same footing, as all historical, legacy and BAU effects would be factored out.

Precedence/usage

- Theoretical option that has been canvassed in the international LULUCF literature, and the informal land sector dialogues. Is likely that we will see some developing country INDCs adopt reference level approaches to any forestry and other land use activities included, but these would be more likely based on historical averages.

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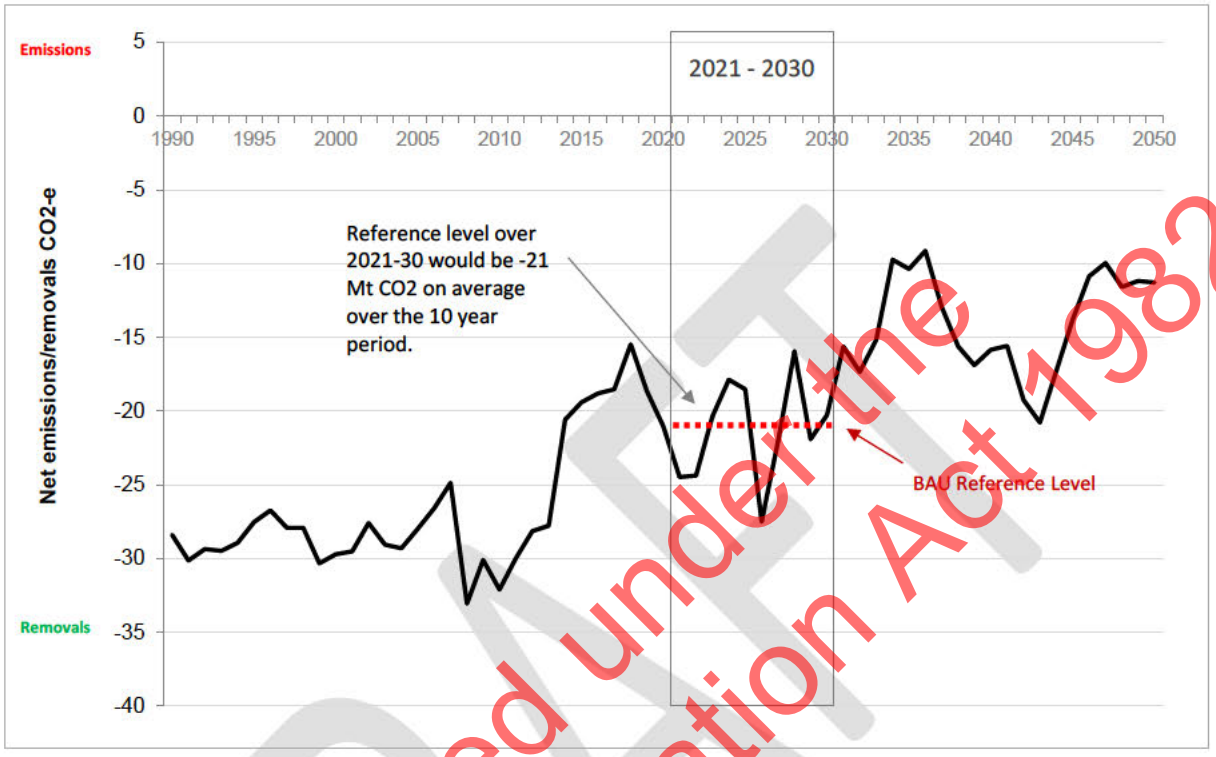
Illustration of emissions impact over 1990 – 2050

Figure 24: New Zealand's Projected Net Forestry & Land Use Emissions under Simple BAU Reference Level Approach & Offset approach - UNFCCC midpoint scenario



Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Activity start year	Baseline
Forest land	BAU Reference Level	Policy Base Year (2009)	BAU projection
Cropland			
Grassland			
Wetlands			
Settlements			
Other land			

Other relevant assumptions

- This approach could also be applied on an activity-based approach, as with REDD+.
- Assumes that land-use conversions would only be debited/crediting relative to BAU conversion rates.

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Modelling results

Modelled emissions liability impact over CC1 and CC2

Simple BAU Reference Level Approach to Entire FOLU/Land sector over 2021-2030 (Mt CO_2)			
Option	**Low Emissions**	**Mid-point**	**High Emissions**
Simple BAU Reference Level	0	0	0

Emissions impact relative to Kyoto CP2 Status Quo

Simple BAU Reference Level Approach over 2021-2030 (Mt CO_2)			
Commitment Period	**Simple BAU Reference Level**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	0	5	-5
2026 -2030	0	21	-21
Annual mean	0	3	-3
Total 2021-2030	0	26	-26

Commentary on liability impact

- A simple BAU Reference Level approach to all forestry and land-use accounting would produce an expectation of zero credits and zero debits, assuming accurate predictions of future emissions based on current policies.

Technical issues to be resolved

- There is no IPVV guidance on how to apply a BAU reference level to the entire FOLU or land sector, so there would be a variety of technical issues to address. These should not affect the underlying principle, that no net debits of credits should be anticipated under BAU.

ETS Implications

Departure from current settings

- If devolved to the ETS, this approach would x [TO BE COMPLETED]

Potential ETS impacts if devolved

Current ETS provisions	Impact
Credit for registered post-1989 sinks	[TO BE COMPLETED]
Debits for harvest of registered post-1989 forest	

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No credits for pre-1990 forest management	
Compulsory liability for pre-1990 planted forest deforestation	
Other land use	

Key Pros & Cons against Criteria

Note to Reviewers: The following table will be completed if there is sufficient interest in this option to warrant a detailed analysis. The table template however has been provided for any specific comments by reviewers on this option against the assessment criteria.

Criteria	Pros	Cons
International expectations	✓	×
Environmental effectiveness & integrity	✓	×
Commitment is least cost	✓	×
Risk and uncertainty	✓	×
Cost effective mitigation & fungibility	✓	×
Co-benefits & manages trade-offs	✓	×
International reporting feasibility	✓	×
ETS implementation feasibility	✓	×
Potential domestic & stakeholder impacts	✓	×
Policy durability & certainty	✓	×
Long-term	✓	×

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mitigation signal		
Strategy for effective global agreement	✓	×
SUM	✓	×

Option 11: Net-Net Reference Level Approach to the Land Sector ('Full carbon stocks accounting') – Expected net emissions & removals added to carbon budget

Summary Description

- This approach would include projected BAU net FOLU/AFOLU emissions and removals over 2021-2030 within the carbon budget (or base year emissions for accounting purposes). Only changes relative to BAU levels would incur debits or credits. The approach provides full accounting recognition of net sinks (on a gross-net basis) towards a carbon neutrality target (e.g., to be 'carbon neutral by 2050'), but imposes a strong additionality requirement on any actual tradable units issued for land sector mitigation. This target form would affect the total quantum of emission reductions implied by any given headline target (as it expands base year emissions).

Rationale

- This hypothetical approach would also support carbon neutrality targets, by recognising the entire land use sink towards the target, but avoids the risk of generating excessive offset units.

Origins/usage:

- This approach was proposed by [redacted] at the Sep 2014 Informal Land Sector Dialogue, as a possible NDC option for high forest developing countries such as [redacted] who wish to recognise their entire forest sink, but in a higher integrity manner which won't lead to excess hot air units.

Withhold under section s9(2)(ba)

Withhold under s9(2)(j), s6(a) and s9(2)(g)(i)

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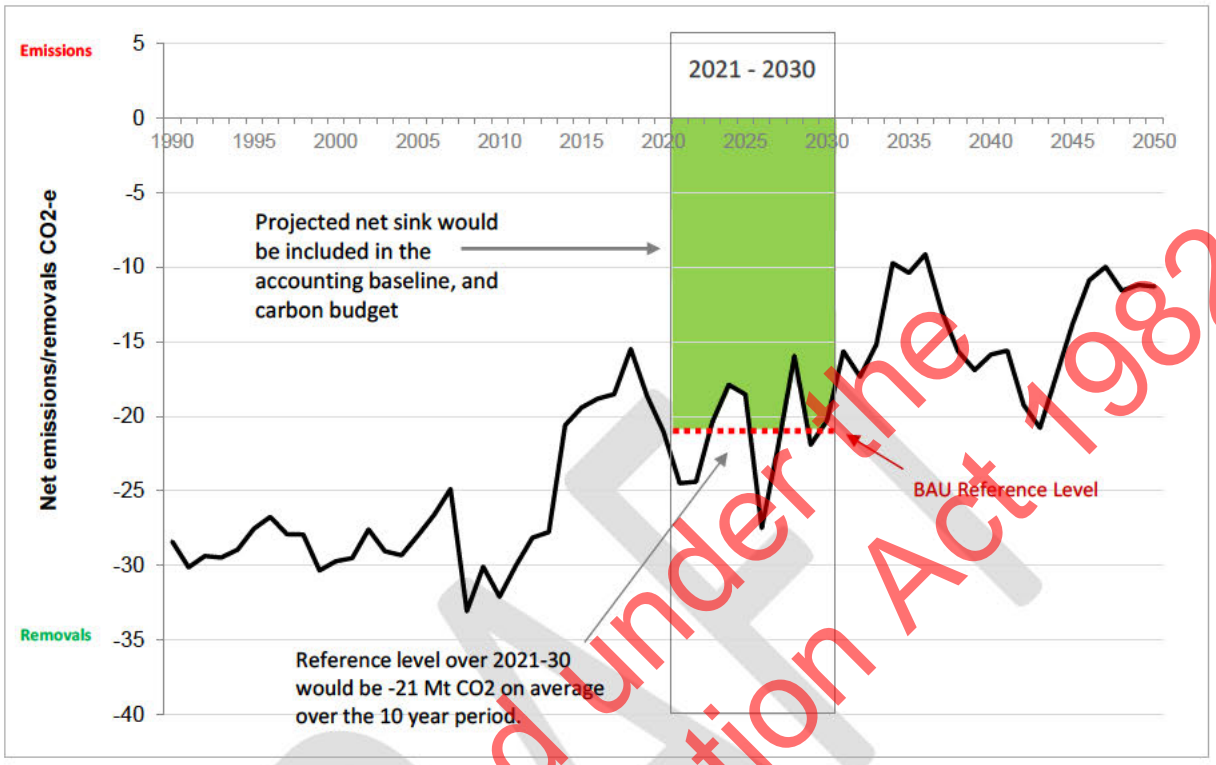
Illustration of Emissions impact of 2021-2050

Figure 25: New Zealand's Projected Net Forestry & Land Use Emissions under Net-Net BAU Reference Level Approach - UNFCCC midpoint scenario



Assessment

- **This option will be assess further if there is sufficient interest in this option to warrant a detailed analysis.**

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Land Use Transitions to BAU Reference Levels[9] ('International Averaging')

157 A more effective accounting approach to forests and land use would retain the strong incentives created under Kyoto for new and additional action, while continuing to minimise liabilities for BAU land management, depending on how new actions are differentiated from normal BAU activity. This could significantly reduce New Zealand's forestry and land use emissions – and potentially deliver a net sink over 2021-2030.

Introduction to land use transitions concept

158 The development of the BAU Reference levels accounting approach developed under Kyoto had important functionalities which offer multiple benefits for managing land sector emissions:

159 The analysis of Reference Level options above (Options 10 and 11) shows that a simple BAU Reference Level approach to all forestry and land-use accounting would produce an expectation of zero credits and zero debits, assuming accurate predictions of future emissions based on current policies.

160 Compared with both the Kyoto CP2 and the GHG inventory-based *status quo* options, the application of a simple BAU reference level to the entire forestry and land use sector offers advantages for:

- **Including the land sector** within the quantified target, while minimising international accounting liabilities
- **Factoring out** emissions and removals due to historical and legacy effects
- **Creating more cost-effective mitigation incentives** for productive land use, by rewarding improvements against business-as-usual (BAU)
- **Recognise multiple objectives**, such as sustainable forest management, and food production, as different land management practices, such as flexible land use
- **Avoiding creating arbitrary winners and losers** through the 'base year lottery effect' – recognising that the land sector has different implications for different Parties (e.g., a net source for some, a net sink for others, often with different trajectories)
- Establishing a **simple, uniform forestry and land use accounting system** that could be applied to all countries, regardless of their national circumstances, emissions profile or unique forest characteristics.

161 A simple BAU reference level approach is not optimal for New Zealand, however, because it would produce weak incentives for new mitigation actions, by only crediting future actions such as new afforestation if these occurred at rates higher than projected under current, business as usual projections.

162 This is a similar problem as under the straightforward 'GHG Inventory-based accounting' approach. As a consequence of the Inventory's 'relativistic' crediting and debiting approach, New Zealand's forests (and broader land use, if covered), would be expected to generate zero net debits or credits over 2021-2030.

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[9] I.e., introduce land use transitions between categories at the long-term average to differentiate new from existing activities (LUC & project) and policies, and enable extension of reference levels to all existing BAU activity.

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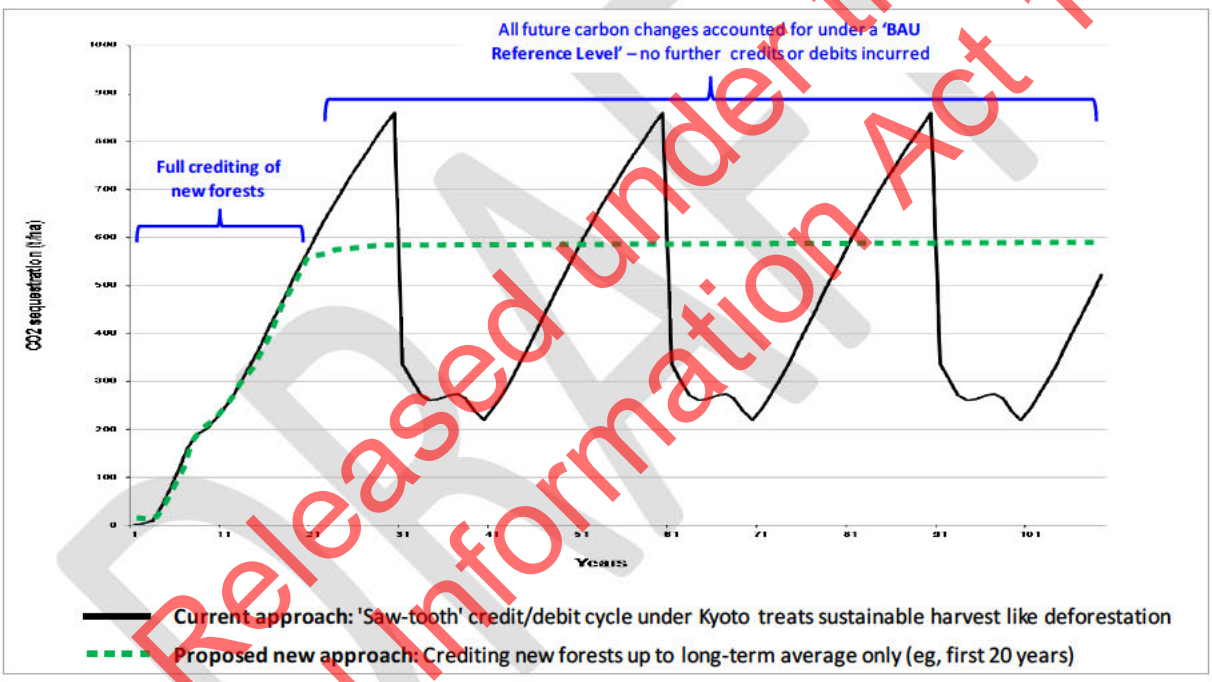
A more effective reference level approach – learning from 'Averaging'

163 A more effective accounting approach to forests and land use would retain the strong incentives created under Kyoto for new and additional action, while continuing to minimise liabilities for BAU land management, depending on how new actions are differentiated from normal BAU activity. This approach would fully credit/debit new actions (e.g., land-use conversions), but once that action's effects are accounted for, the normal management of that land (e.g., sustainable forest harvest) would be transferred to and accounted for under a BAU reference level.

164 This accounting approach would be similar to the forest crediting concept of 'averaging', where credits are only achieved up until the average carbon stock for a forest stand, after which no further credits or debits are incurred provided BAU management practices are maintained.

Figure 26: Averaging – An Optimal Accounting Design?



Implementing the principle of 'averaging' in our international accounting

165 The principle behind 'averaging' – crediting new actions up to the average only – can be used to improve upon the design of simple BAU reference levels, by introducing an accounting distinction between 'new' activities such as new forest planting, and 'existing' activities such as sustainable forest management and harvest.

166 The modified approach would fully credit 'new' activities such as afforestation (for example, up until the long-term average carbon stock), and then transfer this land to the 'existing' category, where all sustainable harvest emissions would be accounted for under a BAU Reference Level. , instead of the only pre-1990 harvest emissions, as at present.

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167 Land transfers could be achieved by introducing land-use transitions between accounting categories. Instead of land remaining permanently under Article 3.3 gross-net accounting, afforestation/reforestation land would transfer the mature forest 'Forest Management' category after a set period of time.

168 This more dynamic distinction between 'new' and 'existing' activities (not rigidly based on 1990) approach would effectively extend the current Kyoto use of BAU reference levels to encompass all existing or mature forests, rather than only the current pre-1990 forests under Article 3.4 as at presently under Kyoto.

169 This effect of this approach would be to provide full credits for the first new forest planting, but no liabilities thereafter so long as the forest is replanted and maintains business-as-usual carbon stocks. This approach would still maintain incentives for reducing emissions from existing forest management, however, as any new mitigation actions would still be eligible to earn credits under the BAU reference level. The Key difference though is that New Zealand would not incur an accounting cost for the normal sustainable management and harvest of its forests.

Emissions liabilities under 'Land in Transition' approach over 1990-2050

Figure 27: New Zealand's projected emissions liabilities from 'Land in transition' approach (crediting new forests up to average carbon stock (20 years) under Emissions Scenarios

170 The graph shows that the effect of the Land in Transition approach is to smooth out the highs and lows of accounting liabilities over time – reflecting the averaging approach combined with land-use transitions of land to BAU reference level accounting at its roll-over point.

171 Under this approach, forestry and land use can either be a net sink of a source, depending on the level of new mitigation action, and external factors such as the carbon price and government incentive schemes.

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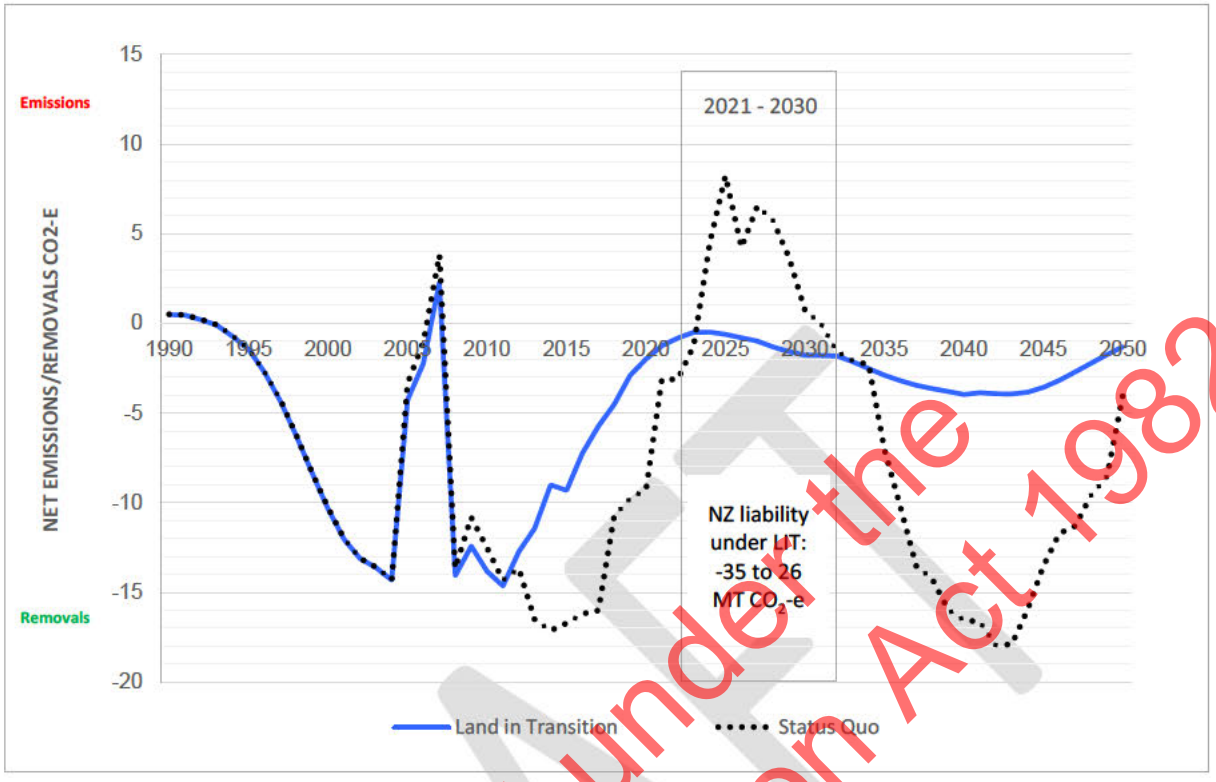
Figure 28: New Zealand's projected emissions liabilities from 'Land in transition' approach (crediting new forests up to average carbon stock (20 years) Compared with Kyoto Status Quo – Midpoint scenario



172 This graph shows the effect of the Land in Transition approach (based on a 20 year roll-over point), compared with the Kyoto CP2 status quo – producing a savings of about 36 MT CO2-e over 2021-30 (see modelling results below).

173 A less conservative modelling of land in Transition would also take into account the effects of HWP accounting, and the possible extension of the FLU rules under this option to all mature forest. Under this scenario, modelling a transition point of 28 years may produce a more realistic projection of future liabilities – shown in the graph below.

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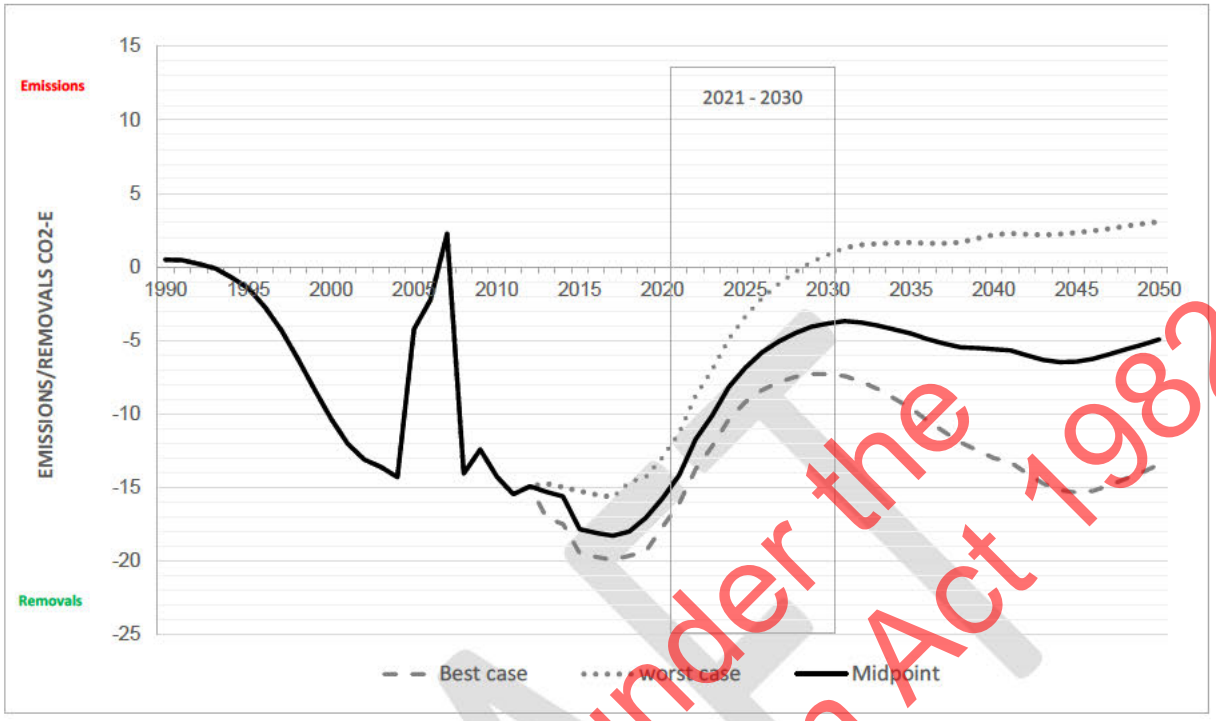
Figure 29: New Zealand's projected emissions liabilities from 'Land in transition' approach (crediting new forests up to average carbon stock (28 years) under Emissions Scenarios



174 Under a 28 year roll-over point, Land in Transition provides greater savings against the Status Quo – closer to 100 MT CO2-e additional removals over 2021-2030 (midpoint scenario).

Modelling results for 'Land in Transition' options

Modelled emissions liability impact over CC1 and CC2

Land in Transition over 2021-2030 (Mt CO_2)			
Options:	**Low Emissions**	**Mid-point**	**High Emissions**
20 year transition	-35	-10	26
28 year transition	-100	-74	-38

Emissions impact relative to Kyoto CP2 Status Quo

Land in Transition over 2021-2030 (Mt CO_2) – Midpoint Projection			
Commitment Period	**Land in Transition (20 years)**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	-4	5	-9
2026 -2030	-6	21	-27

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Annual mean	-1	3	-4
Total 2021-2030	**-10**	**26**	**-36**

Commentary on liability impact

- This approach could potentially deliver New Zealand a moderate net sink of approximately -10 MT (-35 to 26 MT) CO2, based on conservative projections which exclude the benefits of HWP and extended FLU.
- Taking the contribution of HWP and FLU into account, the potential sink under Land in Transition could be much larger, and closer to that achieved from crediting up to 28 years – around -74 MT CO2-e (-110 to -38).

Technical Challenges and Uncertainties

- A number of technical sub-options are possible under the Land in transition approach, which would need to be analysed and resolved. These are identified in greater detail under the chapter on 'Further work'.
- Several major uncertainties in the modelling of Land in transition mean that the modelled estimates may be quite conservative (show fewer removals). These include that:
    - The inclusion of HWP within the 'average' carbon stock could extend the effective crediting of forests from the modelled period of 20 years, to something closer to 26 years. This would mean that the Land in transition approach would provide removals on the first rotation that are similar to under Kyoto (at about 28 years).
    - By extending the classification of Forest Management to include not just pre-1990 forests, but all mature, fully grown forests (regardless of when established), the LIT approach has the potential to exclude the benefits of the FLU rule to mature post-1989 plantation forests. This would reduce deforestation liabilities from post-1989 forests under the LIT approach, particularly at higher carbon prices.

Options to deliver 'Land in Transition'

175 A more effective accounting approach to forests and land use would retain the strong incentives created under Kyoto for new and additional action, while continuing to minimise liabilities for BAU land management, depending on how new actions are differentiated from normal BAU activity. This could significantly reduce New Zealand's forestry and land use emissions – and potentially deliver a net sink over 2021-2030.

176 Three different accounting frameworks could be used implement the modified approach. The common element between all of them is that they all **introduce land use transitions to BAU reference levels** to distinguish new forest planting from normal sustainable forest management. The three 'Land in transition' options are:

- **Kyoto activity-based:** Introduce 'land use transitions' from Article 3.3 to Article 3.4 category at the point of carbon equilibrium (or long-term average carbon stock) –

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providing full crediting for new forests, but allowing all mature forests (and their sustainable forest) to be accounted for under a BAU reference level.

- **GHG Inventory/land-based:** Use land-based GHG Inventory reporting as a base for accounting but apply Kyoto accounting principles, including reference levels to all 'Forest land' as at 1990 [or other base year] (i.e., to all of the areas in the 'Land converted to forest' and 'Forest remaining forest' categories as at 31 December 1989). This would achieve the same crediting outcome as the Kyoto option above. BAU RLs could also potentially be extended to other 'land remaining land' categories as well.
- **Reference level approach to all forests/entire land sector:** The same approach as above, but 'packaged' as an overall 'Reference level' approach (a bit like REDD+). Apply a single reference level to all forests or lands (and potentially to Agriculture as well), where only new activity relative to BAU (defined by a specific policy base year) is credited or debited – with the same outcomes as above.

177 If we decide to pursue a modified approach, a key decision is whether to stick with the existing Kyoto framework, move to the more universal UNFCCC framework as the basis for its accounting, or package the entire approach as a 'reference level' in common with REDD+.

178 These three 'Land in transition' options are similar in their emissions liability effect, but score differently on other criteria. They have therefore been assessed individually below.

Option 11: Kyoto-based 'Land in transition option: Kyoto CP2 activity-based + Land use transitions from Article 3.3 to 3.4

Summary description

- The Kyoto, activity-based version of the 'Land in transition' approach would introduce a modification to current CP2 rules to introduce 'land-use transitions' from Article 3.3 to Article 3.4 categories at a certain point in time (e.g., after 20 years, at steady state, or long-term average carbon stock).
- The effect of this would be to extend reference levels to cover all BAU management activities – including 'forest management' of Article 3.3 AR land (i.e., mature post-1989 forests) – while retaining full crediting for new afforestation/reforestation.
- While the technical rule change would be quite small, it would be a significant conceptual change to the existing Kyoto hierarchy between Article 3.3 and 3.4, and the principle that once land has been classed as Article 3.3, it must remain accounted for under Article 3.3 for all time.
- The introduction of the ability for land to transition from the 'new land use change' category of Article 3.3, to the 'existing land management' Article 3.4 category, also suggests that deforested land could transition to another category, once it reaches steady state. For example, once forest land converted to grazing land has been under constant management as grazing land for 20 year, the 'land use transition' approach suggests that this land would leave the Article 3.3 deforestation category and shift to the Grazing Land Management category (whether or not it has been elected).
- The permanent classification of land as 'deforested' under Kyoto is an important organising principle for the Kyoto LULUCF accounting approach. The introduction of land

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use transitions from Article 3.3 to 3.4 which removed this permanence of D classification could be seen by some as a major change to the Kyoto approach. It would nonetheless be important for accounting under this approach to maintain symmetry between accounting for Afforestation/reforestation and the replanting of deforested lands, to ensure these are both incentivised in the same way.

Rationale and 'negotiability'

- The rationale for this option would be to retain the Kyoto accounting approach in as many respects as possible after 2020, and only change what is needed to address one particular issue – the fixed 1990 definition of what is 'new' (and therefore subject to gross-net accounting) and what is existing (and therefore under a BAU reference level).
- The intention of this option would be to retain the Kyoto principle of treating new and existing activities differently, and its focus on incentivising new actions relative to BAU. The only functional change would be to introduce a more 'dynamic' definition of 'new' actions – to prevent these actions being classed as 'new' forever, and to instead use the full crediting and debiting incentives of gross-net accounting for genuinely new actions only.
- This would mean in our international accounting that only newly planted forests would count towards our target in any given commitment cycle, rather than the re-crediting of existing (post-base year) forests on their second and subsequent rotations. This could be seen as more effectively implementing the environmental integrity principle of 'additionality'.
- The use of land-use transitions to implement 'averaging' in our international accounting – i.e., to credit first rotation forests up to the long-term average carbon stock only, and then largely factor out subsequent harvest and re-growth cycles under a BAU reference level so long as they preserve this average – would also ensure that accounting credits more closely reflect 'permanent' sequestration – another important integrity principle that New Zealand is advocating for internationally.
- While this option would comprise only relatively limited technical changes to the current CP2 forestry rules, it may be less 'winnable' in the negotiations than an entirely new 'land in transition' approach based on simply applying Kyoto principles to GHG Inventory reporting, because it would involve making a change to the current, very detailed and strict Kyoto rules, as set out formally in the IPCC 2013 KP Supplement. It is also uncertain how much international appetite there is to continue the Kyoto accounting approach after 2020, or re-litigate its rules if it remains a little-used accounting option.

Emissions impact over 1990 – 2050

- [See under the general introductory section above on the overall 'Land in transition' approach. All three 'Land in transition' options have the same approximate liability effect and so have been modelled together.]

Precedence/usage

- Theoretical option, to fix a flaw in the Kyoto approach. No precedent or pathway yet for modifying Kyoto CP2 rules, as no Kyoto CP3 is expected, though the idea has been presented by MPI at Informal Land Sector Dialogues.

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Accounting coverage and approach

Land use/activity	Accounting approach	Critical assumptions	Activity start year	Baseline
Afforestation/reforestation	Gross-net up until average carbon stock	AR direct-human-induced requirements HWP	1990	0
Deforestation	Gross-net	FLU	1990	0
Forest management	BAU reference level	FMRL Cap on credits only	2009 policy base year	BAU projection over 2021-2030
If more comprehensive accounting adopted:				
Cropland management	BAU reference level	Tier 1 steady state default	2009 policy base year	BAU projection over 2021-2030
Grazing land management				
Wetlands drainage and rewetting				

Other relevant assumptions

- Default assumption is that 1990 remains the activity start date for land use conversions.
- Assumed that all other CP2 LULUCF accounting rules would apply, as set out in the IPCC 2013 KP Supplement (except those changed by the 'Land in transition' approach). However, we might prefer to apply no caps on Forest Management credits, as the unsymmetrical cap approach of the current CP2 rules is a disincentive to high mitigation.
- The CP1 rule of ARDC would not apply.

Technical challenges and Uncertainties

- A number of technical sub-options are possible under the Land in transition approach. These are discussed in detail under the chapter on 'Further work'.

Modelling results

- [See under the general introductory section above on the overall 'Land in transition' approach. All three 'Land in transition' options have the same approximate liability effect and so have been modelled together.]

ETS Implications

Potential ETS changes if devolved

Current ETS provisions	Implied ETS changes

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Credit for registered post-1989 sinks	**Modified ETS status quo, to introduce 'averaging'.** New forest establishment would continue to be eligible for credits, but only up to the long-term average carbon stock, and for plantation forests, only on the first rotation. This means that forests would continue to be eligible for the same amount of credits overall (i.e., as would be received over multiple rotations), but would only receive the net amount over that period on the first rotation. No credits would be able to be earned on future rotations, unless new management practices changed the average carbon stock – see under 'pre-1990 forest management'.
Debits for harvest of registered post-1989 forest	**Significant change – harvest debits no longer incurred for ETS participants in 'Averaging' approach.** Averaging could be either an option, or compulsory for ETS participants. ETS participants in Averaging would no longer be required to pay back the credits they had earned when they harvest their forests. Post-1989 forest owners pre-dating the Averaging approach, who received credits over-and-above the average and who are still in the ETS, may either need to still pay their full harvest liability on harvest, or pay the excess back the excess credits in order to enter the averaging scheme and avoid any future harvest debits.
No credits for pre-1990 forest management	**Implied change to ETS status quo.** Current ETS settings are based on NZ's CP1 approach (when FM was not elected). Under NZ's CP2 approach, FM is accounted under a BAU RL and nationally, no significant debits or credits are expected. Under the Status Quo option, if FM accounting were devolved to the ETS, forest owners could be eligible to earn credits or debits for changes in forest management emissions relative to a stand-specific definition of 'BAU'. Under the 'Land in transition approach, the definition of 'Forest management' – the current 'pre-1990 forest' category under the ETS – would need to be expanded to include post-1989 forests which have reached 'maturity' (e.g., their long term average carbon stock). As the government would be liable for any changes relative to BAU emissions and removals for these forests, it follows that any 'Forest management' forest owner who had been a participant of Averaging and who later changed their forest management practices in a way that altered the long-term average carbon stock of their forests should either (a) become a compulsory ETS participant again for any debits against the long-term average, or (b) become a voluntary participant for any credits.
Compulsory liability for pre-1990 planted forest deforestation	**Potential significant change to ETS status quo.** Under either the Kyoto status quo or LIT approaches, there is potential fiscal misalignment after 2020 (see under Kyoto CP2 Status Quo (Option D.3) for a more detail). [redacted] Withhold under s9(2)(g)(i) and s6(e)(iv) [redacted] Withhold under s9(2)(j), s9(2)(g)(i) and s6(e)(iv)
Flexible land use rule	**Potential change to ETS status quo.** Under the 'Land in transition' approach, it would be logical to extend the application of the FLU rule to all fully-grown, mature plantation forests, to support land-use flexibility. This would be a change from the existing Kyoto CP2 rule, which only applies to pre-1990 plantations.
Other land use	**Continues status quo** – no credits/debits for other land use activities.

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Feasibility of ETS Implementation

- This option is likely to be feasible to devolve to the ETS, as in its impact on stakeholders it resembles the averaging approach that has been previously examined as an ETS option, and supported by some forestry stakeholders, including the FOA.
- Unlike the previously considered averaging option, which was recommended by the 2011 ETS Review but not implemented by the Government, this option entails additional changes – the inclusion of forest management under the ETS to ensure the long-term average is maintained – which would manage the fiscal risks on the Crown.

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Key Pros & Cons against Criteria – Kyoto-based option of Land in Transition

Criteria	Pros	Cons
International expectations	✓ 'Builds on' an existing agreed international accounting approach. ✓ Should gain increasing environmental credibility over the long term, as it becomes clear that only new actions are credited, and only once.	× Implements a higher-integrity forestry and land-use approach after 2020, but if not well understood then might be perceived as changing the CP2 rules to suits ourselves. Having to deal with not having carryover from CP2 might also be seen as our own fault. × May not meet expectations that developed countries progress towards a more comprehensive 'land-based' approach after 2020, particularly if no elective Article 3.4 activities are included. *[This could be addressed by expanding the accounting coverage of this option.]*
Environmental effectiveness & integrity	✓ Strong additionality standards and likely full crediting/debiting for AR & D. Avoids re-crediting the same forest over and over again. Has very high integrity compared to other accounting treatments. ✓ Crediting up to the long-term average means forestry crediting better reflects permanently stored carbon. ✓ Activity-based approach focuses on human effects. *[Same as status quo.]* ✓ Uses existing IPCC approaches and guidance more closely than a land-based version of Land in transition, which could enhance transparency and review.	× Accounting coverage is limited to forest and forest conversions (i.e., deforestation). *[This could be addressed by expanding the accounting coverage of this option.]*
Commitment is least cost	✓ Avoids potential high cost of UNFCCC net-net accounting approaches which compare against 1990, when our forestry removals were higher. *[Same as status quo.]* ✓ Avoids the high liability costs on New Zealand over the 2020s under CP2 rules, which debit the harvest of our fast growing forests, and penalise us for the inability to carry over surplus achievement from pre-2021. ✓ Avoids the high liability costs on NZ under CP2 rules due to our high rates of new forest planting between 1990 and the start of the first crediting period (CP1), exacerbated by the discontinuation of the ARDC rule.	× Shifting to an averaging approach potentially reduces total forestry credits for NZ over the 2040s (though most of these would need to be paid back later, on harvest) –– assuming that 1990 continues to be the base year and eligible activity start date for commitment beyond 1990. × Does not credit regeneration of natural forests resulting from new management after 1990 but prior to 2009 RL policy base year.

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	✓ Can still incorporate useful Kyoto rules that limit inappropriate emissions – such as Flexible Land-use and Natural Disturbance.	
Risk and uncertainty	✓ Potential debits and credits from all mature, fully grown forests (not just pre-1990 forests) are limited to departures from BAU. ✓ Natural disturbance provisions limit the potential liabilities from *force majeure* events in forests. *[Same as status quo.]* ✓ The Crown would no longer have to carry the fiscal risk of the forest growth & harvest crediting and debiting cycles being misaligned with the commitment crediting periods, combined with uncertainty around future rules on carry-over. ✓ Avoids NZ banking on the assumption that, even though we pay a large debit over the 2020s and 2030s for our post-1989 forests under Kyoto CP2 rules, in the 2040s we will again accrue a large credit for these same forests. By 2040, it is quite possible that the 1990 start year will be abandoned as too old, and our early 1990s planting boom would no longer earn credits for us in the 1990s. ✓ If devolved to the ETS, much reduced risk to Crown (relative to status quo) that post-1989 foresters will default on their harvest liabilities after 2020 under high carbon prices.	× Future international rules negotiations create some risks and uncertainties for all accounting options, however, these risks are potentially higher for approaches which are either not (1) pure Kyoto CP2 or (2) a pure, no-rules GHG Inventory based approach – such as this option, which modifies the CP2 rules. × It could be difficult to accurately predict the average carbon stock of a forest in advance, without knowing its final harvest age. *[This could be addressed through a number of options for crediting up to the average, including spreading it out over 28 years, and/or including the average carbon storage in the HWP pool.]* × Without carryover of international units from pre-2020, Crown will continue to face a fiscal risk from deforestation liabilities for post-1989 deforestation after 2020. *[Same as CP2 status quo.]* × Potential debits under the FMRL are unlimited, but credits are currently capped. [redacted] Withhold under s9(2)(j) and s9(2)(g)(i) × Some potential for accidental credits/debits from incorrectly projecting the BAU FMRL, but less than if account against base year. *[Same as CP2 status quo.]*
Cost effective mitigation & fungibility	✓ Fully crediting only the first rotation of new forests (and subsequent rotations over-and-above the average only) will help to ensure that accounting incentivises genuinely new afforestation and new management, ensuring the most emissions reductions for any given quantify of units issued. ✓ Shifting to the Land in transition approach would ensure that future high-carbon prices would not prevent NZ from sustainably harvesting its post-1989 planted production forests (as could occur under the Kyoto CP2 approach of fully debiting harvest) – particularly on second and subsequent rotations of post-1989 forest. ✓ Only the most material categories are included – forest and forest conversions. *[This could change if we expanded the accounting coverage of this option.]* ✓ Net removals under this Kyoto-based version of land in transition	× If international market access is limited to only those countries which adopt one of the currently available accounting approaches (pure Kyoto CP2 rules, GHG-based accounting), then a modified Kyoto approach (to implement Land in transition) could conceivably put at risk market access eligibility. However, such an international rule would also lock in the current two-track commitment approach of Kyoto and would not support an effective global agreement (as no developing country would agree to the pure CP2 rules, and so would not take on binding commitments) so if this risk applied then is possible NZ would not ratify – nullifying the risk. × Mitigation opportunities in agricultural soils are not captured or incentivised. *[Same as CP2 status quo. This could be addressed by expanding the accounting coverage of this option.]*

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	should remain eligible mitigation towards our commitment, if the legitimacy of the removals is based on the environmental integrity of the accounting approach. ✓ Exportability and fungibility of NZ units in international carbon markets should be retained under this Kyoto-based version of Land in transition, if the eligibility of units is based on the environmental integrity of the accounting approach. However, the functioning of market mechanisms after 2020 is unclear.	
Co-benefits & manages trade-offs	✓ Extending a BAU reference level to all fully-grown forest (not just pre-1990 forests) allows sustainable harvesting of planted production forests without penalty, and removes the perverse accounting incentive under CP2 rules to reduce the sustainable sourcing of renewable fibre and fuel from post-1989 forests. ✓ Continued application of the Kyoto CP2 FLU rule (potentially to all mature plantation forests) would allow the same, and potentially enhanced, level of land-use flexibility for plantation forests that exists under Kyoto. ✓ Option for all deforestation to remain fully debited, consistent with supporting biodiversity values of extant natural forest. *[Same as status quo.]* ✓ Modifying the pure Kyoto CP2 rules creates scope to make other changes to better recognise values, e.g., biodiversity (e.g., through tree weed exemptions), or forest permanence (non-harvest) or protection status (through differentiated baselines, or a uniform activity start date for land use change and management).	× [redacted] Withhold under s9(2)(j) × A modified Kyoto CP2 rule framework (as applied under this option) could potentially open up other CP2 accounting rules and principles for negotiation, which could potentially put at risk the FLU rules for use after 2020, if countries opposed it being included as part of a new all-Party rule set. × Limiting land use accounting to forests and deforestation only may not incentivise more sustainable pasture management practices. *[Same as CP2 status quo – could be addressed through expanding accounting coverage.]*
International reporting feasibility	✓ Existing activity-based approach is continued. ✓ Existing coverage is continued and not expanded. ✓ LUCAS is still developing its capacity to account against a Forest Management Reference Level, which starts from the 2015 inventory submission. Enhancements needed for a LIT approaches could be incorporated into the ongoing work to implement FMRL accounting.	× New approaches and methodologies may need to be developed for crediting up to a long-term average, or equivalent 'land-use transition' point. *[Note, a variety of low-cost proxies for the average may be applicable at a national reporting level.]* × New system requirements may increase operational costs for LUCAS. × Carbon stock changes due to forest management effects, accounted for under a BAU RL under both the Kyoto and LIT approaches, are difficult and costly to measure and verify. × Reporting approaches under Land in transition may also need to capture activities which alter the long-term average of forests – especially if ETS

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		alignment is required.
ETS implementation feasibility	✓ Existing activity-based approach, on which the ETS forestry settings are based, continues. *[Same as status quo.]* ✓ A simply proxy for averaging may be possible: for example, just crediting up to 26 years, instead of the current 28, may be sufficient to implement both averaging and HWP changes. ✓ Operational costs around harvest returns, and managing defaults, could be much lower.	× Land in Transition represents a change from the ETS status quo, and if devolved would likely require legislative and regulatory changes, as well as substantial analytical work and stakeholder consultation. *[Note, a variety of low-cost proxies for the average could be applicable under the ETS, and would likely build on improvements needed potentially in any case to implement HWP effects in yield tables.]* × New operational costs would arise from implementing voluntary/compulsory forest management crediting/liabilities (respectively). *[Though these might arise from implementing the CP2 FMRL in any case.]* × Any system change would decrease understanding of the ETS and create transaction costs for stakeholders to learn the new rules. × Potential for increase in fiscal misalignment between international and ETS deforestation liabilities under any post-2020 framework which does not recognise NZ's pre-2020 surplus. *[Same as CP2 status quo.]*
Potential domestic & stakeholder impacts	✓ International accounting continues to provide full credits and incentives for new afforestation on the first rotation or establishment of new forest, up to the same net amount of credits that would have been earned for the entire rotation or life cycle of the forest (once harvest liabilities are taken into account) – so this could continue to be devolved under the ETS. Does not diminish the core carbon profitability of new AR, as most of the carbon benefit is earned on the first rotation in any case. ✓ No units would need to be surrendered on harvest, which could significantly reduce risks for ETS participants, and could potentially stem the tide of forest owners who are leaving the ETS in order to buy their way out of future harvest liabilities while the price is low and manage the risk of a future higher carbon price on their harvest liabilities at a later date. ✓ Forest owners (or the Government) who decide to establish permanent, non-harvested forests (e.g., new planting on DoC land or under a trust) could potentially earn credits for a long time (e.g., 200-400 years for native to reach long-term average). ✓ Potential opportunity to extend the FLU rule to fully-grown post-1989	× May not give quite as many credits upfront for new afforestation, on the first rotation, as under the current status quo (e.g., might only be credited for 20 years rather than 28), even though the total net amount of credits would be the same. × Could impact negatively on post-1989 forest owners currently in the ETS (or who plan to join), who are currently banking on a net positive balance of units over their second and subsequent rotations, once harvest liabilities are taken into account, because they: (1) have already accumulated sufficient NZUs to meet their harvest liabilities in the 2020s or 30s, (2) are anticipating earning credits from their second rotation from around the late 2020s onwards, and (3) anticipate that they will sufficiently change their management practices/rotation length/harvest intentions on the second rotation, *such that* they would earn materially more credits over the 2030-40s than they would need to pay back on harvest in around 2050-60. Few forest owners would likely meet these criteria. × [redacted] Withhold under s9(2)(g)(i)

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	forests, depending on international rules. ✓ Activities to enhance existing forest carbon stocks, including pre-1990 indigenous forests, would continue to be eligible for international credits, and could potentially be devolved to ETS participants. *[Same as status quo.]* ✓ Low risk that land owners would face liabilities for other land uses or agricultural soils under the ETS. *[Same as status quo.]*	[redacted]
Policy durability & certainty	✓ Not clear if the Kyoto approach will be internationally durable beyond CP2. Improving it may make it more durable over the long term. ✓ Changing the high-risk, cyclical crediting/debiting approach of Kyoto to AR may help to support greater participation in the ETS over the long-term.	× May reduce policy certainty in the near term, by introducing further changes after 2020 to the current international Kyoto framework for forestry accounting (beyond those that are pending already for the CP2 period), and the ETS settings on which they're based. However, it is expected that the changes would be largely supported by forest stakeholders, if devolved.
Long-term mitigation signal	✓ Creates incentives on the Government to continuously maintain and enhance the existing area and current carbon stocks of New Zealand forests over the long-term.	× Does not incentivise carbon management across entire landscape. *[Same as CP2 status quo – could be addressed through broader accounting coverage.]*
Strategy for effective global agreement	✓ Puts into practice and promotes many of our international negotiation objectives for global forestry accounting, which is that it should reward new actions and avoid arbitrary or windfall ('hot air') outcomes. ✓ Could be a somewhat more acceptable common accounting approach for all Parties – though less so than the land or reference level-based versions of the 'Land in transition' approach.	×
SUM	✓ **= 41**	× **= 27**

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Assessment of Kyoto-based option of 'Land in transition'

- Overall, the Kyoto activity-based version of the 'Land in transition' approach scores more highly than the Kyoto Status quo option in the assessment of pros and cons.
- The Kyoto activity-based version of the 'Land in transition' approach would have the advantage over other Land in transition options in that it would continue to use the existing Kyoto-based activity-based framework, on which the LUCAS and ETS systems are based.
- Continuing to apply the Kyoto activity-based approach after 2020 would also help to ensure that Kyoto's successful accounting provisions and CP2 rules continue to apply to New Zealand's FOLU accounting in future.
- An advantage of the Land in Transition approach is that the Crown would no longer have to carry the fiscal risk of the forest growth & harvest crediting and debiting cycles being misaligned with the commitment crediting periods, combined with uncertainty around future rules on carry-over.
- Adopting an improved/modified version of the Kyoto CP2 approach, which has been corrected to allow for land use transitions and make it more suitable for other countries (including developing countries) with fast growing forests could potentially help to make the Kyoto approach a more suitable candidate for a common FOLU accounting framework for all Parties (though the high deforestation liabilities under Kyoto would continue to be a barrier).
- However, equally, continuing to use the Kyoto framework (still based on a 'LULUCF' understanding of the land sector) may impede New Zealand's efforts elsewhere to introduce a more effective approach globally to the land sector as a whole – including for agriculture. The land-based version of LIT has the advantage that it could be more easily extended to the AFOLU sector – the basis for GHG Inventory reporting from 2015.

Option 12: Land in Transition Land-based option: UNFCCC land-based accounting[10] with in-built transitions + Kyoto CP2 rules including BAU Reference Levels

Summary description

- This 'Land in transition' option is based on the GHG Inventory land-based reporting framework. The key change it makes to a pure, Inventory based-accounting approach is not to introduce land-use transitions (like to Kyoto version) – as these already exist in Inventory reporting – but instead, to introduce Kyoto accounting principles.
- Specifically, the approach would combine the existing UNFCCC Inventory 'land-use roll over' function with the Kyoto CP2 principles of (1) accounting for land use change differently to land management, (2) applying gross-net accounting to new mitigation activities, such as land-use change (i.e., the 'Land converted to' categories), and (3) applying BAU reference levels to land management (i.e., the 'Land remaining land' categories).

[10] Note, UNFCCC land-based reporting already includes automatic transitions of land, from the 'land converted to' category to the 'land remaining land' category.

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- This would have the effect of applying two different accounting treatments to forests depending on whether they are newly established (in a state of conversion to a new land use) or in an existing land use (a land remaining land category).
- Business-as-usual reference levels would be applied to all fully-grown mature forests, which would minimise liabilities for sustainable harvest – recognising that it is carbon neutral in the long-term.
- Full, gross-net carbon accounting would be applied to new forests – creating incentives for new afforestation/reforestation while smoothing or averaging out fluctuations due to tree growth and harvest.
- As with all of the land it transition options, this approach rewards the long term average carbon stored from planting a new forest without incurring future liabilities from harvesting.
- The other Kyoto CP2 forestry rules and useful principles would also be applied, under this 'hybrid' Inventory/Kyoto principles based approach.

Rationale and 'negotiability'

- The rationale for this approach is that the GHG Inventory provides a better common platform for a common accounting approach for all parties after 2020, under the new agreement, which is more realistic, cost-effective and politically achievable than trying to get developing countries to agree to accounting using the Kyoto accounting approach.
- A GHG Inventory based approach is favoured by developed countries who:
    - Never signed up to Kyoto [redacted]
    - Think it might be a simpler, higher-integrity and more comprehensive framework for all Parties [redacted],
    - Benefit from net-net accounting against a historical base year because of their high deforestation emissions in the past [redacted], or who
    - Do not need or agree with all of the Kyoto forestry rules, but will likely retain and apply the specific provisions they need to their GHG Inventory-based accounting after 2020 ([redacted] – most likely the natural disturbance and reference level provisions.

Withhold under s9(2)(j), s6(a) and 9(2)(g)(i)

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Withhold under s9(2)(j), s6(a) and 9(2)(g)(i)

- Developing country interest in land sector accounting is mostly limited to REDD+ reference level accounting, which is activity rather than land based. However, a core focus of the MRV (GHG reporting) negotiations between all Parties is to encourage developing countries to commit to more regular GHG Inventory reporting obligations, similar to those for developed countries, and to this end, the GHG Inventory based approach to forestry and land use accounting might be seen as the more obvious basis for future accounting.
- The rationale for New Zealand to adopt the land-based option of the 'Land in transition' approach includes that it could be signalled, 'won' and implemented in our INDC accounting under the very simple description of "applying Kyoto principles to the GHG Inventory". [redacted] the land based version of LIT may be the easiest to achieve in the negotiations – compared to trying to change a specific Kyoto CP2 rule under the Kyoto-based version.

Withhold under s9(2)(j), s6(a) and 9(2)(g)(i)

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- There are also genuine reasons why New Zealand might prefer to shift to land-based accounting after 2020:
    - It is based on the common MRV framework for all Parties, and therefore may encourage developing countries to account for the land sector under quantified GHG targets.
    - It would likely involve more comprehensive accounting coverage (potentially 100% of New Zealand's area), which is seen by many as having higher environmental integrity.
    - It already has, in-built, the core concept of the 'Land in transition' approach, which recognises that land use is dynamic over time, and which offers to create more effective accounting incentives than the rigid Kyoto system, based permanently on 1990.

Emissions impact over 1990 – 2050

- [See under the general introductory section above on the overall 'Land in transition' approach. All three 'Land in transition' options have the same approximate liability effect and so have been modelled together.]

Precedence/usage

- There are several international examples applying Kyoto accounting principles to UNFCCC land based reporting: Canada's current 2020 target accounting, the EU and US post-2020 INDCs (applying Kyoto principles to either a land or an activity-based approach), and multiple references in the current draft Paris Agreement to applying existing provisions to more comprehensive (i.e., land based) approaches. These examples lack sufficient technical detail to either corroborate or contradict the proposed approach described here.

Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical assumptions	Activity start year	Baseline
Land converted to forest – up until roll-over/average	Gross-net	AR direct-human-induced requirements HWP	1990	0
Forest converted to other land uses since 1990 – up until roll-over/average	Gross-net	FLU	1990	0
Forest remaining forest	BAU Reference Level	Activity start year is the policy base year, not 1990 No cap?	2009 policy base year	BAU projection over 2021-2030
Other land uses in conversion (if elected) – up until roll-over/average	Gross-net		1990	0

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Other land remaining land (if elected)	BAU Reference Level / Net-net	No cap?	Policy base year / NA if net-net	BAU projection over 2021-2030, or 1990 levels

Other relevant assumptions

- We have assumed that 1990 remains the activity start date for land use conversions which are eligible to earn credits. This is primarily because it is an important Kyoto additionality principle, that only actions since the base year (or policy base year) should be credited or debited.
- However, GHG Inventories do not have activity start years, but report emissions from 1990 taking into account all relevant historical activity that are still impacting on emissions and removals in 1990 (referred to as backcasting). If the 1990 activity start year did not apply under this approach, a long-term averaging approach would potentially bring into accounting additional areas of AR land established before 1990 – particularly if this was non-harvested or indigenous forest, and had not yet reached its long term average. This effect has not been modelled, but could be explored under future work.
- Either existing coverage could be maintained, or other/all land uses could be elected.
- [redacted] Withhold under s9(2)(j), s6(a) and 9(2)(g)(i)
- A net-net approach could potentially be applied to other land uses, as 1990 levels can be argued to be a reasonable 'BAU' baseline for management effects on non-forest land use categories which are less prone to cyclical emissions effects.

Technical challenges

- A number of technical sub-options are possible under the Land in transition approach. These are discussed in detail under the chapter on 'Further work'.

Modelling results

- [See under the general introductory section above on the overall 'Land in transition' approach. All three 'Land in transition' options have the same approximate liability effect and so have been modelled together.]

ETS Implications

Key changes under this 'Land in transition' option, compared with the Kyoto option

- International accounting would use the 'land based' categories of GHG Inventory AFOLU reporting, instead of the Kyoto activity based categories which reflected in the ETS. This means that whereas our international accounting would use the term 'Land converted to forest', the ETS would use 'Afforestation/reforestation'. This could be confusing for some, but would not necessarily require any change to the ETS which could continue to use the Kyoto activities.

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- Any decision to dispense with the Kyoto 1990 eligibility start date for land use change activities, or the 2009 policy base year for forest management activities over-and-above BAU, in our international accounting, and instead adopt the rolling baseline approach of GHG Inventories, could have a significant effect on ETS settings if devolved – mainly by expanding the definition of eligible AR land.

Potential ETS changes if devolved

- [For a summary of the implied ETS changes under the 'Land in transition' approach, see under the Kyoto-based option, above. Only changes relative to the Kyoto option of 'Land in transition are shown in the table below.]

Current ETS provisions	Implied ETS changes – Compared with Kyoto 'Land in transition' option
ETS terminology	**No ETS change required, but terms would differ from international accounting.** International accounting would use the 'land based' categories of GHG Inventory AFOLU reporting, instead of the Kyoto activity based categories which reflected in the ETS. This means that whereas our international accounting would use the term 'Land converted to forest', the ETS would use 'Afforestation/reforestation'. This could be confusing for some, but would not necessarily require any change to the ETS which could continue to use the Kyoto activities.
Credit for registered post-1989 sinks	**Potential expansion in eligibility if no international activity start year.** Any decision to dispense with the Kyoto 1990 eligibility start date for land use change activities in our international accounting, and instead adopt the rolling baseline approach of GHG Inventories, could have a significant effect on ETS settings if devolved – mainly by expanding the definition of eligible AR land.
No credits for pre-1990 forest management	**Potential minor expansion in eligibility if no international activity start year.** Any decision to dispense with the Kyoto 2009 policy base year for forest management activities over-and-above BAU in our international accounting, and instead adopt the rolling baseline approach of GHG Inventories, could have an effect on ETS settings if devolved – potentially by expanding the definition of eligible FM land subject to 'new' management activity.
Other land use	**Potential change to status quo** – land use change and management activities on all other land uses could potentially become eligible for ETS credits or/or liabilities. In practice, it would likely be difficult to measure and verify management effects of emissions and removals, and the effects might not be sufficiently material to warrant the costs of inclusion in the ETS.

Feasibility of ETS Implementation

- This option is feasible to devolve to the ETS, but less so than the Kyoto-based version of 'Land in transition'.

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Core Differences between Land and Kyoto-based versions

Table: Pros and Cons of Land-based version of Land in Transition *compared with* the Kyoto version

PROS of Land-based Version – *Relative to Kyoto Version of LIT*	**CONS of Land-based Version** – *Relative to Kyoto Version of LIT*
✓ Is likely to be more 'winnable' in the negotiations, and require very little to be said in the INDC description, as many other developed countries have indicated they support what they see as a self-evident right to apply Kyoto accounting principles to Inventory-based accounting.	× Implements a higher-integrity forestry and land-use approach after 2020, but not all countries may agree with applying the same Kyoto LULUCF accounting 'principles' to Inventory-based accounting that we do.
✓ The land-based version of 'Land in Transition' does not require an 'averaging' approach to be applied in forest crediting, because UNFCCC reporting already contains an in-built land-use transitions at either 20 years (default) or a country-specific period (28 years for NZ). Therefore, the land-based LIT option should be relatively easily and simply achieved in the negotiations through a high-level decision that Kyoto accounting principles can be applied to UNFCCC Inventory-based accounting. In the current negotiations (May 2015), this endorsement seems likely.	× Discarding the activity-based approach of Kyoto, which focuses on human effects, may lead to more non-anthropogenic emissions being included in accounting. × Would draw less closely on existing IPCC guidance and rules than a Kyoto-based version of Land in transition, which could reduce its perceived transparency and reviewability.
✓ Not clear if the Kyoto approach will be internationally durable beyond CP2. Adopting a new approach that combines the best features of both Kyoto and the GHG Inventory may provide a more durable approach over the long term.	× Under the land-based version, it may be slightly less certain that we could carry across the existing CP2 forestry rules to our post-2020 accounting (such as the natural disturbance provisions which limit the potential liabilities from *force majeure* events in forests), compared with the modified Kyoto version of LIT [redacted]
✓ A shift to a land-based approach internationally would not need to be devolved to the ETS, which could continue to operation on an activity basis.	× If international market access is limited to only those countries which adopt one of the currently existing accounting approaches (pure Kyoto CP2 rules, GHG-based accounting), then a new accounting could conceivably put at risk market access eligibility – and this risk could be slightly higher for a land-based version of LIT.
✓ Under a land-based approach to 'Land in transition, where the broad 'principles' of Kyoto are applied to land-based categories (rather than the exact rules), it may be easier to secure international agreement to	× Departs from the NZ's existing activity-based approach, so new

Withhold under s9(2)(j), s6(a) and 9(2)(g)(i)

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PROS of Land-based Version – *Relative to Kyoto Version of LIT*	**CONS of Land-based Version** – *Relative to Kyoto Version of LIT*
the extension of the FLU rule to all fully-grown, mature plantation forests, rather than just to pre-1990 plantations, as is the case under the existing Kyoto CP2 rules. This may mean the land-based version would better support land-use flexibility. ✓ The land-based version would build on LUCAS's current land-based reporting for the UNFCCC Inventory. A less-costly, proxy approach to averaging may be possible under this option, using the existing in-built transitions at 20 and 28 years. ✓ Meets expectations that developed countries progress towards a more comprehensive 'land-based' approach after 2020, particularly if additional land-use categories are included.	international reporting and accounting formats would be required. × The land-based option of LIT departs more from the current activity-based approach to international accounting than the Kyoto-based version of LIT, on which the ETS forestry settings are based, which may create some additional complexity for aligning ETS and LUCAS reporting. × Any system change would decrease understanding of the ETS and create transaction costs for stakeholders to learn the new rules.
✓ **= 7**	× **= 8**

Key Pros & Cons against Criteria – Land based version of Land in Transition

Criteria	Pros – *Land based version of Land in Transition*	Cons – *Land based version of Land in Transition*
International expectations	✓ 'Builds on' and combines two existing international reporting and accounting frameworks – Kyoto and the GHG Inventory. ✓ Should gain increasing environmental credibility over the long term, as it becomes clear that only new actions are credited, and only once. ✓ Meet expectations that developed countries progress towards a more comprehensive 'land-based' approach after 2020, particularly if additional land-use categories are included. ✓ Is likely to be highly 'winnable' in the negotiations, and require very	× Implements a higher-integrity forestry and land-use approach after 2020, but the effects of this are unlikely to be well understood, and might be perceived as changing the CP2 rules to suits ourselves. Not all countries may agree with applying the same Kyoto LULUCF accounting 'principles' to Inventory-based accounting that we do.

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Criteria	Pros – *Land based version of Land in Transition*	Cons – *Land based version of Land in Transition*
	little to be said in the INDC description, as many other developed countries have indicated they support what they see as a self-evident right to apply Kyoto accounting principles to Inventory-based accounting.	
Environmental effectiveness & integrity	✓ Strong additionality standards and likely full crediting/debiting for AR & D. Avoids re-crediting the same forest over and over again. ✓ Crediting up to the long-term average means forestry crediting better reflects permanently stored carbon. ✓ Accounting coverage is limited to forest and forest conversions (i.e., deforestation). *[This could be addressed by expanding the accounting coverage of this option.]*	× Discarding the activity-based approach of Kyoto, which focuses on human effects, may lead to more non-anthropogenic emissions being included in accounting. × Will draw on existing IPCC approaches and guidance less closely than a Kyoto-based version of Land in transition, which could reduce its perceived transparency and reviewability.
Commitment is least cost	✓ Avoids potential high cost of UNFCCC net-net accounting approaches which compare against 1990, when our forestry removals were higher. *[Same as status quo.]* ✓ Avoids the high liability costs on New Zealand over the 2020s under Kyoto rules, which debit the harvest of our fast growing forests, and penalise us for the inability to carry over surplus achievement from pre-2021. ✓ Avoids the high liability costs on NZ under Kyoto rules due to our high rates of new forest planting between 1990 and the start of the first crediting period (CP1), exacerbated by the discontinuation of the ARDC rule. ✓ Assuming that we would be able to carry across the other Kyoto CP2 rules to a land-based approach, effective Kyoto CP2 rules such as natural disturbance and FLU should still be able to apply to post-2020 accounting.	× Shifting to an averaging approach potentially reduces total forestry credits for NZ over the 2040s (though most of these would need to be paid back later, on harvest) – assuming that 1990 continues to be the eligible activity start date for commitment beyond 1990. × Does not credit regeneration of natural forests resulting from new management and/or legal protection after 1990 but prior to 2009 RL policy base year.
Risk and uncertainty	✓ Potential debits and credits from all mature, fully grown forests (not just pre-1990 forests) are limited to departures from BAU. ✓ The Crown would no longer have to carry the fiscal risk of the forest growth & harvest crediting and debiting cycles being misaligned with the commitment crediting periods, combined with uncertainty around future rules on carry-over. ✓ Avoids NZ banking on the assumption that, even though we pay a	× Future international rules negotiations create some risks and uncertainties for all accounting options; however, these risks are potentially higher for approaches which are either not (1) pure Kyoto CP2 or (2) a pure, no-rules GHG Inventory based approach – such as this option, which would be a hybrid of the UNFCCC reporting and Kyoto CP2 rules. × Under the land-based version of LIT, it may be slightly less certain that

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Criteria	Pros – *Land based version of Land in Transition*	Cons – *Land based version of Land in Transition*
	large debit over the 2020s and 2030s for our post-1989 forests under Kyoto CP2 rules, in the 2040s we will again accrue a large credit for these same forests. By 2040, it is quite possible that the 1990 start year will be changed, as too old, and our early 1990s planting boom would no longer earn credits for us in the 1990s. ✓ The land-based version of 'Land in Transition' does not require an 'averaging' approach to be applied in forest crediting, because UNFCCC reporting already contains an in-built land-use transitions at either 20 years (default) or a country-specific period (28 years for NZ). Therefore, the land-based LIT option should be relatively easily and simply achieved in the negotiations through a high-level decision that Kyoto accounting principles can be applied to UNFCCC Inventory-based accounting. In the current negotiations (May 2015), this endorsement seems likely. ✓ If devolved to the ETS, much reduced risk to Crown (relative to status quo) that post-1989 foresters will default on their harvest liabilities after 2020 under high carbon prices.	we could carry across the existing CP2 forestry rules to our post-2020 accounting (such as the natural disturbance provisions which limit the potential liabilities from *force majeure* events in forests), compared with the modified Kyoto version of LIT. However, given [redacted] Withhold under s 9(2)(j), s 6(a) and s 9(2)(g)(i) × Without carryover of international units from pre-2020, Crown could continue to face a fiscal risk from deforestation liabilities for post-1989 deforestation after 2020. *[Same as CP2 status quo.]* × Potential debits under the FMRL are unlimited, but credits are currently capped. [redacted] Withhold under s9(2)(j) × Some potential for accidental credits/debits from incorrectly projecting the BAU FMRL, but less than if account against base year. *[Same as CP2 status quo.]*
Cost effective mitigation & fungibility	✓ Fully crediting only the first rotation of new forests (and subsequent rotations over and above the average only) will help to ensure that accounting incentivises genuinely new afforestation and new management, ensuring the most emissions reductions for any given quantify of units issued. ✓ Shifting to the Land in transition approach would ensure that future high-carbon prices would not prevent NZ from sustainably harvesting its post-1989 planted production forests (as could occur under the Kyoto CP2 approach of fully debiting harvest) – particularly on second and subsequent rotations of post-1989 forest. ✓ Only the most material categories are included – forest and forest conversions. *[This could change if we expanded the accounting coverage of this option.]* ✓ Net removals under this land-based version of land in transition should remain eligible mitigation towards our commitment, if the legitimacy of the removals is based on the environmental integrity of the accounting approach.	× If international market access is limited to only those countries which adopt one of the currently available accounting approaches (pure Kyoto CP2 rules, GHG-based accounting), then a modified Kyoto approach (to implement Land in transition) could conceivably put at risk market access eligibility – and this risk could be slightly higher for a land-based version of LIT. However, such an international rule would also lock in the current two-track commitment approach of Kyoto and would not support an effective global agreement (as no developing country would agree to the pure CP2 rules, and so would not take on binding commitments) so if this risk applied then is possible NZ would not ratify – nullifying the risk. × Mitigation opportunities in agricultural soils would not be captured or incentivised unless additional land-uses are included in accounting. *[Same as CP2 status quo. This could be addressed by expanding the accounting coverage of this option.]*

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Criteria	Pros – *Land based version of Land in Transition*	Cons – *Land based version of Land in Transition*
	✓ Assuming that units will still be able to be issued and traded under land-based accounting, exportability and fungibility of NZ units should still be possible under this land-based version of Land in transition, if the eligibility of units is based on the environmental integrity of the accounting approach. However, the functioning of market mechanisms after 2020 is unclear.	
Co-benefits & manages trade-offs	✓ Extending a BAU reference level to all fully-grown forest (not just pre-1990 forests) allows sustainable harvesting of planted production forests without penalty, and removes the perverse accounting incentive under CP2 rules to reduce the sustainable sourcing of renewable fibre and fuel from post-1989 forests. ✓ The land-based option of Land in Transition assumes Kyoto forestry principles can be applied to land-based accounting, in which case continued application of the Kyoto CP2 FLU rule (potentially to all mature plantation forests) under this hybrid approach would allow the same, and potentially enhanced, level of land-use flexibility for plantation forests that exists under Kyoto. ✓ Option for all deforestation to remain fully debited, consistent with supporting biodiversity values of extant natural forest. *[Same as status quo.]* ✓ Modifying the pure Kyoto CP2 rules creates scope to make other changes to better recognise values, e.g., biodiversity (e.g., through tree weed exemptions), or forest permanence (non-harvest) or protection status (through differentiated baselines, or a uniform activity start date for land use change and management). ✓ Under a land-based approach to 'Land in transition, where the broad 'principles' of Kyoto are applied to land-based categories (rather than the exact rules), it may be easier to secure international agreement to the extension of the FLU rule to all fully-grown, mature plantation forests, rather than just to pre-1990 plantations, as is the case under the existing Kyoto CP2 rules. This may mean the land-based version would better support land-use flexibility.	× [redacted] Withhold under s9(2)(j) and s9(2)(g)(i) × Applying a different accounting approach to the current Kyoto framework could potentially open up the CP2 forestry rules and principles for re-negotiation, which could potentially put at risk the FLU rule for use after 2020, if countries opposed it being included as part of a new all-Party rule set. × Limiting land use accounting to forests and deforestation only may not incentivise more sustainable pasture management practices. *[Same as CP2 status quo – could be addressed through expanding accounting coverage.]*
International	✓ The land-based version of LIT would build on LUCAS's current land-based reporting for the UNFCCC Inventory. A less-costly, proxy	× *Existing activity-based approach to NZ's Kyoto-based accounting is discontinued, so would require new accounting formats and tables.*

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Criteria	Pros – *Land based version of Land in Transition*	Cons – *Land based version of Land in Transition*
reporting feasibility	approach to averaging may be possible under this option, using the existing in-built transitions at 20 and 28 years. ✓ Existing coverage is continued and not expanded. ✓ LUCAS is still developing its capacity to account against a Forest Management Reference Level, which starts from the 2015 inventory submission. Enhancements needed for a LIT approaches could be incorporated into the ongoing work to implement FMRL accounting.	× *New approaches and methodologies* may need to be developed for crediting up to a long-term average, or equivalent 'land-use transition' point. × New system requirements may increase operational costs for LUCAS. × Carbon stock changes due to forest management effects, accounted for under a BAU RL under both the Kyoto and LIT approaches, are difficult and costly to measure and verify. × Reporting approaches under Land in transition may also need to capture activities which alter the long-term average of forests – especially if ETS alignment is required.
ETS implementation feasibility	✓ A shift to a land-based approach internationally would not need to be devolved to the ETS, which could continue to operation on an activity basis. ✓ A simply proxy for averaging may be possible: for example, just crediting up to 26 years, instead of the current 28, may be sufficient to implement both averaging and HWP changes in the ETS. ✓ Operational costs around harvest returns, and managing defaults, could be much lower.	× Land in Transition represents a change from the ETS status quo, and if devolved would likely require legislative and regulatory changes, as well as substantial analytical work and stakeholder consultation. *[Note, a variety of low-cost proxies for the average could be applicable under the ETS, and would likely build on improvements needed potentially in any case to implement HWP effects in yield tables.]* × New operational costs would arise from implementing voluntary/compulsory forest management crediting/liabilities (respectively). *[Though these might arise from implementing the CP2 FMRL in any case.]* × The land-based option of LIT departs more from the current activity-based approach to international accounting than the Kyoto-based version of LIT, on which the ETS forestry settings are based, which may create some additional complexity for aligning ETS and LUCAS reporting. × Any system change would decrease understanding of the ETS and create transaction costs for stakeholders to learn the new rules. × Potential for increase in fiscal misalignment between international and ETS deforestation liabilities under any post-2020 framework which does not recognise NZ's pre-2020 surplus. *[Same as CP2 status quo.]*
Potential domestic & stakeholder impacts	✓ International accounting continues to provide full credits and incentives for new afforestation on the first rotation or establishment of new forest, up to the same net amount of credits that would have been earned for the entire rotation or life cycle of the forest (once	× May not give quite as many credits upfront for new afforestation, on the first rotation, as under the current status quo (e.g., might only be credited for 20 years rather than 28), even though the total net amount of credits would be the same.

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Criteria	Pros – *Land based version of Land in Transition*	Cons – *Land based version of Land in Transition*
	harvest liabilities are taken into account) – so this could continue to be devolved under the ETS. Does not diminish the core carbon profitability of new AR, as most of the carbon benefit is earned on the first rotation in any case. ✓ If devolved, no units would need to be surrendered on harvest, which could significantly reduce risks for ETS participants, and could potentially stem the tide of forest owners who are leaving the ETS in order to buy their way out of future harvest liabilities while the price is low and manage the risk of a future higher carbon price on their harvest liabilities at a later date. ✓ Forest owners (or the Government) who decide to establish permanent, non-harvested forests (e.g., new planting on DoC land or under a trust) could potentially earn credits for a long time (e.g., 200-400 years for native to reach long-term average). ✓ Potential opportunity to extend the FLU rule to fully-grown post-1989 forests, depending on international rules. ✓ Activities to enhance existing forest carbon stocks, including pre-1990 indigenous forests, would continue to be eligible for international credits, and could potentially be devolved to ETS participants. *[Same as status quo.]* ✓ Low risk that land owners would face liabilities for other land uses or agricultural soils under the ETS. *[Same as status quo.]*	× Could impact negatively on post-1989 forest owners currently in the ETS (or who plan to join), who are currently banking on a net positive balance of units over their second and subsequent rotations, once harvest liabilities are taken into account, because they: (1) have already accumulated sufficient NZUs to meet their harvest liabilities in the 2020s or 30s, (2) are anticipating earning credits from their second rotation from around the late 2020s onwards, and (3) anticipate that they will sufficiently change their management practices/rotation length/harvest intentions on the second rotation, *such that* they would earn materially more credits over the 2030-40s than they would need to pay back on harvest in around 2050-60. Few forest owners would likely meet these criteria. × [redacted] Withhold under s9(2)(g)(i) and s6(e)(iv)
Policy durability & certainty	✓ Not clear if the Kyoto approach will be internationally durable beyond CP2. Adopting a new approach that combines the best features of both Kyoto and the GHG Inventory may provide a more durable approach over the long term. ✓ Changing the high-risk, cyclical crediting/debiting approach of Kyoto to AR may help to support greater participation in the ETS over the long-term.	× May reduce policy certainty in the near term, by introducing further changes after 2020 to the current international Kyoto framework for forestry accounting (beyond those that are pending already for the CP2 period), and the ETS settings on which they're based. However, it is expected that the changes would be largely supported by forest stakeholders, if devolved.
Long-term mitigation signal	✓ Creates incentives on the Government to continuously maintain and enhance the existing area and current carbon stocks of New Zealand forests over the long-term.	× Does not incentivise carbon management across entire landscape. *[Same as CP2 status quo – could be addressed through broader accounting coverage.]*
Strategy for	✓ Puts into practice and promotes many of our international negotiation	×

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Criteria	Pros – *Land based version of Land in Transition*	Cons – *Land based version of Land in Transition*
effective global agreement	objectives for global forestry accounting, which is that it should reward new actions and avoid arbitrary or windfall ('hot air') outcomes. ✓ Could be a somewhat more acceptable common accounting approach for all Parties – though less so than the land or reference level-based versions of the 'Land in transition' approach.	
SUM	✓ **= 43**	× **= 30**

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Assessment of GHG Inventory, land-based option of 'Land in transition'

- Overall, and like the activity-based version of Land in Transition, the land-based version of Land in transition also scores much more highly than the current Kyoto CP2 Status Quo option. The land-based version retains all the core strengths of the other proposed Land in Transition options, in that it provides full, one-off crediting for forest establishment, while continuing to incentives enhanced forest management and minimising the liabilities for sustainable forest harvest.
- The land-based version of 'Land in transition' approach has the advantage over other Land in transition options in that it would be relatively simple to describe and negotiate for in any high-level negotiations on how the land sector should be treated. Because the functionality for land-use transitions is already in-built within GHG Inventories, any collective agreement under the new agreement that Kyoto accounting principles can be applied to Inventory-based accounting would allow the land-based version of Land in Transition to be implemented.
- Potential risks around the land-based version could arise in the negotiation of more detailed accounting guidance, where countries may have different views on how Kyoto principles should be applied to land-based accounting. While serious objections to BAU reference levels being applied to the 'forest remaining forest' category seem unlikely, differing views are more likely on how accounting should reward 'additionality', which could put at risk full crediting of new afforestation – a Kyoto Article 3.3 provision that conflicts with the UNFCCC net-net approach seeming likely to be adopted by the US, and possibly others.
- The Kyoto activity-based version of Land in Transition may therefore be less winnable than the land-based version – but provide greater assurance that, once achieved, would allow Kyoto's successful accounting provisions from CP2 to continue to apply to New Zealand's FOLU accounting in after 2020
- A core benefit of the land-based version is that it conceivably avoids the complexity of averaging, by using instead with a simple time-based rollover point, such as 20 or 28 years. This may be more transparent, understandable and lower cost to implement than averaging, particularly in the near term. However, ideally the effect of averaging would continue to be the long-term goal of any Land in Transition approach, as a means of allowing accounting (and potentially ETS) incentives to differentiate forest sinks on the basis of their permanent long-term effect.
- If a decision was made in favour of the land-based Land in Transition approach, as important assumption would be whether or not the land-based aspect would need to be devolved to the ETS. The initial conclusion made here is that it would not need to be, as in practice the international 'Land converted to forest' and 'Forest land converted to other land use' categories map almost identically to the existing ETS 'afforestation' and 'deforestation' categories. Retaining the existing activity-based classification in the ETS could reduce any domestic changes under the Land in Transition approach.

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Option 13: Dynamic reference level approach to Forestry & Land Use: BAU reference levels for all existing activity & Zero RL (full carbon accounting) for land use change

Summary description

- The Land is Transition approach could also be described and presented as 'Land sector reference level' or a 'Reference level approach to all forests', which would have exactly the same effect on New Zealand's emissions liabilities and the land and Kyoto activity-based versions of Land in Transition.
- The reference level version of Land in transition would apply a reference level to all forests or lands, where new activities and management are fully credited or debited, but existing activities and management under current policies are only accounted for relative to BAU. It could applied using either the land or activity-based approaches described above – for the most part only the overall 'packaging' would be different.
- This could be implemented through applying a zero reference level (i.e., full, gross-net accounting) to 'new activities' (e.g., land converted categories change, new management or Article 3.3 activities) and a BAU Reference Levels to 'existing' activities (e.g., 'land remaining land' categories, Article 3.4 land, or land under BAU management or policy). (Alternatively, instead of applying a zero reference level to new actions, they could simply be 'excluded' from the definition of BAU, which would achieve the same result.)
- This approach differs from the 'Simple BAU Reference Level Approach' described above, under Option D.10, as different types of reference levels are used for new and existing activities. The approach is described as 'dynamic' because the distinction between 'new' and 'existing' is not fixed (as with the Kyoto 1990 split) but updates over time through the use of land-use transitions, in the same way as for the other versions of this approach.
- The reference level version of Land in transition is mostly just different 'packaging' on either the land or activity-based versions above. However, one possible core difference is that it could be extended more broadly, as the basis for a 'reference level approach to the entire land sector' – a concept with has been debated internationally.[11]
- A key feature of a dynamic reference level approach, where different types of reference levels apply to different activities, is that it could be extended to form a "Reference level approach to the entire land sector'. This could include agriculture, potentially under a different type of reference level again, for example based on BAU production, dry matter conversion rates, or even intensity per unit product. However, agriculture accounting options are not further considered here.

Rationale

- The reference-level version of Land in Transition achieves the same emissions effect as the other Land in transition approaches, but could be 'packaged' as a 'reference level approach' (rather than a Kyoto or UNFCCC-based approach). Politically, this would establish it as a reference level approach for developed countries, akin to REDD+.
- In particular, a reference level approach to the land sector could provide the basis for a simple and flexible common framework for land sector accounting for all Parties after 2020 – both developed and developing – which merges the best of the Kyoto and REDD+

[11] [Insert reference to Paulo Canaveira's report.]

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land-use activity based approaches, but provides the necessary flexibility for different national circumstances, by allowing each country to specify what type of reference level it applies to type of each activity or land use, as appropriate. This would enable developing countries to continue applying historical baselines/trends to deforestation accounting, as they do currently under REDD+, which would avoid some of the high costs for them of a Kyoto approach.

- Such a flexible reference level approach could provide the basis for a common approach, but it would not have full environmental integrity unless some minimum standards and principles were imposed, such as the need for symmetrical accounting of afforestation and deforestation. The design requirements for a common global; system that contains the necessary flexibility for all Parties' accounting has been developed elsewhere by MPI analysts, and is not included here – as the focus of this report is to identify the *single* best approach for New Zealand, rather than the best framework for all approaches.
- Nonetheless, there is currently no precedence for how the technical detail of a post-2020 reference level approach for all Parties would work, so a reference-level version of Land in Transition adopted and promoted by New Zealand could provide the precedent for a new and more effective international framework, by defining a high-integrity version of how an overall reference level approach could work, with more cost-effective rules and consistent with New Zealand's objectives.
- The Land in transition approach would also solve for developing countries the same problems faced by New Zealand under Kyoto as a result of our fast-growing production forests, as well as our high forest plantings between the base year and the first commitment period, which could also occur in developing countries, and which necessitated the creation of the ARDC rule in CP1.

Emissions impact over 1990 – 2050

- [See under the general introductory section above on the overall 'Land in transition' approach. All three 'Land in transition' options have the same approximate liability effect and so have been modelled together.]

Precedence/usage

- An overall land-sector reference level approach seems to be consistent with the EU's vision for a common accounting framework under the new agreement (who read into the draft agreement in Geneva in February 2015 that, "Parties shall base their accounting for the land-use sector on realistic and meaningful reference levels building on existing guidance under the Convention and its instruments." The word 'shall' denotes the compulsory use of reference levels for the entire land-use sector – which they define as including agriculture.
- International literature on 'reference level approaches' makes no distinction between this type of reference level, and the one described above as a 'simple BAU reference level'. The features of this Land in Transition approach are therefore at a technical level beyond the current international negotiations. The elements are consistent, however, with Kyoto accounting principles.

Accounting approach to included sub-categories/activities

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Land use/activity	Accounting approach	Critical assumptions	Activity start year	Baseline
'New' activity (land-use change, new policies)	Zero reference level (gross-net) *Or* Excluded from BAU reference level	Not necessary to align with policy base. FLU	1990	0
'Existing' activity (land already in conversion in the base year, land under constant management)	Projected reference level	Use of activity start year, or rolling baseline	2009 (reference level 'policy base year')	BAU projection

Other relevant assumptions

- It is assumed that the Kyoto additionality principle of only crediting new actins/management since the base year would still apply, but if not, this could have a large impact on liabilities.
- In all other respects, this approach is the same as the other Land in Transition options, as has the same accounting assumptions, depending on whether a land or an activity-based approach was adopted.
- As for the other options, any decision to expand the accounting coverage to include other land uses would have other, technical and liability implications.

Modelling results

- [See under the general introductory section above on the overall 'Land in transition' approach. All three 'Land in transition' options have the same approximate liability effect and so have been modelled together.]

Technical issues to be resolved

- A number of technical sub-options are possible under the Land in transition approach. These are discussed in detail under the chapter on 'Further work'.
- In any application of reference levels to multiple land use categories, a number of 'connectivity' issues may need to be resolved, including how different baselines would be combined, and whether land use change between categories would be addressed through technical corrections. Options could include:
  - **Additive approach** – Simply 'add up' projected forestry and land-use baselines.
  - **Combined approach** – Set different baselines for LUC, land management and Agriculture. Allow technical corrections for area changes to management categories, but assume zero LUC for land converted to categories, and don't allow technical corrections to their areas.

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ETS Implications

- If devolved to the ETS, this approach would have the same effect as either the land or the activity-based versions of Land in Transition, described above, depending on whether the reference level was either land or activity-based. ETS implications are therefore not described separately here.

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Key Pros & Cons against Criteria – Reference Level based version of Land in Transition

Criteria	**Pros** – *Relative to other LIT Approaches*	**Cons** – *Relative to other LIT Approaches*
International expectations	✓ The approach is simple to explain, familiar to developing countries, and has been discussed internationally as a theoretically-viable approach for all countries after 2020. ✓ The approach is consistent with the accounting principles read in by the EU to the draft Paris Agreement, which state that all land sector accounting after 2020 must be against a reference level. ✓ The approach could be used to explain, and frame within an overall 'land sector approach', any alternative accounting approach to agriculture after 2020, if desired.	× Not all countries may agree that a reference level approach should be an allowed approach for developed countries. Developing countries could object if they see it as an attempt to tighten the integrity of the REDD+ reference level approach. × Some observers believe that projected reference levels have lower credibility than other accounting approaches, which could lead them to think poorly of an overall reference level approach (whereas in fact it depends on multiple variables – a BAU baseline may have greater credibility than an historical one that results in arbitrary accounting outcomes credits). × Is no direct precedent yet for developing countries applying a unified reference level approach to the entire FOLU/land sector. Difficult to predict how much of an outlier we might be after all INDCs are tabled.
Environmental effectiveness & integrity	✓ A reference level-based approach to Land in Transition could imply updating the 1990 activity start year to our current FMRL policy base year, 2009, which could mean we would only credit new forests established since 2009. This could be seen as enhancing the 'additionality' of claimed emission reductions.	×
Commitment is least cost	✓ Provides a viable framework for the extension of accounting rules to agriculture (if desired) which offers potential cost savings above all other accounting settings under consideration in this report.	× The reference level version of Land in transition might suggest aligning the activity start year with the reference level policy base year (which could, e.g., make 2009 as the start of eligible afforestation/reforestation for crediting purposes). This could remove the effects of the 1990s forest plantings from our accounting, potentially diminishing our future sink for a period.
Risk and uncertainty	✓ A reference level approach would help to ensure that any additional land uses included in accounting could be accounted for under a BAU reference level. This would help to manage the risk of any future requirement to account for agricultural soils, under croplands and grasslands, in the event these are identified as a significant source of	× The negotiation risks are uncertain around all accounting options; however, these risks are potentially higher for a developed country approach which is neither a directly based on the GHG Inventory or on the Kyoto Protocol, but instead is closer to REDD+. × An overall, unified 'reference level' approach to the FOLU/land sector

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Criteria	Pros – *Relative to other LIT Approaches*	Cons – *Relative to other LIT Approaches*
	emissions for New Zealand.	could be more likely to lead to international calls for caps on land sector credits, due to concerns about reference level methodologies.
Cost effective mitigation & fungibility	✓ *[As for other Land in Transition options]*	× *[As for other Land in Transition options]*
Co-benefits & manages trade-offs	✓	× The potential flexibility of an overall reference level approach to allow the definition of activities as either "within" the BAU baseline – in which case they are largely factored out – or "outside" the BAU baseline – in which case they are fully credited or debited – provides a possible means by which certain, net-positive land-use activities could be included within accounting baselines, and therefore not incur liabilities. This could include deforestation of tree weeds (exotic wilding pines), in situations where biodiversity is more important than mitigation, or essential adaptation actions which produce emissions (e.g., conversion of forest to vineyards, or a hydro dam).
International reporting feasibility	✓ .A reference level approach might better support the retention of an activity-based approach, consistent with current reporting and ETS systems, but without the political drawbacks of describing it as a 'Kyoto' approach	× The potential flexibilities offered by a reference level approach have the potential to increase the complexity of our international reporting, if it alters any current accounting assumptions such as activity definitions or start dates.
ETS implementation feasibility	✓ *[As for other Land in Transition options]*	× *[As for other Land in Transition options]*
Potential domestic & stakeholder impacts	✓ *[As for other Land in Transition options]*	× *[As for other Land in Transition options]*
Policy durability & certainty	✓ Not clear if the Kyoto approach will be internationally durable beyond CP2. Adopting a new approach that combines the best features of both Kyoto, the GHG Inventory and REDD+ may provide a more durable approach over the long term.	× Could be seen as a larger departure from our current Kyoto CP2-based accounting approach that either the GHG Inventory land or Kyoto activity-based versions of Land in Transition, reducing policy certainty.
Long-term	✓ The low-cost benefits of a reference level-based Land in Transition	×

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Criteria	Pros – *Relative to other LIT Approaches*	Cons – *Relative to other LIT Approaches*
mitigation signal	approach, where extended to additional land-uses and potential agriculture, provides a viable, cost-effective framework to bring the entire landscape into New Zealand's international accounting, which may help to incentivise carbon management across entire landscape over the long term.	
Strategy for effective global agreement	✓ Could be the most viable common land sector accounting approach for all Parties, in the long run. ✓ A reference level approach would equally support adopting a land-based approach or an activity based approach, but given REDD+ also adopts an activity reference-level based approach, there may be greater justification for continuing an activity-based approach under a Reference Level version of Land in Transition, which could help provide greater continuity with NZ's existing activity-based approach, without the political difficulties of continuing a Kyoto 'framing'.	× Given the current high-level of the international negotiations, conducted mainly in Plenary and dominated by developed/developing country politics, NZ may need to be quite gutsy to table a conspicuously different approach (in framing at least) to the EU and other developed country Parties.
SUM	✓ **= 11** (compared with other LIT approaches)	× **= 10** (compared with other LIT approaches)

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Assessment

- While the reference level version of Land in transition is largely just different 'packaging' on top of the land or activity-based versions of Land in Transition, analysed above, it nonetheless has some potentially important advantages:
    - A dynamic reference level approach, where different types of reference levels apply to different activities, could be extended to form a "Reference level approach to the entire land sector'. This could include agriculture, potentially under a different type of reference level again, for example based on BAU production, dry matter conversion rates, or even intensity per unit product.
    - A reference level approach, by association with REDD+, may provide a more effective stepping stone to a common, effective accounting framework for all Parties – particularly if we get a very poor outcome under the Paris Agreement (e.g., with very few rules for the land sector) and we need to start from a lower common denominator position. In this case, applying a higher integrity version of REDD+, under the aegis of a reference level approach, which meets all of New Zealand's objectives, and which (like REDD+) is also activity-based and so continues our existing reporting and ETS systems with least cost and disruption, could be the most strategic move New Zealand could take to promote our overall objectives for the land sector under future climate change regimes.
    - The potentially greater flexibility offered by the reference level version of the Land in Transition approach, and possible greater scope for more tailoring of accounting incentives to match domestic objectives, could help to minimise costs, and enhance co-benefits for sustainable land management.
- Overall, the reference level version of Land in transition has potential to be a viable, all Party approach to land sector accounting. Combined with its potential for a rolling baseline (as 'new' activities transition into the 'existing' pool), it even has potential as an effective approach for all sectors, as it could avoid the potential hot air of permanently locking in inflated historical baselines. Regardless of the packaging then, the accounting effects of an activity-based reference level version of Land in Transition, might serve as the ultimate objective for our future land sector accounting approach in the ongoing negotiations.
- In the near term, for the purpose of formulating our 2015 INDC, a reference level approach may be seen as a fairly large departure from the accounting approaches proposed by other developed country in their INDCs. For this reason, its adoption in our 2015 INDC may depend on the larger decision around whether to apply an accounting approach to agriculture, and if so, whether it needs to be framed within a broader land sector accounting approach. In this event, a 'net-net' version (Option D.11) of a reference level-based Land in Transition option might also be considered.

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Differentiated forest treatment

Option 15: Differentiated forest treatment: BAU Reference Level for planted forests + full carbon accounting of permanent, non-harvested forests

Summary description

- This option would apply differentiated accounting approaches to different categories of forest management (pre-1990 forests), to recognise that some forests may be subject to cyclical rotations, whereas others may be permanently protected from harvest and as a result steadily increasing in carbon stock.
- This option is a variation on Options 12-14 above, in that it includes the concepts of land use transitions, but adds differentiated forest treatment.
- There are different ways that forests could be differentiated, including: exotic/indigenous; planted/natural or permanent/harvested, with further subdivisions possible differentiating selective from clear-felling harvest practices. For this analysis, we assume a differentiation based on the permanent (non-harvested)/non-harvested (selective or clear fell) categories – though the other alternatives are recognised as sub-options.
- This option could be based on either the land or activity-based versions of Land in Transition, and would apply a BAU reference level to all mature, fully grown production forests – i.e., all planted or natural, exotic or indigenous forests that are subject to harvest – and gross-net accounting to all permanent, non-harvested forests – both the fully-grown, mature categories (pre-1990 / Forest management / land remaining land), as well as land in a state of conversion towards being permanent, non-harvested forests (i.e., afforestation/reforestation of permanent forests, and non-harvested PFSI forests) – which would occur under the Land in Transition approach in any case.

Sub-options

- This approach has the following sub-options, which would require further analysis:

Framework Sub-options

Framework Sub-options

- Kyoto CP2 based variation:
  - Kyoto CP2 Rules + Zero-based FMRL (pre-1990 natural forest) + BAU FMRL (harvested/production forests only) (+/- cap)
  - Land in Transition based variations:
  - Kyoto CP2 Rules + Zero-based FMRL (pre-1990 natural forest) + BAU FMRL (harvested/production forests only) + LU transitions (variation on Option 12) (+/- cap)
  - UNFCCC based accounting + in-built land-use transitions + CP2 rules (BAU Reference Level for mature harvested/production forests and Zero RL/gross-net for mature, permanent, non-harvested forests (variation on Option 13)

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- Dynamic reference level approach to Forestry & Land Use: BAU reference levels for all existing activities & Zero RLs (full carbon accounting) for land subject to land use change and forest land subject to new management as a permanent forest (variation on Option 14).

Differentiation Sub-Options

- Differentiation of mature, fully grown forests ('Forest Management' or 'Forest land remaining forest land' categories) on the basis of:
  - Exotic ***versus*** indigenous
  - Planted ***versus*** natural
  - Permanent, non-harvested ***versus*** harvested and/or production forests
  - Permanent and selectively harvested forests ***versus*** 'non-permanent' clear-felled forests.
- This analysis assumes the distinction of 'permanent, non-harvested versus harvested and/or production forests'.

Rationale

179 This approach would seek to recognise, incentivise and reward the permanent long-term carbon effect of protecting forests from harvest. It would do this by accounting for forest management actions which alter the long-term carbon stock of a forest, for example by legally re-classifying harvestable forest into non-harvestable forest, by enabling them to be fully recognised in and incentivised by accounting under a gross-net approach.

180 The rationale would be that, as all forest in New Zealand is at minimum legally protected from unsustainable harvest, it follows that its BAU state is to be in a long-term carbon equilibrium or steady state, with its actual carbons stock at any one time reflecting its particular harvest regime. Forest areas legally protected from all harvest are in a state of transition from their previous [long-term average] carbon stock, to a new long-term permanent carbon stocking level. Therefore, all future carbon stock increases should be fully credited under gross-net accounting.

181 This rationale is slightly hard to maintain, as the same argument could be made for sustainably managed production forests – that if they are sustainable long-term, then the BAU RL should be set to zero. In practice, under the KP, we acknowledge that even a sustainably harvested forest will not have a BAU baseline of zero over the commitment period, as a result of the dynamic effects of differing age-class structures across forests resulting from past activities and practices and natural disturbances.

182 The differentiated forest approach is different from the Land in transition option, where forest management actions which alter the long-term average carbon stock of a forest are recognised and credited only for their impact relative to projected BAU emissions over the commitment period

183 Applying a gross-net approach to natural forests could therefore ignore what the actual BAU trajectory was, before its policy change to a protected state. The argument for this could be that, while not strictly correct in terms of what the atmosphere sees (in terms of additional

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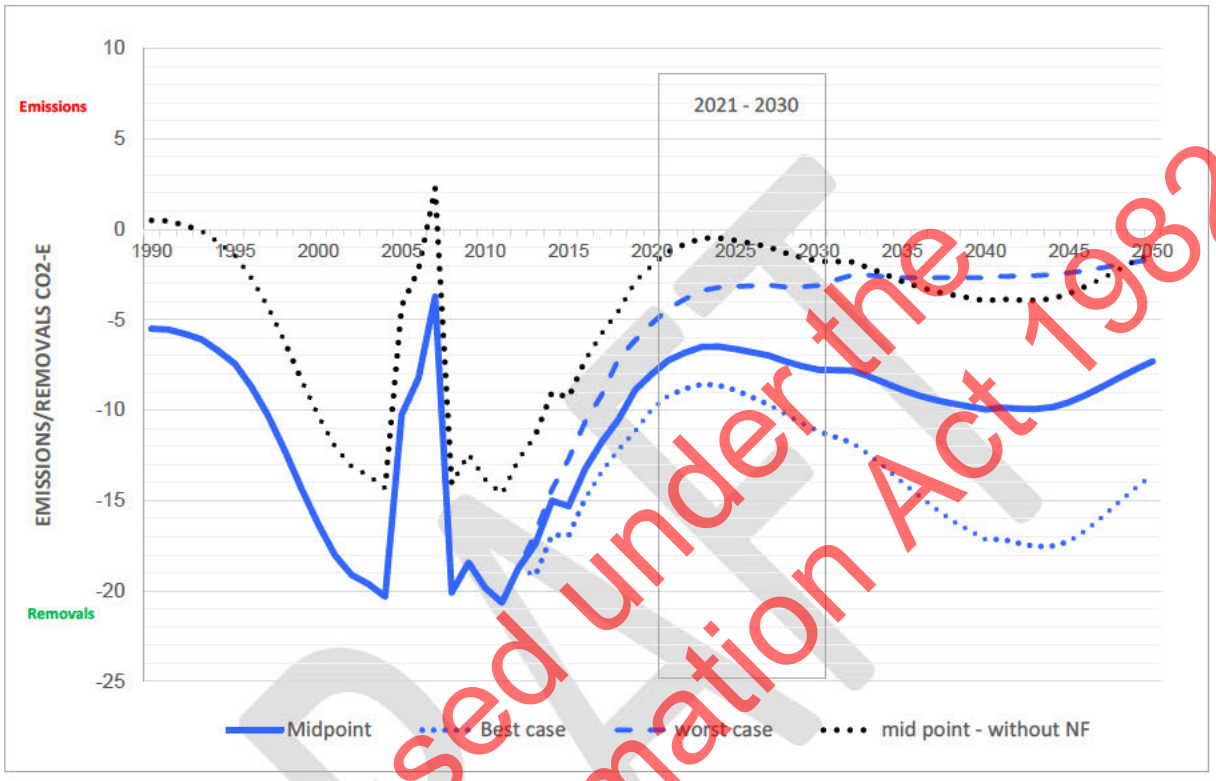
reductions), it nonetheless provides a strong positive incentive and reward under the accounting system for protracting some old growth forests from all harvest.

Illustration of emissions impact over 1990 – 2050

Figure 30: Land in Transition with Gross-net of Pre-1990 Indigenous forest



Precedence/usage

- Theoretical option. Little precedent for accounting for natural/planted or harvested/non-harvested forest management differently (exception is the FLU rule for plantations only).

Accounting approach to included sub-categories/activities

Land use/activity	Accounting approach	Critical assumptions	Activity start year	Baseline
Afforestation/reforestation	Gross-net	dhi	1990	0
Deforestation	Gross-net	FLU	1990	0
Forest management - harvestable	BAU Reference Level		2009 policy base year	Projected baseline
Forest management – permanently non-harvestable	Gross-net	Definition of 'non-harvestable', 'permanent' Activity start date Any cap on FM credits	1990	0

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Other relevant assumptions

- As per table above.
- For modelling purposes, emissions and removals from all pre-1990 natural forests are used instead of 'permanently non-harvested pre-1990 forests', which may be different.

Modelling results

Modelled emissions liability impact over CC1 and CC2

Land in Transition with Gross-Net of Pre-1990 Indigenous Forest over 2021-2030 (Mt CO_2)			
Option	**Low Emissions**	**Mid-point**	**High Emissions**
Land in Transition with gross-net of Pre-1990 Indigenous forest	-95	-70	-34

Emissions impact relative to Kyoto CP2 Status Quo

Land in Transition with Gross-Net of Pre-1990 Indigenous Forest over 2021-2030 (Mt CO_2) – Midpoint Projection with FLU			
Commitment Period	**Land in Transition with gross-net of Pre-1990 Indigenous forest**	**Status Quo**	**Savings (-) or Cost (+) under New Option**
2021 -2025	-34	5	-39
2026 -2030	-36	21	-57
Annual mean	-7	3	-10
Total 2021-2030	**-70**	**26**	**-96**

Commentary on liability impact

- xxx.

Technical issues and Major Uncertainties

- Any cap on credits could have a major effect on potential credits under this option.

ETS Implications

Departure from current settings

- If devolved to the ETS, this approach would effectively be a 'PFSI for pre-1990 forests'.
- Unlike the PFSI though, it is assumed that no harvest would be allowed.
- xxx

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Potential ETS impacts if devolved

Current ETS provisions	Impact
Credit for registered post-1989 sinks	
Debits for harvest of registered post-1989 forest	
No credits for pre-1990 forest management	
Compulsory liability for pre-1990 planted forest deforestation	
Other land use	

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Key Pros & Cons against Criteria

Note to Reviewers: The following table will be completed if there is sufficient interest in this option to warrant a detailed analysis. The table template however has been provided for any specific comments by reviewers on this option against the assessment criteria.

Criteria	Pros	Cons
International expectations	✓	×
Environmental effectiveness & integrity	✓	×
Commitment is least cost	✓	×
Risk and uncertainty	✓	×
Cost effective mitigation & fungibility	✓	×
Co-benefits & manages trade-offs	✓	×
International reporting feasibility	✓	×
ETS implementation feasibility	✓	×
Potential domestic & stakeholder impacts	✓	×
Policy durability & certainty	✓	×
Long-term mitigation signal	✓	×
Strategy for	✓	×

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effective global agreement		
SUM	✓	×

Initial Assessment

184 This approach would be a variation on the Land in transition approach, which seeks to recognise the permanent long-term carbon effect of new actions (based on the long term average carbon stock effect), including forest management actions which alter the long-term carbon stock of a forest, for example by legally re-classifying harvestable forest into non-harvestable forest, should be fully recognised in and incentivised by accounting.

185 However, establishing the additionality of all carbon increases captured by any gross-net accounting approach would be difficult – for many individual stands, it is likely that there may have been some natural regeneration or regrowth under BAU in any case. This approach could therefore potentially put at risk the environmental integrity of our accounting, by crediting BAU sinks that would have occurred anyway, in the absence of additional action or change in management. It could raise questions about countries' discretion to pick and choose different type of reference levels for different forests, and increase distrust of the valuable BAU reference level approach, that allows us to accommodate the sustainable harvest of our production forests without penalty.

186 More generally, there may be some broader risks around differentiating our conservation forests from our production forests, if it calls into question the carbon value or environmental credentials of our commercial forests.

187 The overall liability benefits of this approach would also be highly vulnerable to an external cap on FOLU credits.

188 Nonetheless, given the mitigation and co-benefits of fully recognising in accounting permanent forests which are legally protected from harvest in perpetuity, it is recommended that NZ seek international endorsement of an appropriate accounting framework to recognise, reward and incentivise the permanent protection of old growth forests, before including it explicitly in our INDC, to avoid putting at risk the broader forestry accounting approach (including the proposed Land in Transition approach, which is more conservative), as well as potentially the carbon value, ability to sustainably harvest, and environmental credentials of our exotic planted production forests.

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E) Accounting Coverage

189 If New Zealand's international commitment accounting is expanded to include other, non-forest land uses, then this will bring into accounting any anthropogenic soils carbon changes that are occurring on agricultural land.

190 Soil carbon under grasslands and croplands are a potentially large new source of emissions which is not currently included under the NZ ETS sectoral definitions of agriculture. Including it in our international accounting therefore has potential implications for domestic implementation.

Options

1. **Status quo** – Forest land and deforestation only
2. **Increased coverage** – Extend coverage to Croplands and Grasslands (UNFCCC), or Grazing land management and Cropland management (Kyoto).
3. **Comprehensive coverage of all lands** – Extend coverage to all land use categories – 100% of New Zealand
4. **Provisional inclusion of Grasslands and Croplands** – For example, depending on UNFCCC/Kyoto approach, accounting treatment, available data or certainty levels.

191 Given the scale of the relative emissions and removals from the other land use categories, this option is primarily about whether New Zealand should account for agricultural soils.

Discussion

192 Soil is a significant reservoir of carbon in the landscape. Relatively small changes in the amount of carbon stored in soil could have a large effect on New Zealand's future emissions liabilities. Land management measures that increase the amount of carbon stored in soils could potentially offset some of the emissions from agriculture.[12] On the other hand, practices that deplete soil carbon and release it back into the atmosphere can add to the emissions of other greenhouse gases.

193 From an accounting perspective, what matters is not the total quantity of carbon in soils, but whether this quantity changes over time, at a national level, due to anthropogenic management practices. The effects of these management practices on the majority of our grasslands are currently not captured in New Zealand's GHG Inventory, which adopts the IPCC default assumption that soil carbon levels in lands under consistent management for 20 years are at equilibrium, or steady state. It is possible that future methodological improvements will improve the sensitivity of reporting, and bring any soil carbon changes on these lands into the national estimates.

194 Given the potentially significant contribution that changes in soil carbon could make to New Zealand's total emissions, it will be important to understand what the national trends in soil carbon are, and on what scale, before we make a decision on expanding our accounting to

[12] NZAGRC/PGGRC fact sheet: What we are doing

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cropland and grasslands. There could also be significant operation costs involved in improving our national inventory estimates on soil carbon stock changes.

195 Over the longer term, the maintenance of soil carbon stocks will be critical to the sustainability of primary production in New Zealand. In the UK, for example, it was recently reported that they only have 100 harvests left on their soils.[13] There may therefore be co-benefits for sustainable land management in New Zealand, including from better data, awareness and accounting incentives, from including agricultural soils in our international accounting.

196 Including grassland soil carbon in accounting could also have implications for the ETS, which does not presently include emissions liabilities for soil carbon management. Potentially (in theory), this could be included in future liabilities under the ETS, if it were included in our international accounting.

197 However, the ability for any international accounting or domestic ETS incentives to affect soil carbon levels will depend on whether we have the national inventory capacity to identify, measure the effects and verify the uptake of management practices that can maintain or increase soil carbon – or equally, result in carbon losses. Until such time, including agricultural soils may only impose a cost on New Zealand, without any immediate gain (with the possible exception that it may provide the rationale for greater research in quantifying soil carbon).

198 There is also a possibility that, regardless of our ability to successfully implement improved soil management practices, the prevailing national trends in soil carbon stocks will always be downward. This is because, as a recently forested landscape (pre-colonisation), New Zealand has generally very carbon rich soils. This may mean that we are more prone than other countries to losing soil carbon from similar management practices, and that it is correspondingly more difficult to increase carbon stocks, where they are already approaching saturation levels.

199 This uncertainty makes it difficult to make a decision now to expand our accounting coverage, without adequate data or certainty about the implications. MPI has recently commissioned a study from Landcare on the feasibility of reporting carbon stock changes in managed grasslands at a national level, and their likely liability impact, but this research will not be completed in time for our INDC tabling.

200 Nonetheless, New Zealand may face considerable international pressure to expand our accounting coverage from 2021. Widely held concerns over the perceived narrow mandatory coverage of Kyoto (limited to forests and deforestation) has led to an ongoing work programme under UNFCCC Subsidiary Body for Scientific and Technical Advice (SBSTA) to consider how Kyoto accounting could be made more comprehensive. While this work has not yet reached a conclusion, the developed country INDCs tabled so far by the EU, US, and Norway all indicate expanded coverage of at least grasslands and croplands, if not the entire land-use sector.

201 Given that grasslands cover over 50% of New Zealand, it may be reasonable that other countries expect us to also account for this category if other developed countries do so, and we are continuing to claim forestry removals towards our targets. To only include sink

[13] From: http://www.independent.co.uk/news/uk/home-news/britain-facing-agricultural-crisis-as-scientists-warn-there-are-only-100-harvests-left-in-our-farm-soil-9806353.html

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categories in accounting, while avoiding sources, could bring into question the value of the net removals we claim for our forests, and the legitimacy of forestry offsets in general.

202 [redacted]

Withheld under s9(2)(j)

203 Any commitment to expansion should also be subject to materiality considerations, as other than grasslands most other non-forest categories are very minor, and may not be cost-effective to estimate.

Technical issues and uncertainties

- There are no significant technical barriers to accounting for soil carbon changes based on existing estimates in the New Zealand GHG Inventory, which are limited to measuring the effects of land use change.
- There may be significant technical challenges to reporting soil carbon stock changes on managed lands under consistent land use, or in accounting for the Kyoto 'Grazing Land Management' category.
- Major uncertainties, and accounting risk, arise from not knowing whether future UNFCCC Expert Reviews, or reporting rules, will require New Zealand to move beyond its existing broad stratification of grasslands in its Inventory (which for example would not pick up a change from non-irrigated to irrigated land), its current use of the Tier 1 steady state default assumption for land under constant management.

Suggested that MPI holds a workshop with soil experts to further debate this issue, and the draft recommendation.

Draft Recommendation – Accounting Coverage

x.x In the ongoing negotiations, seek to ensure that requirements for expanded coverage are subject to the availability of adequate national estimates, and materiality considerations.

x.x In the 2015 INDC, indicate that the comprehensiveness of accounting will be expanded to include Grazing land management and Cropland management (or their land-based equivalents), only, on the assumption that adequate national estimates and levels of certainty will be available by 2021 to commence accounting of anthropogenic management effects on soil carbon stocks relative to baseline trends.

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F) Treatment of Other Land Uses

Options

1. **Kyoto Article 3.4 Status quo** – net-net against base year

2. **BAU Reference level** – Include all other land use categories within a BAU reference level (land or activity-based)
3. **Combined reference level approach** – Account fully for conversions between categories but put remaining land under a BAU reference level (a Land in Transition approach).

Discussion

- To be completed following a discussion with relevant soil carbon experts.

Draft Recommendation – Treatment of Other Land Uses

x.x In the ongoing negotiations, seek to apply the Land in Transition approach indicated for forests to other land use categories as well, which would apply BAU reference levels to land management categories ensure accounting incentives are low-cost, while accommodating national circumstances (historical background trends), mitigation potential, materiality considerations and the need to balance multiple land management objectives.

x.x In the 2015 INDC, if a decision is made to expand accounting coverage, reserve the right to apply an appropriate reference level approach to any additional land use categories, such as BAU reference levels to managed lands, to manage the liability risk of any innate downward trend in soil carbon as a result of historical land management practices.

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9 Discussion of Options

204 This section summarises the assessment of the current Kyoto approach (the status quo), and compares it with other options. In particular, it discusses the merits of the highest-scoring alternative forestry and land use accounting option, the 'Land in Transition' approach.

205 Issues under the overall design of the Kyoto framework were discussed under the 'Problem Definition' chapter, but are expanded on here based on the Kyoto CP2 Status Quo option assessment.

Kyoto Status Quo

Issues with the Design of Kyoto

206 A key objective of Kyoto forestry accounting approach is to **incentivise new mitigation action** in addition to 'business-as-usual', defined as pre-existing land-use activities in 1990. It did this by treating **new** activities differently to *existing* activities:

- **New activity** (since 1990) = fully credited/debited under gross-net accounting
- **Existing activity** (pre-1990 or BAU) = largely factored out through net-net accounting or use of BAU FMRLs

207 This approach 'rewards' (or penalises) new actions, by defining anything that has happened since to 1990 levels as eligible mitigation. For participating Annex 1 (developed) countries, this approach established effective national accounting incentives for new forest planting (afforestation) and reducing deforestation (irrespective of whether these were devolved under an effective carbon price).

208 The problem that arises under the Kyoto accounting approach is that it defines land subject to 'new' relative to a fixed year in time (1990), creating an arbitrary classification of lands that remains fixed throughout time. This results in two classifications of forests within Kyoto accounting, each under two different accounting treatments:

- **'New' post-1989** or Article 3.3 forests and any deforestation since 1990, which are subject to full (gross-net) accounting, and
- **'Existing' pre-1990** Article 3.4 Forest Management forests, which are accounted for relative to BAU levels of harvest activity only.

Liability impacts of Kyoto

209 When combined with New Zealand's high forest planting between 1990 and the start of the first crediting cycle (2008), and the fast growth rates and relatively short harvest rotations of our planted production forests, the current Kyoto accounting approach creates:

210 Moderate-to-high emissions liabilities for New Zealand over 2021-2030, depending on future emissions projections, as our post-1989 forests reach harvest age.

211 An arbitrary emissions penalty for New Zealand resulting from the harvest liabilities from forest growth that occurred between 1990 and the start of CP1 (2008), for which we were

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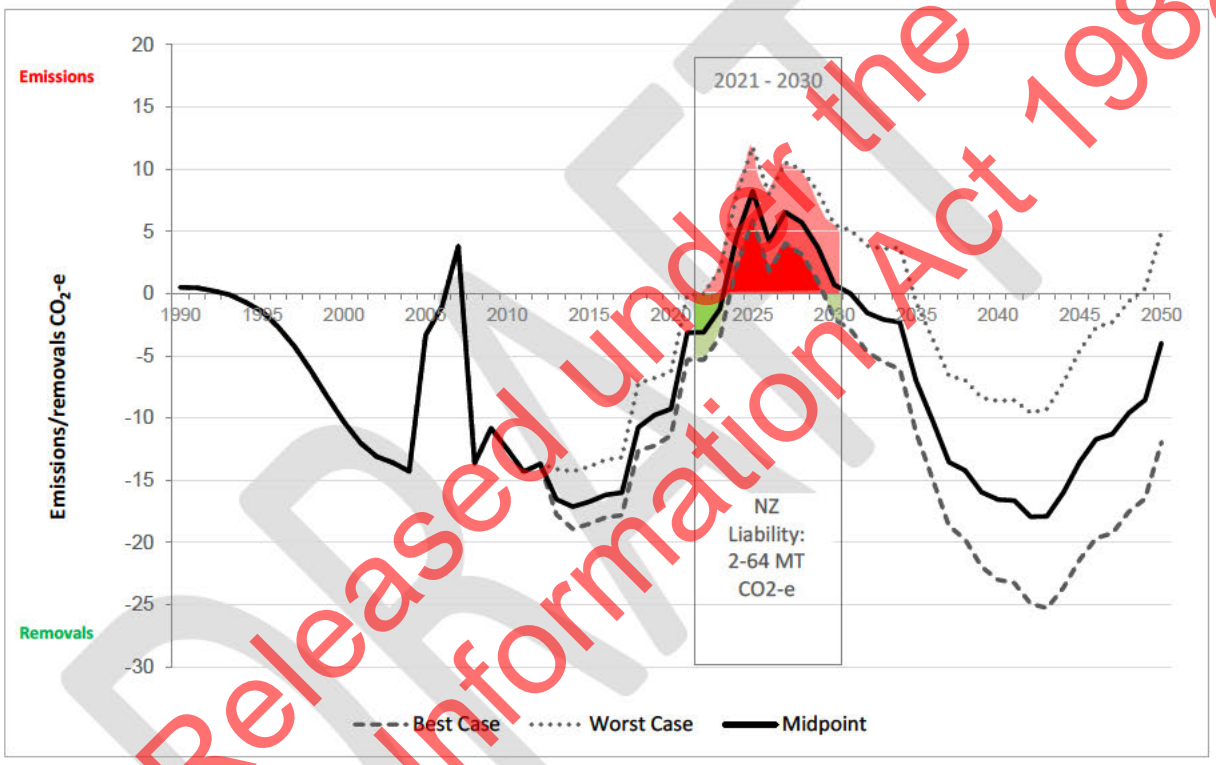
never credited (this was addressed by the ARDC rule, which was discontinued internationally after CP2).

212 An inability to meet these international liability costs from our Kyoto forests after 2020, due to an inability to carry over our accumulated surplus of units from CP1 and CP2. I.e., while New Zealand is expected to hold sufficient units to 'pay back the forestry credit card' after 2020, our unit 'savings account' will be wiped if countries' national accounting balance sheets restart from zero in 2021 under the new agreement.

213 The effect of the Kyoto approach on New Zealand's liabilities is illustrated in the graph below.

Figure 31: New Zealand's Projected Net Forestry & Land Use Emissions under Kyoto CP2 rules (Article 3.3 & 3.4 BAU FMRL) under Future Emissions Scenarios



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Effectiveness of incentives under current Kyoto approach

214 The design of the Kyoto approach means that it applies an inconsistent accounting treatment to sustainable forest harvest emissions:

215 The harvest emissions of existing pre-1990 forests is able to be accounted for under a BAU reference level, which removes the legacy effects of past management and uneven age class distributions, and imposes no carbon liability for business-as-usual sustainable forest harvest.

216 The harvest of post-1989 forests however is accounted for in the same way as deforestation emissions – i.e., it is fully debited, even though the carbon stock loss is not permanent but will be restored as the forest is replanted and re-grows.

217 This approach creates few problems for countries with relatively low and/or constant levels of new mitigation activity (Article 3.3 afforestation or deforestation), resulting in an even age-

class distribution forest; with very slow growing, temperate forests; or selective harvest practices, which result in relatively stable emissions across multiple commitment periods.

218 In countries such as New Zealand, however, the rapid growth and cyclical harvest emissions of our short rotation planted forests create significant difficulties for managing forest emissions over short commitment periods, particularly where no carry-over or banking of units is possible.

219 Over time, the Kyoto approach creates a perverse accounting incentive to reduce the harvest of our sustainable production forests, even when their carbon cycle is neutral over the long-term, and the products of harvest contribute to mitigation across the broader economy (e.g., through material substitution, biofuels) or to broader sustainable land management objectives (e.g., sustainable sources of wood, erosion control or protection of indigenous conservation forests).

220 The disincentives under Kyoto to harvest our post-1989 planted production forests will become higher under higher carbon prices.

Assessment of Kyoto Status Quo Option for our 2015 INDC

221 The assessment of the Kyoto status quo option found that aspects of the Kyoto approach will be problematic for New Zealand after 2020 against a broad number of the INDC objectives and criteria. The specific problems for New Zealand under Kyoto CP2 rules include:

- New Zealand will incur net emissions from our post-1989 Kyoto forests over 2021-2030, as these forests reach harvest age, adding around $95 million to $3 billion to the costs of our post-2020 target (at a $50 carbon price per tonne).
- While New Zealand is expected to hold sufficient surplus units by 2020 to pay the international liability costs of our Kyoto forests after 2020, our expected inability to carry over our accumulated surplus of units from CP1 and CP2 means that we pay 'twice over' for this harvest.
- A significant portion of our post-1989 forest harvest liability could be considered to be an arbitrary and 'unfair' accounting penalty that arises for New Zealand as a result of our unusually high new forest establishment and growth that occurred between 1990 and the start of CP1 (2008), for which we were never credited, but which incurs full emissions liabilities on harvest. (This issue was acknowledged and addressed by the ARDC rule, but this was discontinued internationally after CP2).
- Over the long term, the peaks and troughs of New Zealand's emissions liabilities will create a 'boom and bust' cycle in the government's fiscal liabilities under any climate change commitment, which will be difficult to manage across commitment periods. The right to carry-over surplus between commitment periods will becomes critical beyond 2030 (when we start to re-accumulate credits under Kyoto rules), but is not assured under the new agreement.
- Where devolved, the Government's fiscal liability for our post-1989 forests becomes an ETS liability for forestry participants, but with limited carbon benefits for them over future rotations unless they reduce their harvest. This creates a domestic carbon price incentive that works against the sustainable harvest of our production forests that will become more severe if the carbon price rises.

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- ETS harvest liabilities for post-1989 forestry participants becomes a financial risk for them under high carbon prices if they do not hold enough units for their harvest liabilities. This also creates a potential ETS default risk for the government.
- Two parallel accounting systems for pre-1990 and post-1989 forests, including as reflected in deforestation liabilities, may be seen as increasingly unfair and untenable over time.

222 As the Status Quo option, however, continuing to apply the current Kyoto CP2 approach after 2020 would also bring with it some substantial benefits, both as a result of maintaining New Zealand's existing reporting and ETS systems and processes, and as a means of strengthening international support behind the Kyoto model relative to other, worse alternatives.

223 For these reasons, it is recommended that the current Kyoto status quo approach be weighed against the best alternative option, and the approach to our INDC decided based on a full consideration of the broader objectives, as well as strategic, tactical and domestic considerations.

Highest Assessed Alternative Option to Kyoto Status Quo

224 The assessment of options identified the 'Land in Transition' (aka 'international averaging' or 'extended use of BAU reference levels') to be the highest assessed alternative option to the Kyoto Status Quo. The reasons for this are explained below.

225 A core function of an effective accounting system is to recognise and incentivise new actions over and above business as usual.

226 Despite the issues arising for New Zealand under the current Kyoto approach, the configuration of the Article 3.3 and 3.4 framework had the right underpinning idea – to incentivise new human actions to reduce emissions, beyond ore-existing activity levels.

227 The Kyoto rules however were arguably not well configured for the long term, for high land-use change countries, or for very fast (or slow) forest growth rates. For incentives to be effective, targeted and efficient, they need to be able to distinguish 'new' action from 'existing' BAU activity on a more dynamic basis – not a fixed, historical point in time.

228 An alternative approach, explored under the 'Land in Transition' options (Options 12-14), extends the application of Reference levels more broadly, as the basis for a more cost-effective approach to forestry and land-use.

229 When combined with the introduction of land use transitions between land categories, this modified Kyoto approach would address some of the key flaws in Kyoto accounting, by introducing more dynamic definitions and treatment of 'new' activities versus 'existing' activities than simply using a fixed base year. It would also offer flexibility to define how long an activity should be credited or debited as 'new and additional' – i.e., excluded from the BAU baselines – this could be explored under 'Future work' (see final chapter).

'Land in Transition' – Extending the Use of Reference Levels through a more dynamic definition of 'new' versus 'existing' activity

230 The 'Land in transition' approach extends the use of BAU Reference levels to all mature, fully grown forests though the use of a more dynamic definition of 'new' versus 'existing' activity – the attainment of the long-term average carbon stocking effect of new activities – to enable

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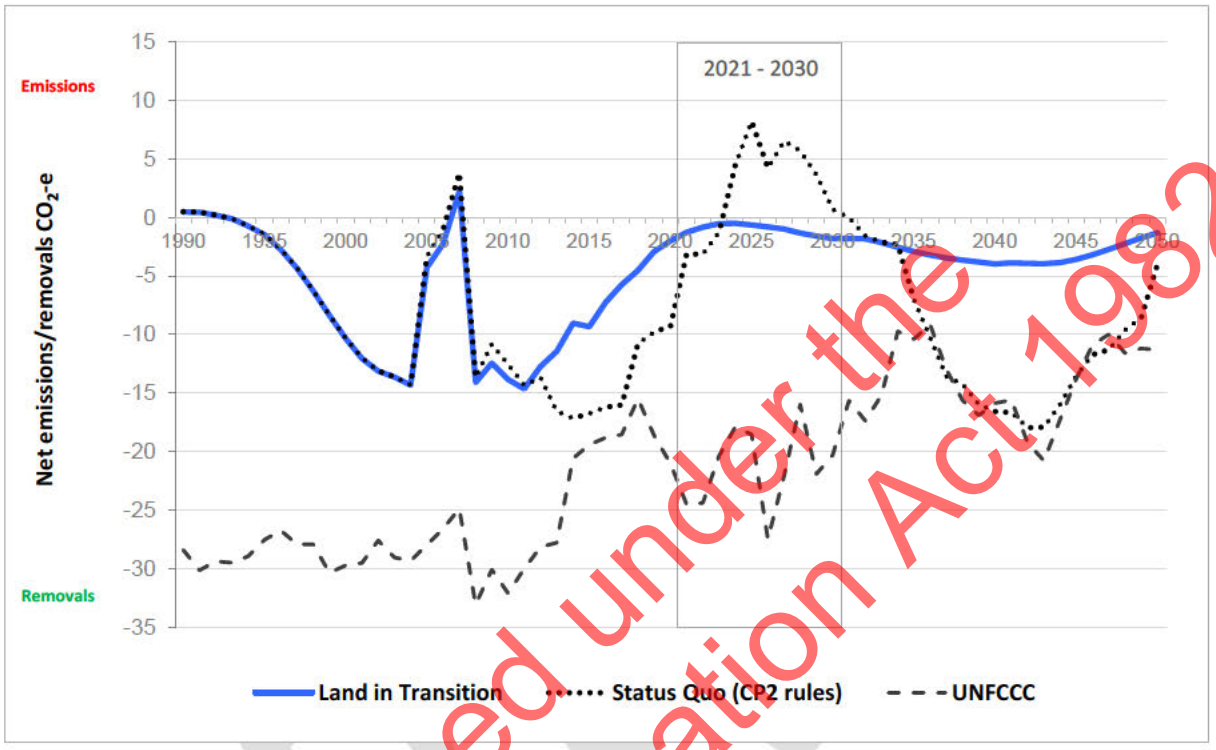
land use transitions out of the full carbon accounting 'gross-net' approach, into the BAU accounting category. **(See under Options 12-14 for a full description of the Land in Transition approach.)**

Figure 32: New Zealand's net forestry and land use emissions under different rule scenarios (midpoint projections)



231 The functional effect of the land in Transition approach is that it would provide a method for smoothing out the temporary, cyclical ups and downs of harvest and re-growth of plantation forests, while maintaining the same overall level of credits. This would maintains the best aspects of Kyoto, while avoiding some of its key pitfalls. The potential benefits of Land in transition include the following:

- **Enables Government to better manage fiscal risks** – Crediting up to the long-term permanent average carbon effects of actions provides a method for smoothing out the temporary, cyclical ups and downs of harvest and re-growth of plantation forests, while maintaining the same overall level of credits. This will enable the Government to better manage the fiscal and economic costs of production forest cycles across multiple commitment periods, particularly in light of uncertainty on whether we will have the ability to 'bank and borrow' units across commitment periods, using carry over.

- **Integrates pre-1990 and post-1989 forests over time** – Removes the permanent split between pre-1990 and post-1989 forests, by replacing the current rigid 1990 definition of eligible afforestation with a more dynamic, updatable definition of 'new' action.

- **Reduces costs on New Zealand over 2021-2030** – Avoids the liability costs on New Zealand over the 2020s under Kyoto CP2 rules, which debit the harvest of our fast growing forests, and penalise us for the inability to carry over surplus achievement from pre-2021. The Crown would no longer have to carry the fiscal risk of the forest growth & harvest crediting

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and debiting cycles being misaligned with the commitment crediting periods, combined with uncertainty around future rules on carry-over.

- **Enhances environmental integrity** – Builds strongly on Kyoto accounting principles, and should gain increasing environmental credibility over the long term, as it becomes clear that only new actions are credited, and only once. Crediting up to the long-term average also means that forestry crediting better reflects permanently stored carbon. All credits earned are for real, additional, permanent effects – gives a very solid, high integrity approach, likely to be more durable, and less subject to a cap. Each credit works hard – it must represent additional action.

- **Supports sustainable production forests** – Extending a BAU reference level to all fully-grown forest (not just pre-1990 forests) allows sustainable harvesting of planted production forests without penalty, and removes the perverse accounting incentive under CP2 rules to reduce the sustainable sourcing of renewable fibre and fuel from post-1989 forests.

- **Protects New Zealand's timber industry from high carbon prices** – Would ensure that future high-carbon prices would not prevent NZ from sustainably harvesting its post-1989 planted production forests (as could occur under the Kyoto CP2 approach of fully debiting harvest) – particularly on second and subsequent rotations of post-1989 forest.

- **Addresses loss of ARDC** – Avoids the high liability costs on NZ under CP2 rules due to our high rates of new forest planting between 1990 and the start of the first crediting period (CP1), exacerbated by the discontinuation of the ARDC rule.

- **Reduced ETS default risk** – If devolved to the ETS, much reduced risk to Crown (relative to status quo) that post-1989 foresters will default on their harvest liabilities after 2020 under high carbon prices Fully crediting only the first rotation of new forests (and subsequent rotations over-and-above the average only) will help to ensure that accounting incentivises genuinely new afforestation and new management, ensuring the most emissions reductions for any given quantify of units issued.

- **Avoids potential future loss of international credibility** – Avoids re-crediting the same forest over and over again. Has very high integrity compared to other accounting treatments.

- **Reduces uncertainty from future rule changes** – Avoids NZ banking on the assumption that, even though we pay a large debit over the 2020s and 2030s for our post-1989 forests under Kyoto CP2 rules, in the 2040s we will again accrue a large credit for these same forests. By 2040, it is quite possible that the 1990 start year will be abandoned as too old, and our early 1990s planting boom would no longer earn credits for us in the 1990s.

- **Makes other accounting rules more achievable** – By modifying the existing rule set, supports the principle of improvement/progression on the current Kyoto system, which may create scope to improve the current treatment of Agriculture, or to better recognise e.g., biodiversity (e.g., through tree weed exemptions).

- **Lower operational costs** – Operational costs around harvest returns, and managing ETS defaults, could be much lower.

- **Need not be complex to implement** – A simply proxy for averaging may be possible: for example, just crediting up to 26 years, instead of the current 28, may be sufficient to implement both averaging and HWP changes.

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- **Core carbon profitability of afforestation maintained** – as most of the carbon benefit is earned on the first rotation in any case. International accounting would continue to provide full credits and incentives for new afforestation on the first rotation or establishment of new forest, up to the same net amount of credits that would have been earned for the entire rotation of the forest under the current Kyoto approach (once harvest liabilities are taken into account).

- **Increase ETS participation** – Changing the high-risk, cyclical crediting/debiting approach of Kyoto to Afforestation/reforestation may help to support greater participation in the ETS over the long-term. No units would need to be surrendered on harvest, which could significantly reduce risks for ETS participants, and could potentially stem the tide of forest owners who are leaving the ETS in order to buy their way out of future harvest liabilities while the price is low and manage the risk of a future higher carbon price on their harvest liabilities at a later date.

- **Credits new actions for full duration of carbon effect** – Forest owners (or the Government) who decide to establish permanent, non-harvested slow-growing forests (e.g., new planting of indigenous species on DoC land or under a trust) could potentially earn international credits for a long time (e.g., 200-400 years for native to reach long-term average).

- **Incentivises net increase in forest area** – Creates incentives on the Government to continuously maintain and enhance the existing area and current carbon stocks of New Zealand forests over the long-term. Puts into practice and promotes many of our international negotiation objectives for global forestry accounting, which is that it should reward new actions and avoid arbitrary or windfall ('hot air') outcomes.

- **Achievable with minimal change to international rules** – The land-based version of 'Land in Transition' does not require an 'averaging' approach to be applied in forest crediting, because UNFCCC reporting already contains an in-built land-use transitions at either 20 years (default) or a country-specific period (28 years for NZ). Therefore, the land-based LIT option should be relatively easily and simply achieved in the negotiations through a high-level decision that Kyoto accounting principles can be applied to UNFCCC Inventory-based accounting. In the current negotiations (May 2015), this endorsement seems likely.

- **Supports long-term mitigation signal** – Directs international carbon incentives towards the future land use actions and behaviours we want to see – not retrospectively rewarding past actions. Supports ambitious action, as its high environmental integrity makes it unlikely to be capped.

- **Strengthens legitimacy of use of forest sinks towards targets.** Preserves the credibility and legitimacy of international forest offsets, avoiding risks that we will lose ability to count forestry sinks towards our target, the fungibility of our forestry units, or have to account for it in more costly ways.

Additional potential benefits of Land in Transition

232 The Land in Transition also has some additional, positive implications, that could be further explored:

- Potential for no harvest liabilities under the ETS (where similar forest replanted) – avoids debiting the temporary loss of carbon stocks associated with regular but sustainable levels of harvest.

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- Potential extension of the Flexible Land Use rule to all mature, established planation forests.
- The period of crediting for new forests would be longer for slower-growing species, such as indigenous specifies. While a *Pinus radiata* forest might not reach maturity for 28 years (giving a potential average crediting period of only 20 years), a newly established, permanent indigenous forest might in theory be credited for 100-200 years or more (international rules permitting) before it reached its long-term average carbon stock.
- Potential incorporation of HWPs in the long-term average carbon stock of forests could enable existing crediting levels for afforestation to be maintained, while still removing harvest liabilities.
- [redacted] Withhold under s9(2)(j)
- Extension of reference levels could better support future tree weed deforestation exemptions under international accounting.

233 For these reasons, the Land in transition options scored highly against most of the other objectives and criteria.

Cost Comparison of Principal INDC options

234 From a cost perspective alone, Land in Transition did not deliver the greatest amount of forestry credits. Nor is the status quo potentially the most expensive approach for New Zealand.

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Principal INDC Options for Forestry & Land Use	Total Net Emissions over 2020–2030 by Emissions Scenario		
	Best Case	Mid Emissions	Worst Case
CURRENTLY AVAILABLE APPROACHES			
New Zealand's Kyoto Protocol CP2-based Approach			
Kyoto CP2 Status Quo – 3.3 ARD & 3.4 FM (BAU RL)	2	26	64
Potential Option under Current Kyoto CP2 Rules			
Kyoto CP2 Rules + Zero FMRL (gross-net of pre-1990 forest) + 3.5% cap	-21	-21	-21
GGH Inventory-based Approach			
UNFCCC based accounting – No special rules – Net-net on 1990	-104	71	185
THEORETICAL ALTERNATIVE APPROACHES			
International Averaging - No HWP			
'Land in Transition' – Land use transitions at average carbon to BAU RL	-35	-10	26
International Averaging - Potential HWP & base year effects			
'Land in Transition' + Roll-over at 28 years (proxy for inclusion of HWP within Average carbon stock) – 1990 start	-100	-74	-38
'Land in Transition' + Roll-over at 28 years – 2005 start[14]	-34	-8	28
Maximum Crediting Approaches – Gross-net			
Kyoto CP2 Rules + Zero FMRL (gross-net of pre-1990 forest) + No Cap	-176	-152	-114
UNFCCC based accounting + Full carbon accounting of FOLU offset	-388	-213	-95

[14] Note, the use of a 28 year roll-over point may not provide a good proxy for the inclusion of HWP effects if a different base year (and therefore activity start year) is used.

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Alternative INDC options to Land in Transition

'No rules Option' – UNFCCC Inventory-based accounting

235 The most widely recognised, legitimate alternative to Kyoto accounting is the GHG Inventory-based option (Options D.6 and D.7).

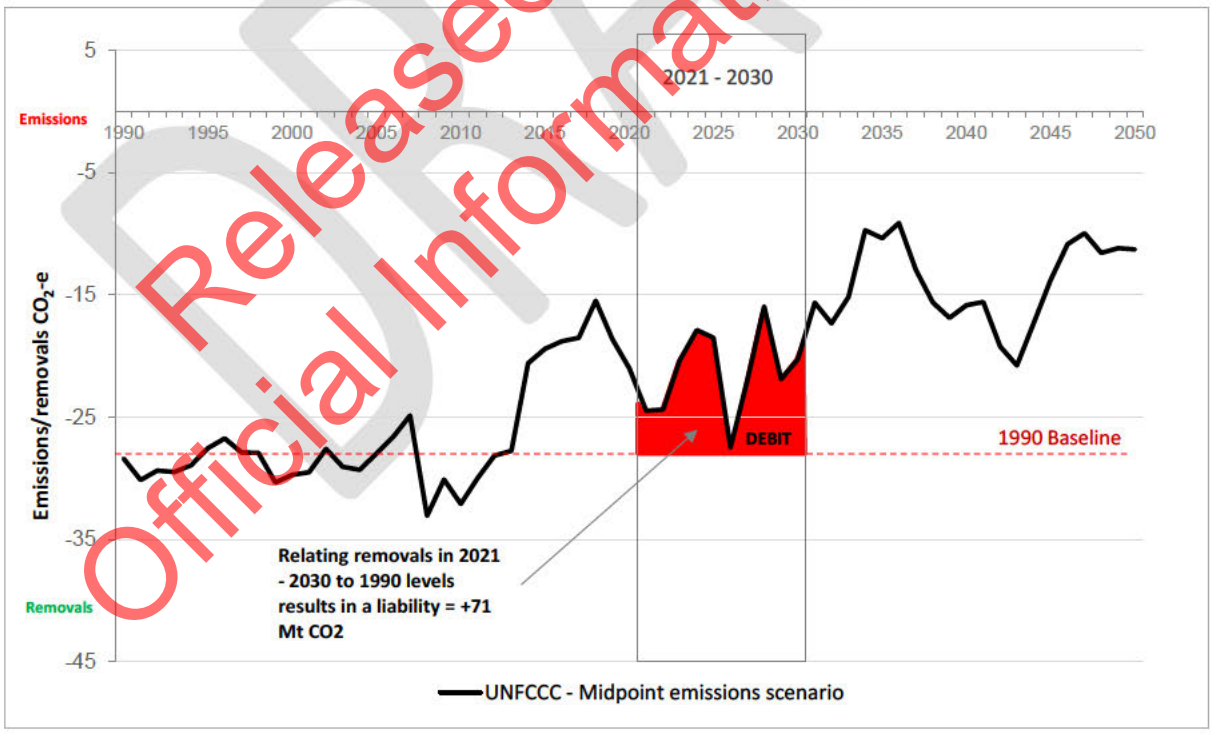
236 This approach would treat forestry and land-use like all other sectors of the economy, without any special accounting rules.

237 A net-net GHG Inventory approach could be the easiest approach for New Zealand to explain, and defend in any immediate post-Paris rules negotiation process – at least in the short-to-medium term. It is similar to the approaches indicated by the US and Canada in their INDCs.

238 The issue with this approach for New Zealand – and for its longer-term integrity – is that it results in arbitrary accounting outcomes for different countries, depending on the level and trend of their forestry emissions profile in the base year.

239 As New Zealand's forests were a larger sink in 1990 (due to low levels of harvest) than are projected to be in the 2020s, net-net GHG Inventory-based accounting would create a large accounting debit for New Zealand of approximately 71 MT CO_2-e over 2021-2030 (see Figure below).

Figure 33: Projections of New Zealand's Total Forestry and Land Use Emissions & Removals under UNFCCC Reporting (includes emissions and removals from all natural and planted forests - midpoint scenario)



240 Future projections of New Zealand's emissions suggest that this approach would always be likely to deliver New Zealand a net debit under accounting, unless there were very high levels

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of new planting that could increase our removals to 1990 levels (when our large pre-1990 forest estate was in its peak growth period).

241 A more significant concern with this approach is that 'net-net' accounting only delivers credits for new activities such as afforestation 'relative' to the level of removals from those same activities in the base year. This means that we would not receive full credits for new forest planting – only for the removals by those forest that exceed 1990 levels. This approach provides poor incentives and rewards for new mitigation actions – and would permanently penalise New Zealand for its previous rates of high forestry removals.

242 This approach is not recommended for New Zealand's post-2020 accounting.

Options with Maximum Credits

243 Two theoretical accounting options were modelled which applied full gross-net accounting to all forests and land-use, without any application of the international cap on credits that currently applies under the Kyoto Protocol (both CP1 and CP2). These were the 'Full carbon accounting of forests' options (Options D.8 and D9).

244 These options were rejected on the following basis:

- **Moving to a gross-net approach would cause significant integrity and credibility problems for NZ** in the climate change arena. It is extremely unlikely any developed country would take a gross-net approach for the post-2020 agreement. [redacted] Withhold under s9(2)(j) and s9(2)(g)(i)
- **Removals would almost certainly be capped after 2020**, just as it is currently capped under Kyoto (at 3.5% of 1990 gross emissions per annum) as it would deliver a huge credit for BAU regeneration of native forest that started before 1990. This would give a credit of just -21 MT over 20210-2030 – less than the averaging approach.
- [redacted] Withhold under s9(2)(j), s6(a) and s9(2)(g)(i)
- [redacted] Withhold under s9(2)(j), s6(a) and s9(2)(g)(i)
- [redacted] it would provide NZ with significant credits – **but the accounting rewards would be focused on <u>past actions</u>** – e.g., the cessation of native bush burning, clearance and unsustainable logging before 1990 – instead of incentivising future new actions and behaviours we want to see. New forests would still be credited, but <u>all harvest</u> would be fully debited (both pre/post-1990). If devolved, some forests would earn credits – but others large debits – it would be a lottery depending on how old your forests were in 2021. All owners would be discouraged to harvest.

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- [redacted]

[redacted]

Withhold under s9(2)(j) and s9(2)(g)(i)

245 The most highly assessed approach is therefore Land in Transition. Given the potential disruption, cost and negotiation risks of any new approach, however, the section below considers the merits of shifting from the Kyoto status quo to the Land in Transition approach.

Kyoto or a New Approach?

Implications of shifting from Kyoto to a 'Land in transition' approach

246 Should New Zealand stick with the current Kyoto CP2 approach, or implement a modified approach - the 'Land in transition' approach – which scored more highly against the objectives and criteria? If so, which variant of it – the land or the activity or reference level version – or with special treatment of our permanently protected, natural forests?

247 Considerations include:

- How valuable is it domestically and internationally to continue accounting using the current Kyoto framework? Is sticking with the Kyoto status quo the most efficient and credible option?
- Is it durable is it over the long term – internationally or domestically – to have two different forest crediting systems, one for pre-1990 forests, one for post-1989 forest, operating in parallel? Is one approach better than the other?
- Do we want to continue a system of banking and borrowing units across commitments– both in Government and private registry accounts – as the best way of managing the emissions liabilities of cyclical forestry emissions and removals?
- How internationally acceptable is it to shift to a new approach? Would we simply be seen as not paying back the 'forestry credit card'?

Advantages of Retaining the Status Quo

248 As the Status Quo option, continuing to apply the current Kyoto CP2 approach after 2020 would also bring with it some substantial benefits:

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- Continues the international status quo. No major changes are required to New Zealand's current international forestry and land use accounting systems.
- No additional changes required to current NZ ETS systems, beyond those that have already arisen from the CP2 rules, or will arise from the loss of carry over beyond 2020.
- Enhances domestic policy certainty by continuing current Kyoto framework that underpins the ETS forestry settings.
- Has high international credibility (even if the future of Kyoto approaches are uncertain under the New Agreement) and meets political expectations that developed countries maintain current or better accounting standards after 2020.
- New Zealand might get its net forest sink back in the 40s, and enable New Zealand to earn significant forestry credits from its post-1989 forests for a second time round, once these attain full growth in the 2040s (provided other rules remain the same and 1990 stays the starting year for eligible mitigation activity).
- If rules remain the same, would enable NZ ETS participants to continue earning credits on second subsequent rotations of post-1989 forest, enabling them to potentially benefit from changing carbon prices or reduced harvest.
- Is based entirely on an existing agreed international accounting 'rulebook' – the 2013 IPCC KP Supplement.
- Positions our international support behind what is currently the most recognised and strongest alternative accounting approach to UNFCCC GHG Inventory based net-net accounting against 1990, which would likely impose a much higher cost on New Zealand.
- May help to keep the current Kyoto CP2 forestry rules in their exact current form, and protect them from future modification under new approaches under the new agreement (though similarly, may prevent improvement in other areas, such as post-1989 forests, or agriculture).
- May enable New Zealand to earn significant forestry credits from its post-1989 forests for a second time round, once these attain full growth in the 2040s (provided other rules remain the same and 1990 stays the starting year for eligible mitigation activity).
- New Zealand would have a strong case for arguing that net removals under Kyoto rules should remain eligible mitigation towards our commitment, and be internationally transferrable under any future international carbon market (even if overall we would face a net debit from forests over the 2020s).

Advantages of Shifting to the 'Land in transition Approach after 2020

249 There are nonetheless equally compelling reasons why we might decide to shift from the current Kyoto approach. These include:

- The Kyoto status quo will impose high costs on New Zealand in the nearer term, over 2021-2030, when liabilities are more certain to occur than possible future credits in the 2040s. These liabilities arise due to the poor suitability of the Kyoto approach to our particular national circumstances (high new planting rates in the early 1990s, and fast growing forests), and the likely inability to carry-over from the 2013-2020 period.
- Over the long term, the Kyoto CP2 accounting approach could have lower credibility and environmental integrity, as it re-credits and debits the same post-1989 short-rotation forests over and over again. It may also create significant financial liability risks for ETS

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participants, for limited ongoing carbon revenue, and result in sub-optimum levels of harvest from our sustainably managed planted production forests. Any uncertainty over whether New Zealand can continue to use a 1990 activity start year beyond 2030 could also limit the Government's ability to devolve 2nd rotation credits in future.

- From a long-term, strategic perspective, continuing to use the Kyoto CP2 accounting rules may limit New Zealand's opportunities to improve on the Kyoto framework and introduce more effective forestry and broader land sector rules.
- Adopting a Kyoto accounting approach, which is unlikely to be suitable for countries with fast growing forests or increasing land-based production, could also create barriers to developing countries advancing to full land sector accounting, and perpetuate the Kyoto two-track approach to binding commitments.
- The proposed Land in Transition approach has strong environmental integrity than the other options considered. This means it is likely to be more durable and acceptable over the long-term, which will help to protect the value, use and fungibility of our forestry units and land-based mitigation – including from future international limits or caps.
- While Kyoto potentially delivers a large sink in the 2040s (mostly on second rotation forests – provide we don't change our 1990 base year and start date) – the future international architecture is uncertain, and attempting to predict accounting rules beyond 2030 may be speculative. It may make sense to put greater weight on options that deliver best on objectives over the shorter term – e.g., the 2020s, rather than those which look potentially beneficial in the 2040s or beyond.
- It is also necessary to recognise that much of the benefit of Kyoto comes from the one-off circumstance of our high new planting spike in the early 1990s. Selecting an accounting approach to take advantage of this one circumstance rests on the continuation of the 1990 definition of eligible activity, and the permanent pre/post 1990 split – which seem unlikely to be durable over the long term (or if New Zealand shifts to a later base year). It may be wise to avoid choosing an approach standing on only one 'leg'.
- Future projections of emissions and removals also become more uncertain over time, as uncertainties start to compound. Given enough uncertainty, any approach might be preferable.
- When assessing the relative merits of seeking to maximise credits, versus minimise liabilities, not all options may have the same degree of risk. Future removals from forests may be more vulnerable to rule changes than future emissions liabilities. This is because a precedent has been set under Kyoto of 'asymmetric caps' – where the cap applies only to credits, not to debits – resulting in a greater downside risk than upside potential benefit. This suggests that adopting a conservative approach to predicted future removals future approach may minimise unpleasant surprises down the track.

250 The decision to continue the current Kyoto CP2 approach, or shift to a more effective approach for New Zealand's national circumstances, must therefore weigh the immediate, inertial benefits of conserving the status quo, against those of taking this opportunity now to limit accounting penalties for productive land use over the 2020s and improve the overall framework for the long-term benefit of land sector accounting.

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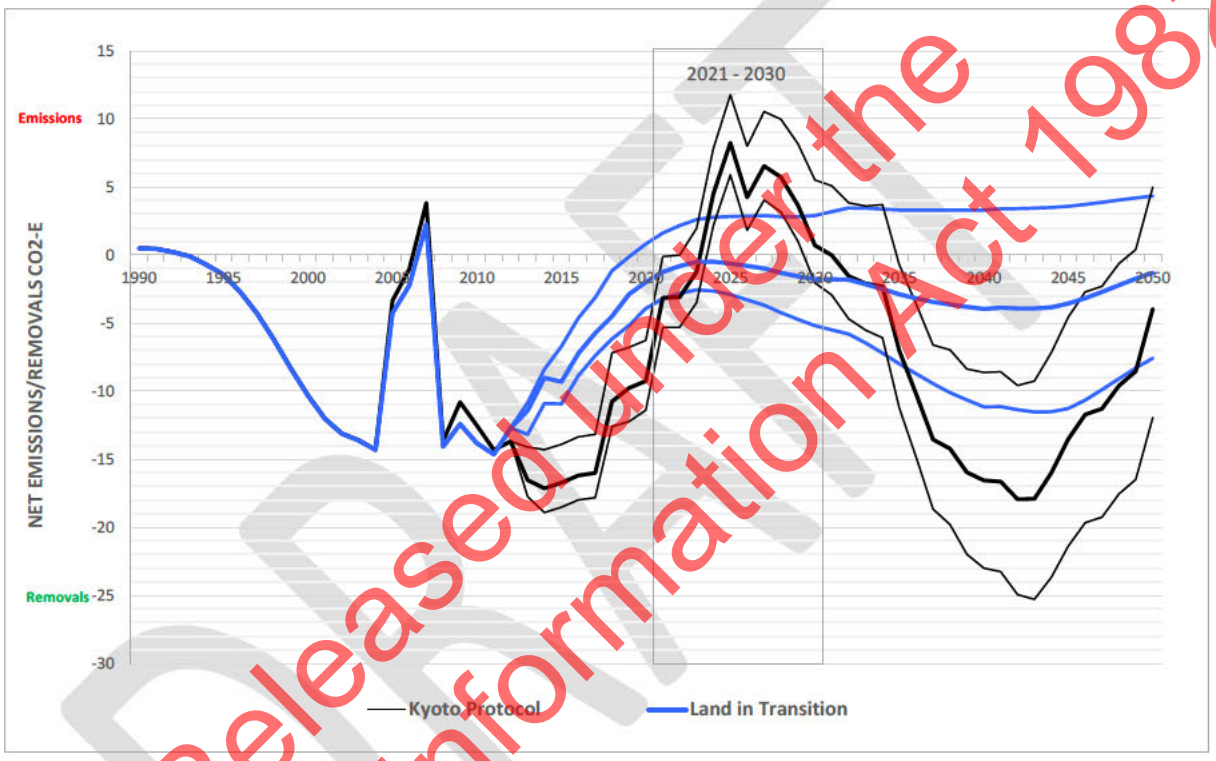
Impact of uncertainties in identifying best approach

251 From a purely fiscal cost-based perspective, the relative pros and cons of the two different approaches – Kyoto and Land in Transition – differ over time under different future emissions scenarios.

252 In particular, the relative fiscal savings created by the preferred approach relative to Kyoto different across different timespans, depending on whether you are comparing best or worst case emissions scenarios.

Figure 34: Comparison between Land in transition and Kyoto Protocol emission trends under Different Emissions Scenarios – using 20 years as proxy for the Average (MT CO2)



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253 The figure above shows that when comparing Land in Transition against the Kyoto Protocol over 2021 – 2030 the Land in Transition approach provides a saving under all scenarios. Beyond 2035 – the Kyoto approach appears to deliver greater net benefits for New Zealand.

254 A key point to consider however is the removals beyond 2030 from the Kyoto Protocol approach may be highly optimistic, as they assume that 1990 base year will continue to be the permanent definition of eligible mitigation activity. Other points to note about the future removals under the Kyoto Protocol approach after 2030 are:

- Most of this sink would have to be paid back in later years, when post-1989 forests are again harvested.
- Most of this sink is from the‘re-crediting’ of post-1989 forests on their second rotation, may not be considered wholly ‘permanent’ (as some of it is above the long-term average) or may not be considered as valid, ‘additional’ mitigation.

- It is uncertain, because it could be wiped out by any future change to the 1990 start year for eligible activity (e.g., if we shifted to a 2005 base year).

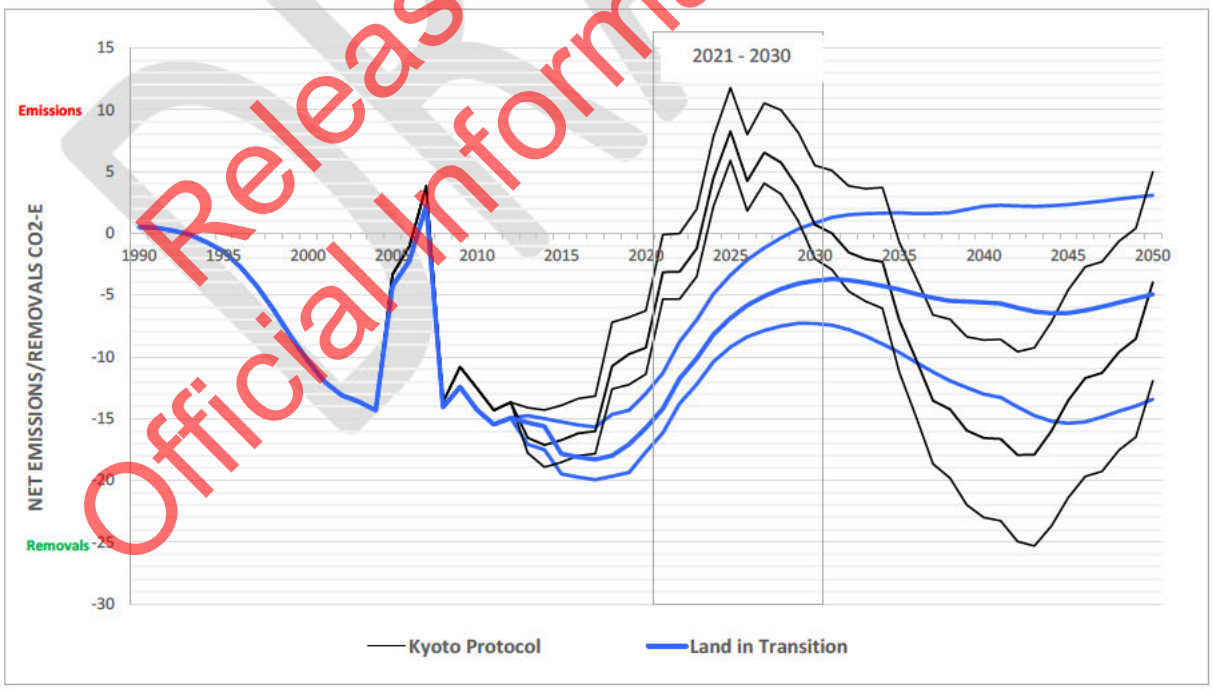
255 Other, more general considerations in making the choice include:

- Uncertainty around future rules increases over time. What rules will apply after 2030? Banking on an approach that delivers a credit over the 2040s, without knowing the start date for eligible activities, use of caps, or even overall treatment towards commitments, might be unwise.
- Durability. Costing our targets based on a fairly firm, conservative expectation of targets and rules will better support policy certainty than applying an approach where the bulk of credits would be based on a broader and hazier notion of 'mitigation' – such as including regenerating sinks under BAU or historical management.

256 While the LIT approach doesn't always provide a significant savings over Kyoto, the LIT has been modelled based on a much more conservative assumption about HWP. This is because we have not yet included any carbon storage in the HWP pool in the averaging approach modelled under Land in transition. Therefore, if we assume that HWP storage should count towards the long-term average carbon stock of forests, then the LIT approach will yield significantly greater savings that shown. In fact, whereas Kyoto credits forests up to about 28 years on average (the normal harvest age), adding in the HWP pool to the average could mean more removals.

257 The figure below shows how Land in Transition compares to Kyoto if we use 28 years' growth as the proxy for the long-term average.

Figure 35: Comparison between Land in transition and Kyoto Protocol emission trends – using 20 years as proxy for the Average (MT CO2)



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Summary conclusions on whether to stay with Kyoto or move to a new approach

258 This may not be a decision that the New Zealand Government can make in isolation of other countries' views – or independent of domestic stakeholders. At this stage (May 2015), we don't know whether any other countries will adopt a Kyoto CP2 approach.

259 We are also awaiting the outcome of the public consultations. Initial indications are however that while forestry stakeholders can perceive the benefits to the Government of an 'international averaging' approach (Land in transition), and of a voluntary domestic averaging option, they are not yet persuaded that a compulsory across-the-board change to the current ETS settings would enhance certainty or the strength of incentives for carbon forestry in new Zealand.

260 For this reason, determine our exact and detailed post-2020 forestry accounting approach not be a decision that New Zealand needs to take now, before we table our INDC. Instead, it may be possible to craft the wording of our INDC is such a way that it keeps the precise final accounting form open to revision, while setting out the bare minimum necessary assumptions. Examples of such INDC text are provided in the next chapter.

261 In the lead up to the Paris conference, however, 'staying on the fence' may not be a desirable option either. If all other developed countries adopt non-Kyoto CP2 approaches, then we may have to be 'quick and nimble' in the negotiations to promote our preferred alternative, and avoid being shoe-horned into a worse option, such as the variations on GHG Inventory-based net-net accounting on 1990 being adopted by the US, Canada and likely Australia.

Draft recommendations - D. Forestry and Land Use Accounting Options

D.1 In the negotiations, continue to work towards being able to account internationally for forestry and land use in a way that better manages New Zealand's emissions from the planting and harvesting cycles of production forests over time, and recognises sustainable forest management for its positive, long-term carbon contribution – and minimise international liabilities for sustainable harvest of all plantation forests.

D.2 When necessary to finalise our post-2020 accounting approach, indicate that we will account internationally for forestry and land use in a manner consistent with the 'Land in transition' approach over 2021-2030 (Options D.12 to D.14).

D.3 In the INDC, seek to retain optionality around the exact settings of our forestry and land-use approach, as well as its overall framing (GHG Inventory or Kyoto based) or accounting framework (land, activity or reference level-based), but clearly specify the core functional accounting assumptions that would achieve the Land in transition approach, so that the outcome is secure under any 'non-retroactivity' clause, in the event of a poor rule outcome in Paris.

D.4 In further work, continue to identify and assess the potential domestic implications of any change to the Land in Transition approach from our current Kyoto CP2-based approach after 2020, and assess the sub-options under Land in Transition (how averaging would work, [redacted], etc.), and the domestic implications.

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Choosing amongst variations

262 Further work is needed to identify which of the identified versions of the Land in Transition approach best meets New Zealand's needs:

- **UNFCCC:** Combine UNFCCC Inventory 'automatic land-use roll over' + Kyoto CP2 accounting rules (i.e., gross-net for land-use change, and BAU reference levels for 'land remaining land' categories)
- **Kyoto based:** Introduce 'land-use transitions' from Article 3.3 to Article 3.4 categories at a certain point in time (e.g., at steady state or long-term average carbon stock)
- **Reference level:** Apply a zero reference level to 'new activities' (e.g., land-use change, new policies or Article 3.3) and a BAU Reference Levels to 'existing' activities (e.g., 'land remaining land' categories, Article 3.4 land, or land under BAU management or policy).

263 A key consideration is whether it is desirable (or an option) to maintain the existing Kyoto framework, based on Article 3.3 and 3.4.

264 Another key consideration is whether we wish to combine our forestry and land use into an overall 'land sector' accounting approach, including agriculture. This would most easily be achieved through an AFOLU reference level approach to Land in Transition

Draft Recommendation – Land in Transition Sub-Options

x.x In our INDC, retain optionality (or silence) around the overall land or activity-based framing, seeking to apply the best elements of each under any future accounting approach. However, if required to choose, we should adopt the version that has the greatest chance of being accepted and durable within the prevailing negotiations. At this stage, we estimate this is the UNFCCC land-based Land in transition approach (Option D.13), as at face value, it is just a version of applying Kyoto accounting principles to the existing Inventory-based reporting categories, which other countries have also indicated they will do.

x.x In further work, consider whether any decision to apply an agriculture accounting approach would suggest that New Zealand should frame its overall land sector approach as a Land Sector Reference Level.

Differentiated forest treatment:

265 This approach could be a variation on any of the Land in transition options, which would seek to recognise the permanent long-term carbon effect of new actions (based on the long term average carbon stock effect), *including* forest management actions which alter the long-term carbon stock of a forest, for example by legally re-classifying harvestable forest into non-harvestable forest.

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266 However, establishing the additionality of all carbon increases captured by any gross-net accounting approach would be difficult – for many individual stands, it is likely that there may have been some natural regeneration or regrowth under BAU in any case. This approach could therefore potentially put at risk the environmental integrity of our accounting, by crediting BAU sinks that would have occurred anyway, in the absence of additional action or change in management. It could raise questions about countries' discretion to pick and choose different type of reference levels for different forests, and increase distrust of the valuable BAU reference level approach, that allows us to accommodate the sustainable harvest of our production forests without penalty.

267 More generally, there may be some broader risks around differentiating our conservation forests from our production forests, if it calls into question the carbon value or environmental credentials of our sustainably managed production forests.

268 Given the mitigation and co-benefits of fully recognising in accounting permanent forests which are legally protected from harvest in perpetuity, it is recommended that NZ seek international endorsement of an appropriate accounting framework to recognise, reward and incentivise the permanent protection of original forests, before including it explicitly in our INDC, to avoid putting at risk the broader forestry accounting approach (including the proposed Land in Transition approach, which is more conservative), as well as potentially the carbon value, ability to sustainably harvest, and environmental credentials of our exotic planted production forests.

Draft Recommendation – Differentiated forest treatment

D.6 In the negotiations, seek international endorsement of an appropriate accounting framework to recognise, reward and incentivise the permanent protection of original forests, without putting at risk our overall gross-net approach to forestry and land use, or the carbon value, ability to sustainably harvest, and environmental credentials of our exotic planted production forests.

D.7 In our 2015 INDC, seek to preserve the optionality for this approach, possibly through language around recognising 'permanence', without committing ourselves to it until further analysis has been undertaken, and its full potential implications and risks identified.

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10 Possible ETS implications of International Averaging

269 The chapter considers very briefly some of the possible domestic ETS implications of the Land in Transition options, which would be understood by stakeholders as an 'international averaging' approach. These implications would need to be further analysed by MPI domestic policy teams before any firm conclusions could be drawn.

Stakeholder views on Averaging

270 A domestic averaging option was previously considered by the Government but not pursued, in part because of concern at potential fiscal risk for the Government in future, because post-1989 forest owners would no longer be liable for their harvest emissions, but the Government might be. This could especially be an issue at a high carbon price, where harvest emissions could impose a high liability cost on New Zealand, but this would be devolved to forest owners making harvest decisions.

271 A further concern was that forest owners would be insulated from the carbon price, so would not respond to carbon price signals to, for example, make their forest management more efficient for carbon, extend the rotation length, etc.

272 MPI presented a possible 'international averaging' option to forestry stakeholders on 19 May 2015, prior to targeted consultations with them on the post-2020 target. Stakeholders were invited to make submissions on their views, objectives, suggestions and concerns regarding post-2020 forestry accounting, including in relation to the merits of an international averaging approach.

2011 ETS Review Finding and recommendations on Averaging:

273 The 2011 ETS Review found that post-1989 forest owners opting into the ETS receive all the sequestered carbon credits as the forests grow and face full liability for emissions at harvest. Some landowners are reluctant to join the ETS, as they are concerned that if they sell their units as they are earned (to obtain cash flow) they may have to buy them back later at a much higher price (e.g. to cover future harvest liabilities). Alternatively, landowners may be unable to meet their liabilities when required at harvest.

274 Three submitters (including the New Zealand Forest Owners' Association) suggested a relatively simple method of addressing harvest risk, called 'averaging'. Under averaging, units would be issued only up to the long-term average forest carbon stock level for carbon earned from 1 January 2008, and none would have to be paid back when harvesting occurs, provided the forest is replanted. Averaging would remove several key risks for post-1989 participants; however, the Crown would take responsibility for the fiscal cost associated with harvesting. This cost to the Crown would arise because, for a particular forest, the Crown would have only the units above the average level to meet the full harvesting liability. Credit for carbon sequestered above the average would be retained by the Government. On harvest, no return of credits from participants would be required; however, if a participant changed land use, they would still need to repay the liability capped at the amount of units received.

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Fiscal risk of Averaging for the Crown

275 [redacted]

Withheld under s9(2)(g)(i) and s6(e)(iv)

Withheld under s9(2)(g)(i) and s6(e)(iv)

279 To identify the potential full range of domestic impacts of the Land in Transition/international averaging approach, it would be necessary to consider all of the potential ways in which forest owners can currently benefit under the ETS from first and subsequent rotations of post-1989 forest, or otherwise be impacted. Some of these ways are identified below, but this analysis would need further work by MPI domestic policy and operational teams, if a decision was made to pursue an alternative international accounting approach after 2020.

280 The carbon revenue for post-1989 forests in the ETS currently comes in at least three forms:

281 **Credits earned for sequestration on the first rotation.** This is the bulk of the credits earned for production forests, but is not available on future rotations, if they are harvested. Under the current ETS design, post-1989 forest owners earn credits for 100% of [above-ground] tree growth, but have to surrender only about 70% of the units earned, reflecting that about 30% of the forest is left behind on site as harvest residue, where it decays gradually over time. This decay offsets some of the growth of the second rotation, with the result that credits earned on the second rotation are reduced, and not much more than the expected harvest liabilities.

It is currently not clear how many post-1989 forest owners will remain registered in the ETS for their second rotations, having already gained the first-rotation benefit, if they will only earn the same amount of units on the second rotation that they would need to surrender, on

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harvest. This process may help owners with multiple forest stands, with an approximate even age class distribution overall, to manage their liabilities. But there will be limited net gain in carbon on future rotations, if their management and rotation length remains the same.

282 **Inter-rotational arbitrage (or benefiting from the value of money now, versus in the future).** Where forest owners receive units for a second rotation forest, it is possible they may sell or surrender the units to pay the liabilities of other forest stands they own, and then buy back the units needed for harvest liabilities at a cheaper price at a later date, closer to harvest time. This crediting, selling, re-buying and surrendering approach to each subsequent growth and harvest cycle has some potential issues:

- It risks forest owners gambling, selling units early in hope of greater returns down the track, and then potentially not being able to afford to harvest
- It creates a default risk for the Crown if the forest owner cannot afford to re-buy the units
- It potentially creates a strong incentive on some forest owners not to harvest, but to leave the forest standing, which would reduce sustainable harvest levels and wood production.

283 Credits earned for improved forest management or minimising harvest emissions, including over multiple rotations.

Impact of changing current ETS approach to Land in Transition

284 Land in Transition would still support the same carbon revenue opportunities for first-rotation forests, but with credits able to be earned up to the average carbon stock only.

285 Land in Transition would limit most carbon benefits from second and subsequent rotations, and from any form of 'inter-rotational arbitrage' (taking advantage of changing carbon prices), because it doesn't credit the second or subsequent rotations of new forests. (These benefits might also be rules out by any change to New Zealand's base year and the overall start date for eligible activity.)

286 Limiting benefits from future rotations is arguably a positive benefit of the LIT approach. Under Kyoto, if a forest owner harvests their post-1989 forest as usual, there may be very limited gain from future price increases, as they would just have to pay back most of the credits they had earned for the growth of the forest. While the projections indicate that, all else being equal, the Kyoto status quo approach could enable post-1989 forest owners to earn significant credits in the 2040s, from earning credits on their second rotation, these credits might be worth very little if they still plan to harvest. Alternatively, if they sold the units for cash before harvest, they are looking at an even higher harvest cost, a risk of default, and either way, a liability hanging over their land.

287 So while the potential for arbitrage under the current ETS approach is a financial benefit for foresters, over very long timespans, it incentivises forest owners not to harvest on the second rotation, if carbon prices would make it economic. This means that when faced with a choice between sustainable timber, and mitigation, mitigation would win.

288 LIT could equally support the benefits of enhanced management of future rotations above, but it would not distinguish between forest management of pre- and post-1989 forests. This

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means that, whereas under the Kyoto approach, the benefits of enhanced Forest management are only available to pre-1990 forests, under LIT, these benefits could either be available to all or no owners of mature (post-average) forests.

289 LIT therefore offers to retain the first time hit of credits for the first rotation, as under the current approach, if only to the average, and it could be supplemented by credits for forest management activities, which could apply equally for pre & post-89, on a voluntary participation basis, without the current arbitrary forest split.

Possible future direction for forestry in the ETS

290 ETS forestry settings are intended to incentivise increases in stored forest carbon. Planted forest make an important and positive contribution to mitigation – they contribute to permanent carbon sequestration both on an average level over the long term, and taking HWPs into account. However, the temporary ups and downs of cyclically harvested forests are not permanently stored carbon.

291 Fundamentally, the design of the future forest accounting system must answer the question, 'How can we have an accounting system that, even at really high carbon prices, supports and allows for sustainable forest harvest?'

292 At present, new plantings of fast-growing production forests have a carbon advantage over permanent forest establishment. This encourages new forest area, because of the higher carbon returns for production forests - but it always has a sting in the tail – harvest liabilities - for whoever is left holding the bill – whether the government, or the forest owner. The cost of this future sting – at unknown future carbon prices – remains impossible to know in advance, and the shadow of this uncertainty – combined with policy and regulatory uncertainty under the ETS, hangs over all carbon forests in New Zealand.

293 Meanwhile, [redacted], from pre-1990 forests – we have succeeded in securing under Kyoto a different accounting approach that creates incentives without penalising sustainable harvest – the BAU reference level – but this only applies to pre-1990 forests. The sting in the tail from this approach is that is also makes it difficult to claim any carbon benefit for non-harvested pre-1990 forests – e.g., our significant DoC estate, and potentially privately covenanted land. Due to the difficulty of identifying the previous long-term carbon trajectory of forest before it became protected from harvest, this benefit may not be able to be achieved under any accounting approach with an acceptable level of environmental integrity and additionality. Nonetheless, it deserves closer attention, in particular to observe how other countries seek to recognise and incentivise the permanent protection of standing forests, including under REDD+.

Withhold under s9(2)(j)

294 In conclusion, the proposed new approach, by exempting temporary, non-permanent dips and fluctuations – and by ensuring that *sustainable* harvest is exempt from liabilities, but that changes in the overall long term carbon balance are fully credited or debited – would more fully recognise the value of sustainable forest management and harvest. Depending on future analysis, and international rules, it may also potentially be able to recognise the value of the slowly incrementing carbon stock in our permanently protected forests, both public and private – but that will depend on future international developments.

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For noting only **– ETS Implications**

Note:

1 that the Kyoto accounting approach will impose significant harvest liabilities on the government and ETS forestry participants over the 2021-2030 period, and is expected to be of limited benefit to most post-1989 forest owners on future re-planting cycles, as few net credits are earned over and above harvest liabilities on second and subsequent rotations.

2 that while existing Kyoto approach is projected to produce a large sink over the 2040s, the future uncertainties around the 1990 eligibility baseline, accounting rules, carry over between commitment periods, as well as the international durability of the Kyoto-based model, means it may be difficult to realise these benefits for forestry owners over the long run.

3 that the proposed new approach, which only credits permanently sequestered carbon, avoids any borrowing across commitment periods and does not require units to be paid back on harvest, provides a much lower risk approach to forestry crediting for the government and forestry ETS participants, with improved cost-effectiveness and support for land management co-benefits such as sustainable forest management and, potentially, more flexible land use.

4 that there is no automatic need for the Government to devolve any new international forestry accounting approach, but that adopting a new international approach will likely mean that divergences with the current ETS entitlements and liabilities could create both fiscal risks and benefits for the Government over long time scales, [redacted]

Withhold under s9(2)(g)(i)

5 that devolving the new approach to the ETS could prevent post-1989 forest owners from earning credits on their second and subsequent rotations, unless they significantly changed their forest management from BAU – and that for them to do so under a devolved 'Land in Transition' approach would require Forest Management (pre-1990 forests) also entering into the ETS from 2021.

6 that international expectations under the new agreement may also require New Zealand to account for its agricultural soils after 2020, and that this could also be a potential misalignment with current ETS settings.

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11 Summary of Recommendations

295 The table below sets outs the recommendations made in this report.

Recommendations

A. Overall treatment within the target

A.1 In our post-2020 commitment, continue to include forestry and land use within the quantified, economy-wide target (Option A.1).

A.2 In our 2015 INDC, specify that net emissions and removals from FOLU (or AFOLU, if appropriate), estimated over the commitment cycle using the indicated approach to the land sector, will be excluded from the base year and carbon budget, and added or subtracted to accounting during the commitment period as appropriate.

B. Treatment as an offset

B.1 In our post-2020 commitment, continue to treat forestry and land use as an overall offset counted towards the quantified, economy-wide target (Option B.1).

B.2 In our 2015 INDC, state that we will continue to treat FOLU as an offset, to be clear that our accounting will not apply the less favourable net-net approach.

B.3 If an accounting approach is applied to the entire AFOLU sector, and there is a strong preference to AFOLU in the base year emissions used to calculate the carbon budget, then further analysis could be done on the feasibility of the 'net-net' Land sector reference level approach (Options C.3 and D.11).

C. Land vs Activity-based approach

C.1 In the ongoing negotiations, work towards an approach that combines the best of both systems – the anthropogenic and activity-focused approach of Kyoto, including its special provisions, combined with the principle of land use transitions from the UNFCCC land based approach – while seeking to minimise any cost and disruption from unnecessary change to existing reporting and ETS systems.

C.2 In the 2015 INDC, indicate that we will adopt either a land or an activity-based approach (as the EU have done), to preserve our options.

D. Forestry and Land Use Accounting

D.1 In the negotiations, seek to account internationally for forestry and land use consistent with the 'Land in transition' approach (Options D.12 to D.14).

D.2 In the INDC, retain optionality around overall land or activity-based framing, but clearly specify important functional accounting assumptions to achieve the Land in transition

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approach, so that the outcome is secure under the expected 'non-retroactivity' clause, in the event of a poor rule outcome in Paris.

D.3 In further work, assess the sub-options under Land in Transition (how averaging would work, [redacted], etc.), and the domestic implications.

Withhold under s9(2)(j) and s9(2)(g)(i)

Land In Transition Sub-Options

D.4 In our INDC, retain optionality (or silence) around the overall land or activity-based framing, seeking to apply the best elements of each under any future accounting approach. However, if required to choose, we should adopt the version that has the greatest chance of being accepted and durable within the prevailing negotiations. At this stage, we estimate this is the UNFCCC land-based Land in transition approach (Option D.13), as at face value, it is just a version of applying Kyoto accounting principles to the existing Inventory-based reporting categories, which other countries have also indicated they will do.

D.5 In further work, consider whether any decision to apply an agriculture accounting approach would suggest that New Zealand should frame its overall land sector approach as a Land Sector Reference Level.

Differentiated forest treatment

D.6 In the negotiations, seek international endorsement of an appropriate accounting framework to recognise, reward and incentivise the permanent protection of old growth forests, without putting at risk the carbon value, ability to sustainably harvest, and environmental credentials of our exotic planted production forests.

D.7 [redacted]

Withhold under s9(2)(j) and s9(2)(g)(i)

D.8 In our 2015 INDC, seek to preserve the optionality for this approach, possibly through language around recognising 'permanence', without committing ourselves to it until further analysis has been undertaken, and its full potential implications and risks identified.

E) Accounting Coverage

E.1 In the ongoing negotiations, seek to ensure that requirements for expanded coverage are subject to the availability of adequate national estimates, and materiality considerations.

E.2 In the 2015 INDC, indicate that the comprehensiveness of accounting will be expanded to include Grazing land management and Cropland management (or their land-based equivalents), only, on the assumption that adequate national estimates will be available by 2021 to commence accounting of anthropogenic management effects on soil carbon stocks relative to baseline trends.

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F) Treatment of Other Land Uses

F.1 In the ongoing negotiations, seek to apply the Land in Transition approach indicated for forests to other land use categories as well, which would apply BAU reference levels to land management categories ensure accounting incentives are low-cost, while accommodating national circumstances (historical background trends), mitigation potential, materiality considerations and the need to balance multiple land management objectives.

F.2 In the 2015 INDC, if a decision is made to expand accounting coverage, reserve the right to apply an appropriate reference level approach to any additional land use categories, such as BAU reference levels to managed lands, to manage the liability risk of any innate downward trend in soil carbon as a result of historical land management practices.

For noting only

ETS Implications

1 Note that the Kyoto accounting approach will impose significant harvest liabilities on the government and ETS forestry participants over the 2021-2030 period, and is expected to be of limited benefit to most post-1989 forest owners on future re-planting cycles, as few net credits are earned over and above harvest liabilities on second and subsequent rotations.

2 Note that while existing Kyoto approach is projected to produce a large sink over the 2040s, the future uncertainties around the 1990 eligibility baseline, accounting rules, carry over between commitment periods, as well as the international durability of the Kyoto-based model, means it may be difficult to realise these benefits for forestry owners over the long run.

3 Note that the proposed new approach, which only credits permanently sequestered carbon, avoids any borrowing across commitment periods and does not require units to be paid back on harvest, provides a much lower risk approach to forestry crediting for the government and forestry ETS participants, with improved cost-effectiveness and support for land management co-benefits such as sustainable forest management and, potentially, more flexible land use.

4 Note that there is no automatic need for the Government to devolve any new international forestry accounting approach, but that adopting a new international approach will likely mean that divergences with the current ETS entitlements and liabilities will create fiscal risks for the Government over long time scales, [redacted].

Withhold under s9(2)(g)(i)

5 Note that devolving the new approach to the ETS could prevent post-1989 forest owners from earning credits on their second and subsequent rotations, unless they significantly changed their forest management from BAU – and that for them to do so under a devolved 'Land in Transition' approach would require Forest Management (pre-1990 forests) also entering into the ETS from 2021.

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6	Note that international expectations under the new agreement may also require New Zealand to account for its agricultural soils after 2020, and that this could also be a potential misalignment with current ETS settings.

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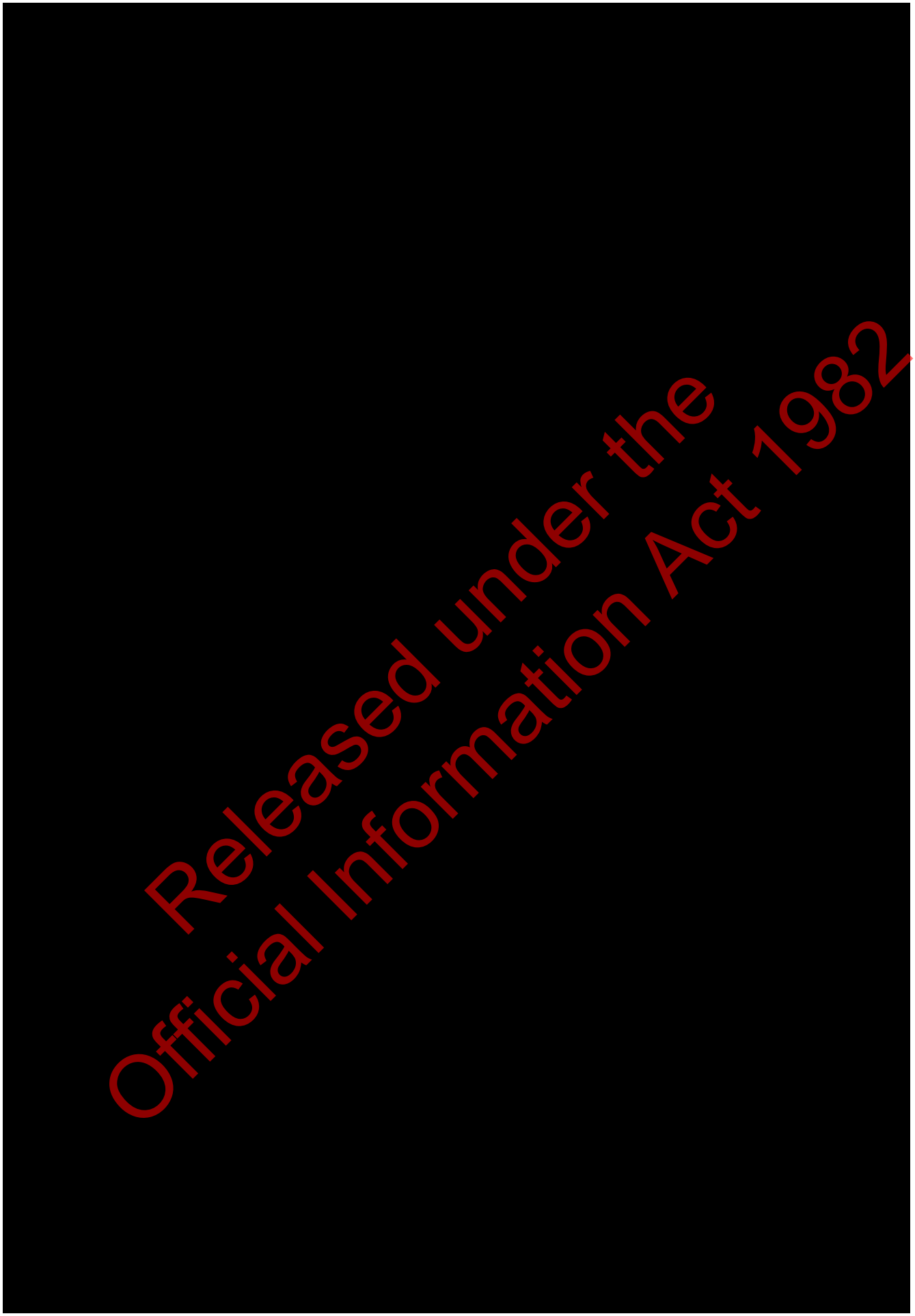

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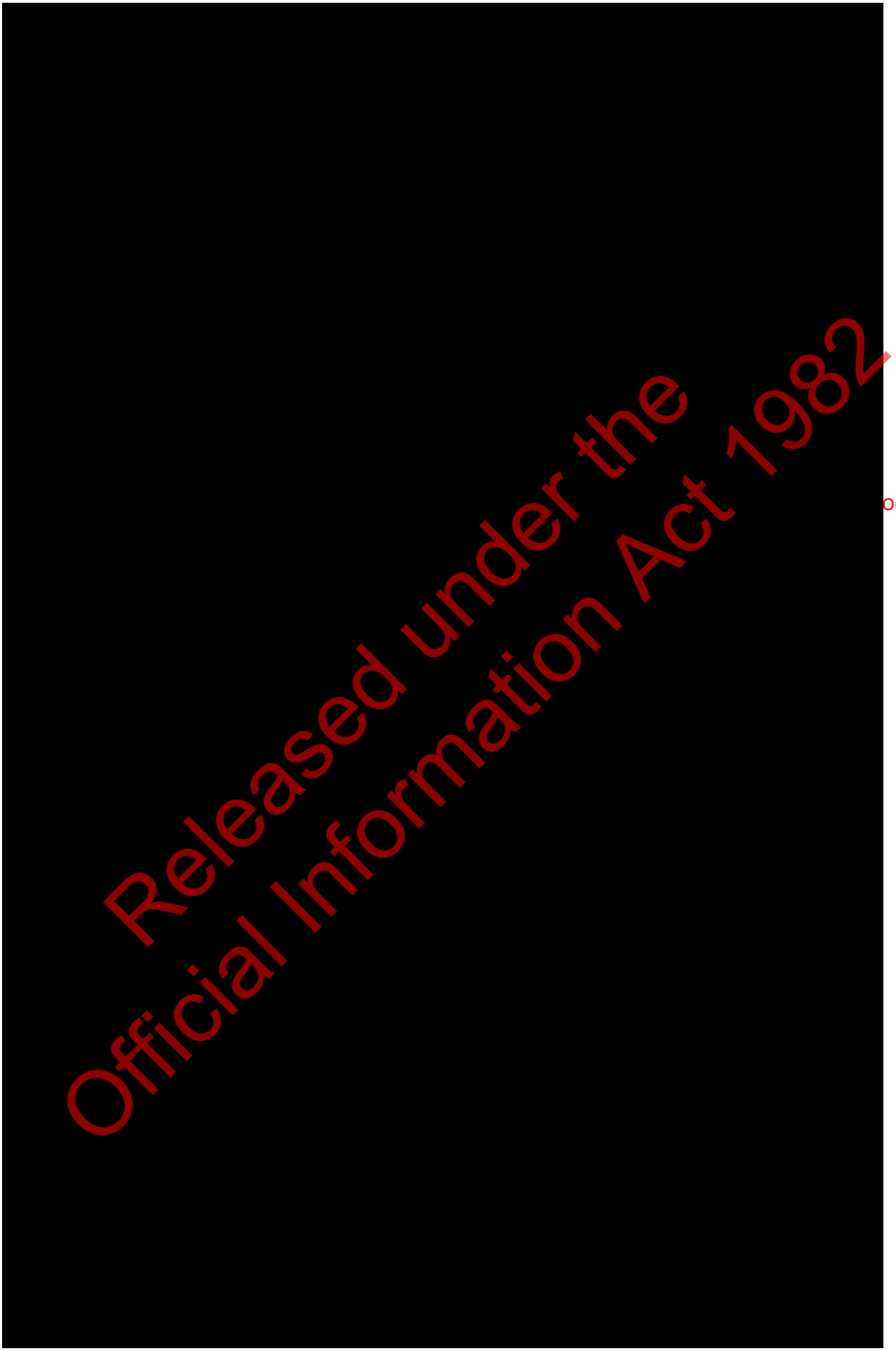

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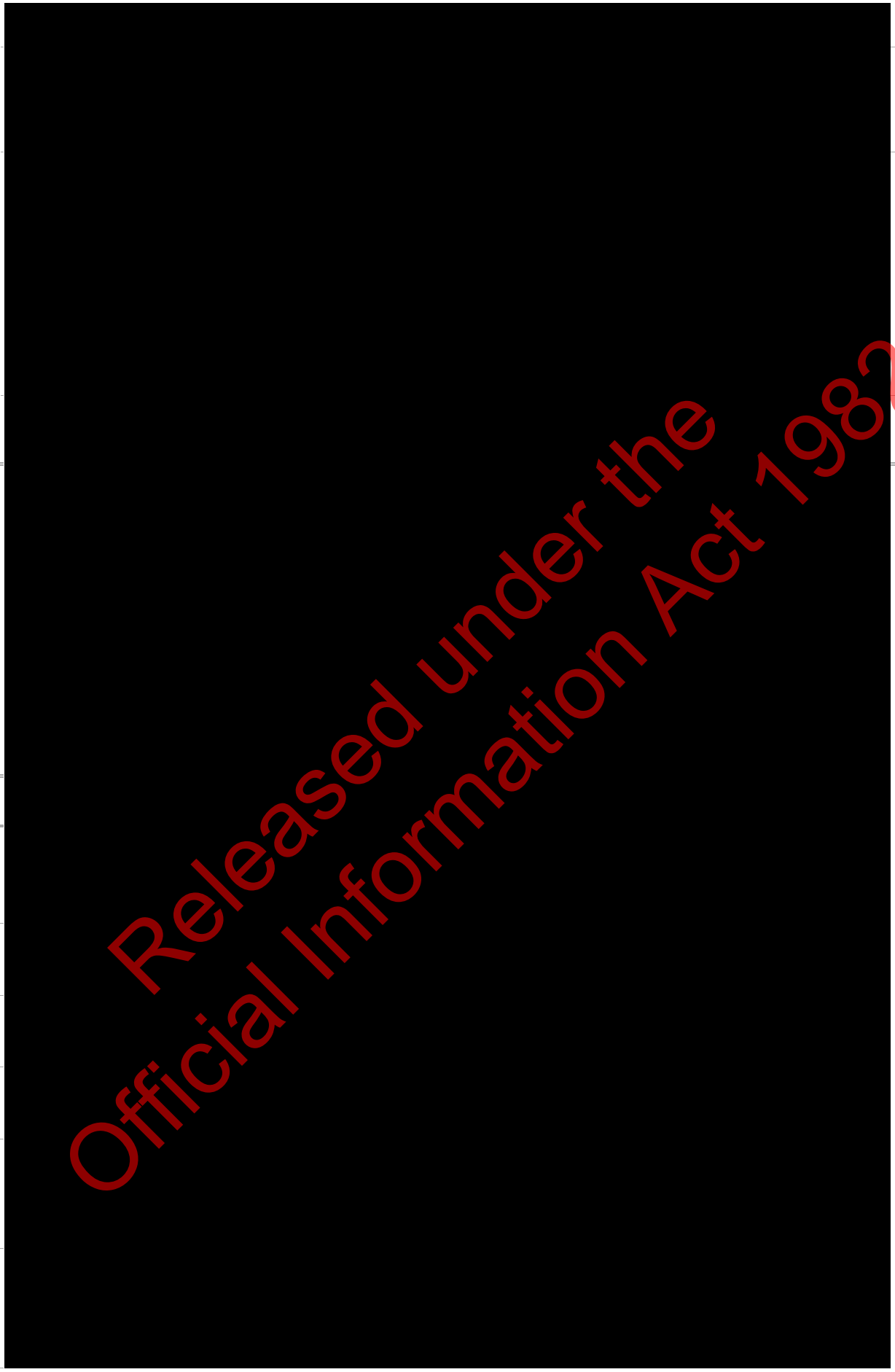

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13 Future Work

Refinement of Land in Transition Approach

Confirming 'Land in Transition' version preferences

304 Future work will be needed explore potential variations on the 'Land in Transition' option, if this is confirmed as the preferred approach.

305 The 'Land in Transition' concept involves crediting/debiting land in transition (i.e., land undergoing land use change or new management effects) up until to steady state only (e.g. until the long-term carbon effect has been achieved), and then transferring this land to under a BAU reference level. The main functional change resulting from this approach is that accounting incentives distinguish between 'new' versus 'existing' actions – applying full incentives or crediting/debiting to new and additional action but only relative, or marginal incentives to the existing sustainable land uses.

306 This approach can be applied under either a Kyoto or UNFCCC reporting framework, or can be presented as a 'reference level' approach. A distinction could also be introduced between different types of mature forests – but noting that this would need a full risk assessment for broader negotiation objectives.

307 Further work is needed to identify which of the identified versions of the Land in Transition approach best meets New Zealand's needs:

- **UNFCCC:** Combine UNFCCC Inventory 'automatic land-use roll over' + Kyoto CP2 accounting rules (i.e., gross-net for land-use change, and BAU reference levels for 'land remaining land' categories)
- **Kyoto based:** Introduce 'land-use transitions' from Article 3.3 to Article 3.4 categories at a certain point in time (e.g., at steady state or long-term average carbon stock)

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- **Reference level:** Apply a zero reference level to 'new activities' (e.g., land-use change, new policies or Article 3.3) and a BAU Reference Levels to 'existing' activities (e.g., 'land remaining land' categories, Article 3.4 land, or land under BAU management or policy).
- **Differentiated forest treatment:** A variation on any of the above, where accounting recognises and fully credits the future carbon stock increases in permanently protected, non-harvested forests.

'Land in transition' sub-options

308 Should the 'Land in transitions to BAU Reference Levels' approach be selected as the preferred approach, then the following sub-options have been identified for further analysis – most likely after tabling of the INDC.

H) Crediting duration for new activities

- 20 years fixed
- 28 years / harvest age
- Long-term carbon stock average
- HWP-adjusted long-term carbon stock average
- Policy/activity/species specific

I) Start year for new activities

309 The Land in transition options assume a 1990 activity start year, as under Kyoto. However, GHG Inventories do not have activity start years, but report emissions from 1990 taking into account all relevant historical activity that are still impacting on emissions and removals in 1990 (referred to as backcasting).

310 If the 1990 activity start year did not apply under the land-based version of the 'Land in transition' approach, a long-term averaging approach would potentially bring into accounting additional areas of AR land established before 1990 – particularly if this was non-harvested or indigenous forest, and had not yet reached its long term average. This effect has not been modelled, but could be explored under future work. Options include:

- 1990
- 2005
- Rolling baseline / continuous

J) Definition of 'new' activities for full crediting/debiting

- Land use change between sub-categories only
- Changes in policies affecting land management
- Projects on managed lands

[redacted]

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Withhold under 9(2)(j) and 9(2)(g)(i)

- [redacted]

[redacted]

Future work on ETS Implications

311 Further work will be required to identify potential ETS implications and domestic implementation options for 'averaging' under a revised international approach from 2021.

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Glossary

GLOSSARY OF KEY TERMS IN INTERNATIONAL CLIMATE CHANGE POLICY

AAU	Assigned Amount Unit, an emissions unit under the Kyoto Protocol
AFOLU	
Annex I country	Annex I of the UNFCCC is a list of industrialised countries
Annex B country	Annex B of the Kyoto Protocol is a list of industrialised countries; they must also then ratify the Kyoto Protocol
AR	
ARDC	
Carbon market	An emissions trading market for greenhouse gas (GHG) emissions, sometimes limited to just CO_2
CDM	The Clean Development Mechanism, a provision described in Article 12 of the Kyoto Protocol that allows tradable credits to be generated through projects in developing countries that can be used by industrialised countries for compliance with their Kyoto commitments
CEFC	
CER	Certified Emission Reduction, an emissions unit under the Kyoto Protocol
CO_2 equivalent	A measurement of a mix of GHGs put onto an equivalent basis through applying "global warming potential" factors to non-CO_2 gases
CP1	First commitment period of the Kyoto Protocol, 2008-2012
EIT	Economies in transition countries in eastern Europe
Emissions trading	In its general usage, a system where emissions units can be traded and ultimately used by some actor (government or private entity) to comply with a commitment in an emissions management programme
Emissions unit	A general term to describe the commodity of trade in an emissions trading system, normally 1 tonne of carbon dioxide equivalent but with names and attributes specific to the trading system in question
ERU	Emissions Reduction Unit, an emissions unit under the Kyoto Protocol
EUA	EU Allowance, an emissions unit under the EU ETS
EU ETS	The European Union Emissions Trading Scheme, a domestic entity-level cap and trade scheme implemented from 1 January 2005
FLU	
FM	
FOLU	
GHGs	Greenhouse gases, in the context of climate change policy mostly meaning carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6)

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GHG stabilisation concentration	The concentration of GHGs in the atmosphere at some time in the future after this stops increasing and reaches a stable level.
IPCC SRES	Special Report on Emission Scenarios by the Intergovernmental Panel on Climate Change
Kyoto Protocol	A protocol under the UN Framework Convention on Climate Change where, inter alia, industrialised countries took on binding commitments to reduce emissions in a first commitment period, 2008-2012
LULUCF	Land use, land use change and forestry, often considered as a sector in emissions management programmes
Non- Annex I country	Developing countries, hence not listed in Annex I of the UNFCCC
P&Ms	Policies and measures, a term used generally at either international or domestic levels to describe elements of a management programme prescribed by governments
Post-2012	The period after the end of the Kyoto Protocol's first commitment period

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Document 2

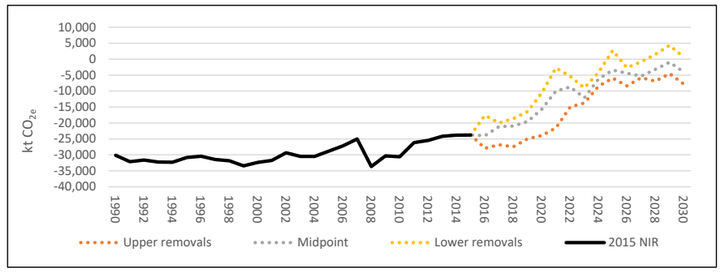
Estimated actual and projected LULUCF removal scenarios , UNFCCC basis, 1990-2030 (kt CO2-e)

Home

Year	Without NZ government forestry measures (kt CO2eq)	With measures - Upper removals (kt CO2eq)	With measures - Mid point removals (kt CO2eq)	With measures - lower removals (kt CO2eq)	2015 National Inventory Report (Kt CO2eq)		
1990	-30,122		-30,122		-30,122		
1991	-32,130		-32,130		-32,130		
1992	-31,620		-31,620		-31,620		
1993	-32,254		-32,263		-32,263		
1994	-32,306		-32,317		-32,317		
1995	-30,840		-30,852		-30,852		
1996	-30,371		-30,419		-30,419		
1997	-31,341		-31,434		-31,434		
1998	-31,672		-31,841		-31,841		
1999	-33,180		-33,466		-33,466		
2000	-31,945		-32,368		-32,368		
2001	-31,187		-31,749		-31,749		
2002	-28,641		-29,341		-29,341		
2003	-29,625		-30,460		-30,460		
2004	-29,550		-30,460		-30,460		
2005	-27,874		-28,817		-28,817		
2006	-26,172		-27,170		-27,170		
2007	-24,018		-25,023		-25,023		
2008	-31,156		-33,654		-33,654		
2009	-28,205		-30,293		-30,293		
2010	-28,363		-30,614		-30,614		
2011	-23,971		-26,159		-26,159		
2012	-22,868		-25,483		-25,483		
2013	-22,479		-24,155		-24,155		
2014	-21,766		-23,796		-23,796		
2015	-21,321	-23,783	-23,783	-23,783	-23,783	-2,462	10.4%
2016	-19,655	-27,943	-24,014	-17,613		-4,359	18.2%
2017	-16,503	-26,844	-21,168	-19,993		-4,665	22.0%
2018	-16,079	-27,475	-20,965	-18,652		-4,886	23.3%
2019	-14,559	-24,978	-19,535	-16,425		-4,976	25.5%
2020	-10,728	-23,959	-15,694	-10,541		-4,966	31.6%
2021	-5,001	-21,565	-9,980	-2,728		-4,979	49. %
2022	-3,844	-15,016	-8,705	-5,377		-4,861	55.8%
2023	-7,316	-13,736	-12,063	-9,009		-4,747	39.4%
2024	-1,646	-8,508	-6,240	-4,183		-4,59	73.6%
2025	1,055	-5,938	-3,400	2,732		-4,455	131.0%
2026	17	-8,392	-4,404	-2,711		-4,421	100.4%
2027	-836	-5,800	-5,280	-796		-4 444	84.2%
2028	1,404	-6,899	-3,226	1,525		-4,630	143.5%
2029	4,054	-4,524	-975	4,328		-5,029	5 5.8%
2030	1,350	-7,792	-4,043	638		-5,393	133 %

Figure 5.10: Net emissions as presented in the 2015 Greenhouse Gas Inventory (1990–2015), and projected (2016–2030) low, midpoint and upper scenarios of net emissio

Figure xx: Estimated actual and projected net removals with and without measures 1990 – 2030 (kt CO2-e)



Impact of NZ government po cie and measures
Cumulative 2016 - 2030 (k CO2-e)

Without measures	-88,288
With measures	-159 691
Difference	-71,404
Percent	4 7%

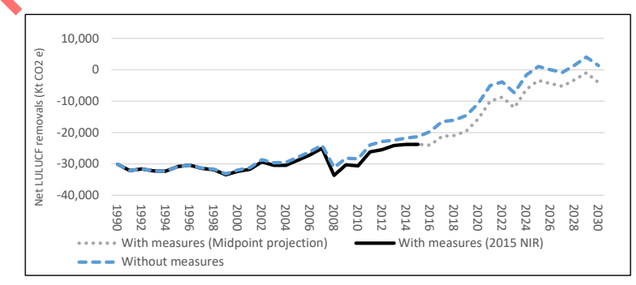


Table x: **2015 NIR (1990 – 2015) and projected (2016 – 2030) low, mid point and upper scena ios of LULUCF net removals, UNFCCC basis (kt CO_{2eq})**

LULUCF: 2015 NIR and projected removal scenario's	Net removals (kt CO_{2eq})									
	1990	1995	2000	2005	2010	2015	2016	2020	2025	2030
LULUCF - 2015 NIR	-30,122	-30,852	-32,368	-28,817	-30,614	-23,783				
LULUCF - Without measures	-30,122	-30,840	-31,945	-27,874	-28,363	-21,321	-19,655	-10,728	1,055	1,350
Lower removal projection						-23,783	-17,613	-10,541	2,732	638
Midpoint removal projection						-23,783	-24,014	-15,694	-3,400	-4,043
Upper removal projection						-23,783	-27,943	-23,959	-5,938	-7,792

Table x: 2015 Greenhouse Gas Inventory (1990–2015) and projected (2016–2030) non-carbon dioxide LULUCF emissions from biomass burning activities

Gas (Converted to kt CO2e)	1990	1995	2000	2005	2010	2015	2020	2025	2030
CH_4	93	112	87	138	110	79	79	79	79
N_2O	177	196	200	174	149	99	108	108	108

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LULUCF Reporting Projections 1990 - 2050 (Mt CO2-e)

All LULUCF categories and pools - 2006 GPG

Factors in non declining yield - low emissions from one estate and high from the other

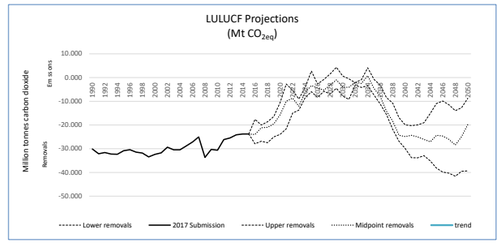
Year	Post-1989 and all forest Deforestation (Mt CO2)			2017
	Low removals	Mid	Upper removals	Submission
1990	0.7	0.7	0.7	0.8
1991	0.7	0.7	0.7	0.8
1992	0.7	0.7	0.7	0.9
1993	0.6	0.6	0.6	0.9
1994	0.2	0.2	0.2	0.7
1995	-0.5	-0.5	-0.5	-0.1
1996	-1.7	-1.7	-1.7	-1.2
1997	-3.5	-3.5	-3.5	-3.1
1998	-5.6	-5.6	-5.6	-5.2
1999	-7.8	-7.8	-7.8	-7.6
2000	-8.1	-8.1	-8.1	-7.9
2001	-9.8	-9.8	-9.8	-9.7
2002	-11.4	-11.4	-11.4	-11.4
2003	-10.6	-10.6	-10.6	-10.6
2004	-8.6	-8.6	-8.6	-8.6
2005	-3.8	-3.8	-3.8	-3.6
2006	-1.6	-1.6	-1.6	-1.5
2007	3.3	3.3	3.3	3.5
2008	-12.5	-12.5	-12.5	-13.3
2009	-9.2	-9.2	-9.2	-10.0
2010	-9.1	-9.1	-9.1	-9.7
2011	-10.6	-10.6	-10.6	-11.1
2012	-9.7	-9.8	-9.7	-10.2
2013	-8.8	-8.9	-8.8	-9.2
2014	-9.0	-9.1	-9.0	-9.3
2015	-12.0	-12.0	-12.0	-12.2
2016	-6.6	-11.7	-14.1	
2017	-6.0	-11.7	-14.7	
2018	-4.6	-11.9	-15.3	
2019	-4.4	-11.9	-15.4	
2020	-2.0	-10.3	-14.6	
2021	6.2	-4.9	-14.6	
2022	6.0	2.3	-1.9	
2023	8.4	6.1	2.8	
2024	16.2	16.4	14.8	
2025	21.3	19.8	16.0	
2026	17.6	16.2	13.5	
2027	16.8	18.7	18.1	
2028	17.6	17.7	18.2	
2029	14.9	19.7	20.8	
2030	10.7	14.0	15.9	
2031	9.8	10.8	10.3	
2032	8.5	12.9	15.8	
2033	8.3	11.3	12.8	
2034	9.0	11.1	11.4	
2035	3.4	4.8	4.9	
2036	0.0	-0.1	-1.4	
2037	-4.0	-5.3	-7.7	
2038	-4.4	-7.7	-12.4	
2039	-6.2	-10.2	-15.6	
2040	-6.6	-11.2	-17.6	
2041	-6.3	-11.8	-19.1	
2042	-7.4	-12.3	-19.2	
2043	-7.0	-12.4	-20.0	
2044	-4.4	-11.9	-22.0	
2045	-1.5	-10.9	-23.5	
2046	0.4	-10.1	-23.9	
2047	0.3	-10.1	-23.9	
2048	0.8	-10.0	-24.0	
2049	0.8	-9.8	-23.7	
2050	5.3	-7.2	-23.4	

Pre-1990 planted forest (Mt CO2)			2017
Low removals	Mid	Upper removals	Submission
			-23.7
			-24.8
			-24.3
			-24.7
			-24.3
			-21.8
			-20.3
			-19.1
			-18.8
			-16.8
			-15.1
			-12.2
			-7.4
			-9.5
			-12.5
			-16.0
			-16.1
			-18.8
			-10.6
			-10.6
			-10.2
			-3.9
			-3.4
			-2.1
			-2.6
-2.7	-0.7	-1.5	-1.6
2.0	0.3	-1.3	
3.5	2.9	-4.6	
5.2	4.7	-3.0	
9.1	7.6	0.1	
10.6	11.0	4.4	
12.6	11.0	3.4	
6.2	4.8	0.5	
2.5	-2.5	-6.0	
-4.4	-7.1	-9.4	
-3.3	-7.8	-8.0	
-3.3	-5.3	-10.0	
-5.5	-8.8	-7.5	
-6.7	-5.8	-6.2	
-7.1	-5.6	-1.0	
-5.5	-3.1	-0.7	
-1.5	-0.1	-1.1	
-1.2	-0.2	-1.7	
0.8	0.7	-0.4	
0.7	2.1	1.7	
1.5	1.3	0.5	
2.4	1.2	-0.1	
2.9	-1.2	-2.7	
1.5	-3.7	-4.7	
-0.3	-6.9	-8.8	
-1.3	-6.3	-10.6	
-2.8	-5.2	-10.5	
-2.5	-4.8	-9.0	
-0.9	-5.2	-7.0	
-0.8	-6.4	-5.3	
-2.3	-5.2	-5.3	
-3.7	-5.4	-5.3	
-2.9	-5.5	-6.5	
-2.6	-6.6	-9.0	
0.5	-2.1	-6.6	
0.9	0.0	-6.8	

Pre-1990 Natural Forest (Mt CO2)			2017
Low removals	Mid	Upper removals	Submission
			-6.3
			-6.4
			-6.4
			-6.3
			-6.3
			-6.3
			-6.3
			-6.3
			-6.3
			-6.2
			-6.2
			-6.3
			-6.2
			-6.2
			-6.2
			-6.2
			-6.2
			-6.2
			-6.2
			-6.2
			-6.2
			-6.2
			-6.2
			-6.2
-3.7	-6.2	-8.6	
-3.7	-6.2	-8.6	
-3.7	-6.2	-8.6	
-3.7	-6.2	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	
-3.7	-6.1	-8.6	

Year	HWP Contribution (Mt CO2)			2017
	Low removals	Mid	Upper removals	Submission
1990				-1.7
1991				-2.7
1992				-2.9
1993				-3.2
1994				-3.7
1995				-4.1
1996				-4.0
1997				-4.5
1998				-3.3
1999				-4.6
2000				-5.0
2001				-5.5
2002				-6.4
2003				-6.2
2004				-5.3
2005				-5.1
2006				-5.5
2007				-5.7
2008				-5.6
2009				-5.7
2010				-6.7
2011				-7.1
2012				-7.8
2013				-8.8
2014				-7.7
2015				-5.8
2016	-6.3	-6.6	-7.4	
2017	-5.9	-6.5	-7.2	
2018	-7.5	-7.8	-9.0	
2019	-8.6	-9.2	-10.3	
2020	-9.4	-10.5	-11.6	
2021	-8.8	-10.1	-11.2	
2022	-8.3	-9.9	-10.9	
2023	-7.9	-9.7	-10.6	
2024	-7.5	-9.6	-10.5	
2025	-7.1	-9.4	-10.3	
2026	-6.8	-9.3	-10.2	
2027	-6.5	-9.2	-10.0	
2028	-6.3	-9.2	-9.[illegible]	
2029	-6.1	-9.1	-9.9	
2030	-5.9	-9.0	-9.8	
2031	-5.7	-8.8	-9.[illegible]	
2032	-5.5	-8.7	-9.5	
2033	-5.2	-8.6	-9.3	
2034	-3.0	-6.5	-7.2	
2035	-1.1	-5.[illegible]	-5.4	
2036	0.4	-3.[illegible]	-3.8	
2037	1.7	-2.[illegible]	-2.3	
2038	[illegible]	-1.1	-2.[illegible]	
2039	[illegible]	-1.3	-2.[illegible]	
2040	0.7	-1.4	-2.6	
204[illegible]	0.[illegible]	-1.5	-3.[illegible]	
2042	-0.1	-1.9	-3.7	
2[illegible]	-1.5	-2.6	-3.7	
2044	-1.9	-2.[illegible]	-4.0	
2[illegible]	-0.6	-2.3	-4.0	
2046	-1.4	-3.[illegible]	-3.8	
2047	-1.[illegible]	-4.6	-5.2	
2048	-2.3	-6.0	-6.6	
2049	-3.4	-7.2	-7.9	
2050	-3.7	-6.7	-8.4	

Year	LULUCF Projections 2017 (Mt CO2-e)			2017
	Low removals	Mid	Upper removals	Submission
1990				-30.122
1991				-32.130
1992				-31.620
1993				-32.263
1994				-32.317
1995				-30.852
1996				-30.419
1997				-31.434
1998				-31.841
1999				-33.466
2000				-32.368
2001				-31.749
2002				-29.341
2003				-30.460
2004				-30.460
2005				-28.817
2006				-27.170
2007				-25.023
2008				-33.654
2009				-30.293
2010				-30.614
2011				-[illegible].159
2012				-25.483
2013				-24.155
2014				-23.796
2015	-23.78[illegible]	-23.783	-23.[illegible]	-23.783
2016	-17.613	-24.014	-27.943	
2017	-19.993	-[illegible].168	-26.844	
2018	-18.652	-20.[illegible]	-27.475	
2[illegible]9	-16.425	-19.535	-24.978	
2020	-10.541	-15.694	-23.959	
2021	-2.728	-9.980	-21.565	
2022	-5.377	-8.705	-15.016	
2023	-9.[illegible]09	-12.063	-13.736	
2024	-4.[illegible]83	-6.240	-8.508	
2025	2.73[illegible]	-3.400	-5.938	
2026	7.[illegible]11	-4.404	-8.392	
2027	-0.796	-5.280	-5.800	
2028	1.525	-3.226	-6.899	
2029	4.328	-0.975	-4.524	
2[illegible]0	0.638	-4.043	-7.792	
2031	-0.532	-4.101	-9.187	
2032	-2.167	-1.881	-3.267	
2033	-0.882	-2.507	-4.150	
2034	4.132	0.778	-3.419	
2035	-0.733	-4.586	-7.359	
2036	-3.159	-7.934	-11.123	
2037	-8.414	-14.134	-15.549	
2038	-10.793	-18.408	-21.843	
2039	-16.932	-24.344	-26.876	
2040	-19.966	-24.865	-29.891	
2041	-20.271	-24.365	-33.789	
2042	-19.978	-25.027	-33.846	
2043	-19.012	-26.103	-32.946	
2044	-15.092	-27.070	-35.149	
2045	-10.959	-24.347	-38.181	
2046	-9.886	-24.636	-39.857	
2047	-11.487	-26.103	-40.302	
2048	-13.984	-28.433	-41.597	
2049	-12.689	-24.896	-39.524	
2050	-8.714	-19.803	-39.314	



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