

NEW ZEALAND INPUT TO AWG-KP SESSION 6 (GHANA, AUGUST 2008) ON LAND USE LAND USE CHANGE AND FORESTRY RULES FOR POST-2012

Summary

- The treatment of LULUCF in the first commitment period of the Kyoto Protocol has resulted in a number of complexities and challenges for domestic policy implementation.
- Improved rules can optimise the contribution forests and land use activities can make to addressing climate change, while maintaining environmental integrity and leading to other environmental co-benefits that will contribute to sustainable development.
- New Zealand considers that a number of principles should be used to guide the discussion and to evaluate changes to the current rules: environmental integrity, economic efficiency, materiality, responding to national circumstances, rules before commitments, credibility and acceptability, maintaining confidence within the investment community, flexibility in allocation of production resources.
- New Zealand considers that the central distinguishing element between possible packages of LULUCF rules is the treatment of Forest Management under Article 3.4 of the Protocol.
- New Zealand believes Article 3.4 activities should remain voluntary for the post-2012 period.
- Unless the effects of forest age class distribution can be addressed under net-net approaches, New Zealand would support the continuation of the gross-net accounting approach applied in CP1, for Forest Management.
- For Article 3.4 activities, separating new activity from business as usual and natural effects is the key challenge for post-2012
- New Zealand has made a number of specific proposals to improve the rules, including:
 1. allowing greater land-use flexibility for planted production forests;
 2. accounting for emissions from harvesting when they occur;
 3. refining the debit-credit rule for A/R forests.
- New Zealand recognises that LULUCF rules are complex and interlinked and that there may be differing approaches to achieve the same outcomes. We propose some possible solutions to key issues in this submission. New Zealand remains open to discussing any alternative approaches with Parties to achieve improvements, while ensuring environmental integrity.

1. Background and Purpose

At its resumed fifth session (Bonn, 2-12 June 2008) the AWG-KP encouraged Parties to share information to allow better assessment of the implications of the options and issues identified in annex IV, including implications for accounting, before the first part of the sixth session of the AWG-KP (Ghana). To facilitate this, the AWG-KP invited Parties to submit relevant information on a voluntary and informal basis to the secretariat before the first part of the sixth session of the AWG-KP, and requested the secretariat to make the information available on the UNFCCC website as received.

This paper is New Zealand's response to this invitation from the AWG-KP.

2. Why is LULUCF important in global Climate Change agreement?

The LULUCF sector has an important role to play in helping to achieve the objective of Article 2 of the UNFCCC. LULUCF can provide flexibility in abatement of greenhouse gas emissions and is an especially important tool for the land-based sectors where other abatement technologies may not be readily available.

3. Why rules need to be changed?

Improved rules can optimise the contribution forests and land use activities can make to addressing climate change, while maintaining environmental integrity and leading to other environmental co-benefits that will contribute to sustainable development.

New Zealand believes that our and other countries' experience in implementing international LULUCF rules in a domestic context, and the better information now available to the international community, can be used to inform improvements to the LULUCF rules that were agreed for CP1.

The treatment of LULUCF in the first commitment period of the Kyoto Protocol has resulted in a number of complexities and challenges for domestic policy implementation. Improvements to the rules is required at the international level because for Parties with significant forest resources the fiscal costs of moving away from the international rules in domestic policy are likely to make this unviable.

In addition, the current rules create unnecessary barriers to changes in the use of production lands that may be necessary for adaptation to climate change, responding to pressures on global food production, and sustainable economic development. For many countries with economies dependant on land-based sectors, flexibility in the use of production lands is essential to their economic welfare.

4. Considerations when assessing proposed changes in rules

When considering changes to LULUCF rules, New Zealand believes the following issues need to be considered and used as a guide for assessing the impact of the proposed changes:

- *Environmental integrity* – ensuring the rules contribute to achieving the objective of the UNFCCC
- *Economic efficiency* – ensuring behaviours that result in emissions and removals face accurate marginal costs and benefits.
- *Materiality* - accounting for everything is not necessary to ensure environmental integrity and achieving the goal of the UNFCCC – the key is establishing the right signals for investment and changes to management in areas that are material to the global climate change challenge.
- *Responding to national circumstances* – ways need to be found to accommodate national circumstances where necessary without compromising the underlying environmental integrity of the Kyoto Protocol.
- *Rules before commitments* - knowing the rules prior to setting commitments allows those commitments to be established in an informed environment, reducing the risk that environmentally inaccurate and economically inefficient rules will develop.
- *Credibility and acceptability* – the rules need to be credible and acceptable. If they are not, then the international process itself may become discredited, undermining the incentives created under the international framework intended to encourage people to make desirable changes in behaviour.
- *Maintaining confidence within the investment community* – to address climate change the private sector needs to make major shifts in investment and management decisions. This is supported if decision-makers have confidence in the durability and consistency of the economic signals established under the rules of an international framework.
- *Flexibility in allocating productive resources* - rules need to provide the maximum level of flexibility possible without compromising environmental integrity. In light of the other issues described above flexibility allows resources to be allocated efficiently in response to a changing climatic, physical, economic and social environment.

5. LULUCF options and development of possible packages

In Bonn (AWG-KP 5.2), a framework was developed to help guide the next stage of negotiations. Under this framework a number of cross-cutting issues were identified that will need to be considered for the post-2012 period. Also identified were a number of options ranging from few to many changes in the rules, and a menu of other proposed elements. To progress discussion at Accra New Zealand believes these options and elements should be combined to form ‘possible packages’ for LULUCF rules.

Ideally, the number of possible packages coming out of Accra should be as few as possible and contain sufficient detail for Parties to assess the implications of these alternative packages in light of their national circumstances prior to, and so as to inform, final decisions on future commitments. Such a process will allow for key approaches to be explored without prejudice and for final decisions on an approach to be made in light of a good understanding of all the elements in the package and the implications of these for post-2012 commitments.

New Zealand considers that the central distinguishing element between these possible packages is the treatment of Forest Management under Article 3.4 of the Protocol; and in particular whether this remains gross-net accounting (with or without caps) or moves to net-net accounting (either employing a base year, base period, or baseline or accounted for under the same framework as Convention reporting). At least one of these possible packages should explore gross-net accounting of Forest Management and at least one should explore a net-net accounting approach.

6. Gross-Net or Net-Net Accounting for Article 3.4 Forest Management (FM)

Key points:

- New Zealand believes Article 3.4 activities should remain voluntary for the post-2012 period.
- Unless the effects of forest age class distribution can be addressed under net-net approaches, New Zealand would support the continuation of the gross-net accounting approach applied in CP1.
- Separating new activity from business as usual and natural effects is the key challenge for post-2012.

THE GROSS-NET APPROACH TO FM ACCOUNTING

Unless the effects of forest age class distribution can be addressed under net-net approaches, New Zealand would continue to support the gross-net accounting approach for 3.4 Forest Management accounting for CP1. This is because for New Zealand, and we understand for a number of other countries, a net-net accounting approach using a similar formulation to that applied to other Article 3.4 activities, would have had a severe and highly inequitable affect on commitments. This is due to a number of reasons including saturation and age class effects.

For New Zealand, the key issue is age class as a result the continued rapid expansion of the exotic forest estate up to 1990, so that in the 1990 base year New Zealand had significant removals from recently established planted production forests (~20 MtCO₂ eq). These forests are now reaching harvest age. Carbon stocks in these forests will be stable to slightly falling in CP1 then falling more significantly in CP2 before increasing once again (see Graph 2: *Expected Total Carbon Stock in New Zealand Planted Production Forests established prior to 1990*, for more detail). New Zealand's indigenous forest estate is estimated to be neutral in terms of carbon stock change.

Unless these underlying effects of forest age class distribution can be addressed under net-net approaches - which we believe may be possible under some options - then New Zealand would continue to support the gross-net accounting approach.

POSSIBLE NET-NET APPROACHES TO FM ACCOUNTING

New Zealand sees three possible approaches to net-net accounting for Forest Management:

1. Base year (assumed to be 1990)
2. Base period (covering a number of years to produce a reference carbon stock change)
3. Forward-looking baseline

A base year (1990) option

The effect of accounting under net-net approaches using a 1990 base year is a very large apparent increase in New Zealand's emissions, when New Zealand's only 'fault' was the significant new forest establishment in the period prior to 1990. This creates a large age-class legacy effect that is not managed well under a 1990 base year accounting approach (see Graph 1: *Planting of New Exotic Forest in New Zealand*).

New Zealand assumes that these same issues will apply to the option of moving LULUCF accounting to a "Land-based approach based on the reporting under the Convention".

If Parties were to have alterations to their Assigned Amount based on emissions or removals from LULUCF in 1990, it would penalise Parties who had net removals in 1990. This penalty occurs twice once for the removals in 1990 and once when the forest is harvested (and liabilities created). For New Zealand, this would be very significant.

A base-period option

Applying a base-period may mitigate some of the detrimental and inequitable effects of a base year approach. However, to be effective for New Zealand's circumstances, such a base period would probably need to cover a full cycle of normal forest management (approximately 29 years for New Zealand), which is an artefact of historic age class distribution (see Graph 2). Even then the base-period approach implies major variation in New Zealand's apparent emissions and removals over coming periods, something which would have a significant effect on future targets.

A Forward-Looking Baseline Option

Of the three net-net approaches identified thus far, the forward-looking baseline shows the most promise for addressing Parties' concerns and for isolating and crediting/debiting only non-business as usual activities.

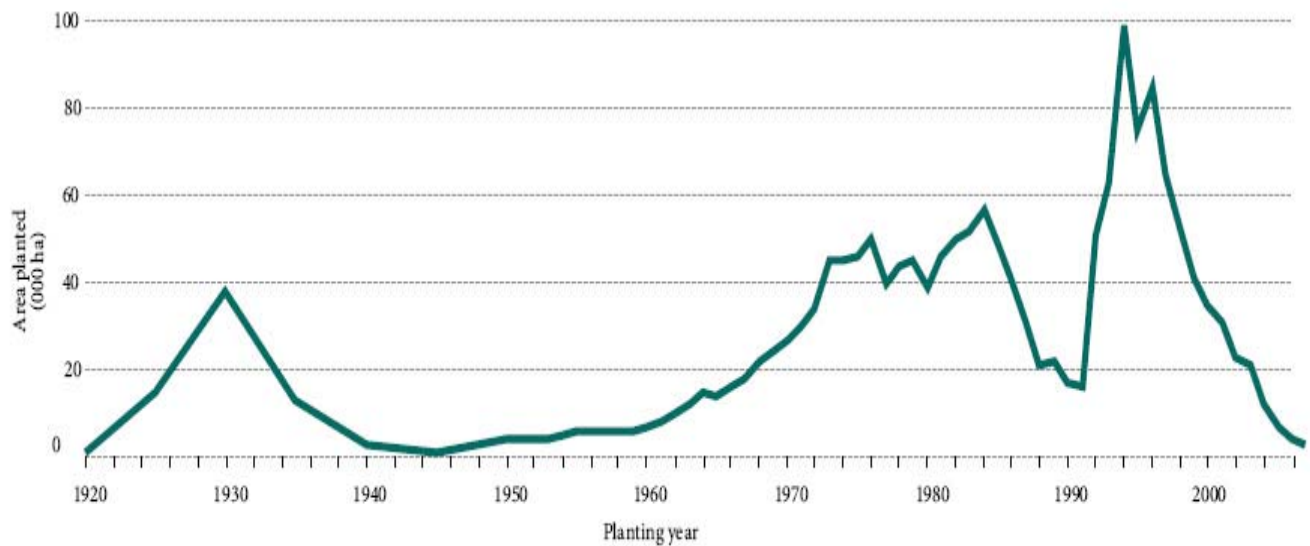
This is because such an approach could factor out both age class effects (which would be incorporated into a business as usual management scenario for carbon stock change), and climate change effects (which could be incorporated into growth models as they are updated).

The two major challenges with such an approach are:

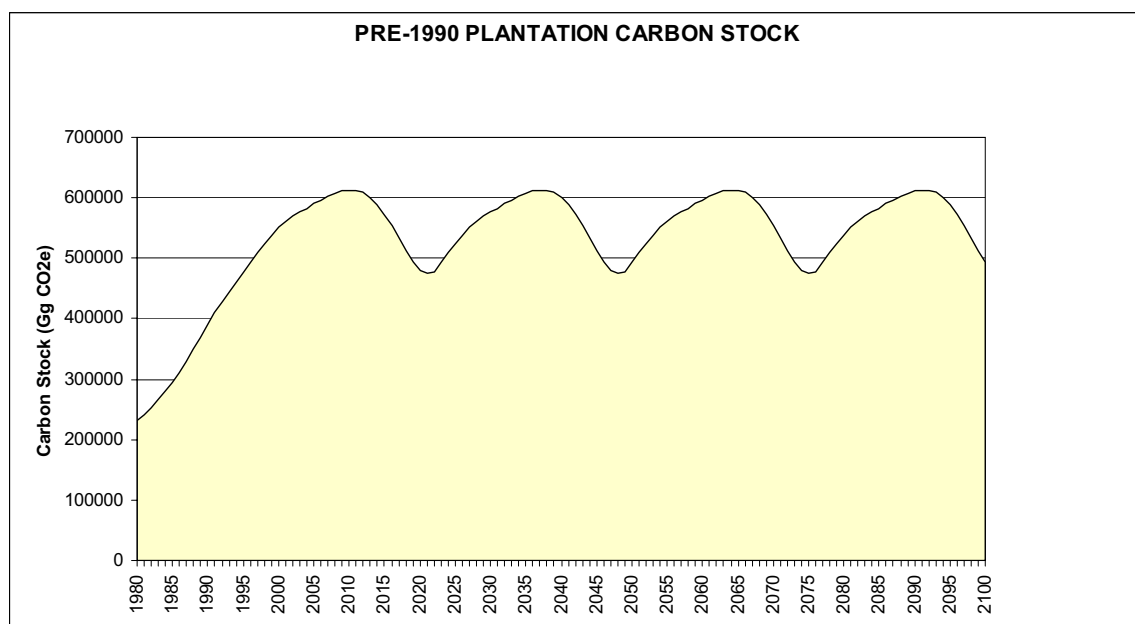
- How to create an accurate, credible and verifiable forward-looking baseline; and
- What happens to the forward looking baseline after subsequent accounting periods once management has changed in response to carbon price signals?

New Zealand looks forward to further exploring this option with Parties.

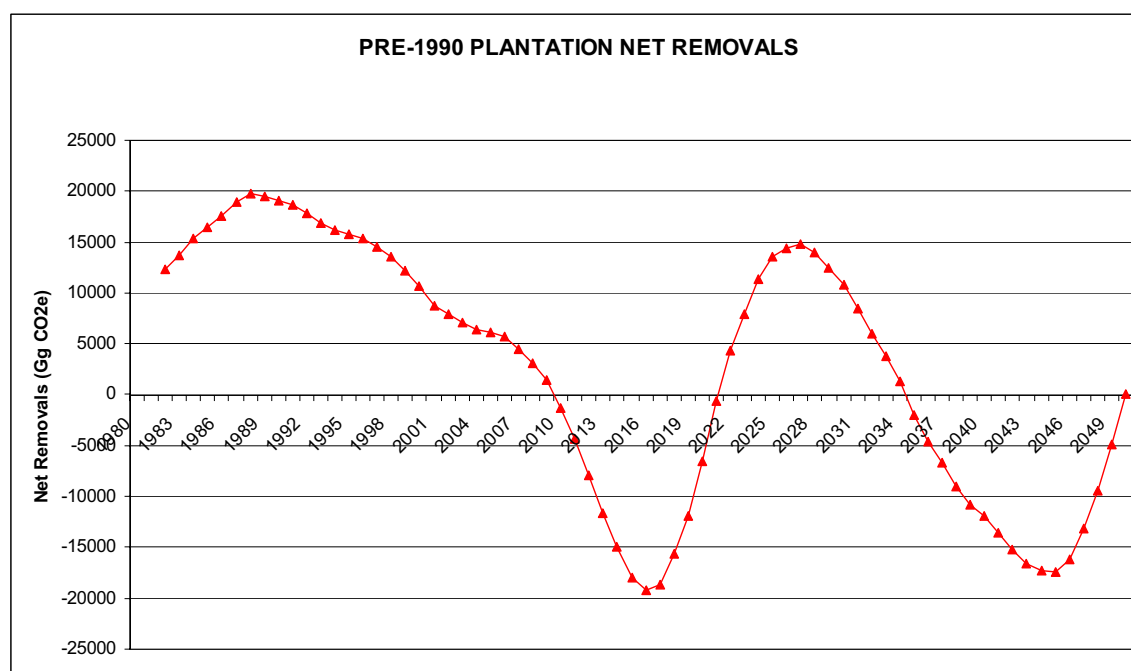
Graph 1: *Planting of New Planted Production Forest in New Zealand*



Graph 2: *Expected Total Carbon Stock in New Zealand Planted Production Forests Established Prior to 1990*



Graph 3: Net Removals and Emissions for New Zealand's Planted Production Forests Established Prior to 1990



Notes: Positive = net sink
Negative = net source

The graphs illustrate how the planted forest estate, and the carbon stock contained within, was expanding up until 1990. The steady cycle that becomes apparent after 1990 is the result of forest established after 1990 being an Article 3.3 activity.

New Zealand's planted forest that was established prior to 1990 is expected to become a net source from around 2011 due to its age class profile before returning to a net sink from 2022. This is under business as usual management.

To provide an indication of the importance of these figures from New Zealand's perspective, New Zealand's 1990 emissions were 61MtCO₂ eq from all Annex A sectors.

7. Other Elements for inclusion in LULUCF Packages

Other possible elements proposed by other Parties as listed in the AWGKP conclusions from Bonn and are not covered in this paper, though New Zealand remains open to exploring all options.

Element 1: Voluntary or Mandatory Article 3.4 Activities

New Zealand's believes Article 3.4 activities should remain voluntary for the post-2012 period. However, New Zealand strongly supports the mandatory accounting in CP2 where Parties elected activities for CP1.

Key reasons for continuation of voluntary 3.4 activities:

- some Parties lack data for certain activities;
- there is significant scientific uncertainty over what is really happening in some activities;
- net-net accounting with a 1990 base year is problematic;
- some activities will not have a material impact on the climate due to their lack on importance for some Parties and the costs of understanding these complex systems will likely outweigh the climate benefit;
- it is unclear whether issues such as age class legacy and inter-annual variability and natural disturbances can be appropriately dealt with when accounting for 3.4 activities;
- new 3.4 activities might be proposed;
- accounting for some activities is not appropriate under some Parties' national circumstances. This is evidenced by the number of Parties electing 3.4 Activities in CP1 (See Table 1);

Table 1: Number of Parties electing 3.4 Activities in CP1

3.4 Activities	Number of countries electing
Forest management	21
Cropland management	4
Grazing land management	2
Revegetation	3
No 3.4 activities elected	15

Element 2: Flexible land use for planted production forests established prior to 1990

The current treatment of deforestation tends to lock-in land use of plantation forests established prior to 1990. In a world that is rapidly changing physically, economically and socially, freezing the use of production lands as at 1990 is a high risk and inefficient strategy that can lead to significant spill-over effects.

New Zealand believes it is necessary to look at the inter-linkages between planning and implementation of forestry and agricultural mitigation and adaptation initiatives to derive maximum benefit to the global environment as well as local communities or economies. Providing flexibility in the use of production land is critical to achieve this.

To adapt to climate change, Parties need land use flexibility so that planted forests, other non-wood crops and animal agriculture can move to locations where they are best suited in new climatic and economic conditions. This is critical to ensure that food production is not threatened and that economic development proceeds in a sustainable manner.

Forests can have both positive and negative adaptive consequences. For example, forests could have adverse implications for watersheds¹ especially in catchments already under water allocation pressures and/or where climate change is expected to reduce rainfall. On the other hand, where climate change is expected to drive more frequent and intense storms, forests can reduce erosion and sedimentation of rivers substantially².

Climate change requires that planners and land managers have the flexibility to locate land use activities where they are best suited.

Forestry can make a very significant contribution to a low-cost global mitigation portfolio that provides synergies with adaptation and sustainable development. However, some of this opportunity is being lost in the current institutional context because the ‘locking-in’ of land use is acting as a major deterrent to investment.

One method of addressing this issue is for the post-2012 framework to allow for an area of planted forest established prior to 1990 to be harvested and replanted on another area of land without accounting for the temporary carbon stock changes. Environmental integrity is maintained in this approach as there would be no change to what the atmosphere sees compared with business as usual harvesting and replanting of forests.

Such a mechanism would assist Parties to meet sustainable development objectives, by allowing land use to change where there is a higher value use of the land and by increasing the options available to Parties for adaptation to climate change.

New Zealand strongly believes that, given concerns to protect natural forest systems and the biodiversity they contain, flexibility should be restricted to planted production forests only.

There is a range of options to achieve flexibility for planted production forests established prior to 1990 and the choice of options will depend on the agreed accounting approach for Forest Management. Assuming the current treatment of Forest Management continued (capped gross-net with voluntary accounting), we believe that one approach is to:

- modify the existing definition of ‘deforestation’, as described under Article 3.3, so that in the case of “planted production forest” deforestation occurs only if an “equivalent forest” is not established elsewhere on land that would have otherwise qualified as A/R land;
- add a new definition of planted production forest, for the purpose of determining when and where deforestation has occurred;
- treat the newly established forest as part of Forest Management, not A/R forest.

¹ Research in New Zealand has shown that plantation forests can reduce water yields by up to 50% in drier areas (Maclaren, 1996: *Environmental Effects of plantation Forests*, New Zealand Forest Research Institute)

² Research in New Zealand has shown that plantation forests can reduce landslides by 90% and the rates of earthflows by 2-3 orders of magnitude (that is 100-1000 times) (Maclaren, 1996: *Environmental Effects of plantation Forests*, New Zealand Forest Research Institute)

New Zealand proposes that flexibility of land use be provided for in respect of planted production forest lands with text along the following lines. This text could be placed as part of a new LULUCF CMP decision or a revision of the existing 16/CMP1 text.

a) “Deforestation” is the direct human-induced conversion of forested land to non-forested land (unchanged from 16/CM.1)

b) In the case of “planted production forests” established before 1 January 1990 only, conversion of forested land to non-forest land shall be considered harvesting, and shall not be considered deforestation, where an “equivalent forest” is established elsewhere on non-forest land that would have qualified for afforestation or reforestation. For the purposes of paragraph (b):

i) “Planted production forest” is a forest, consisting of introduced species, which as at 1990 met all the following criteria: one or two species at plantation, even age class, and regular spacing³. The “planted production forest” shall have been established by direct human-induced conversion of non-forest land to forest land by the planting and/or seeding provisions of an afforestation or reforestation activity;

ii) “Equivalent forest” means an area of forest that will achieve at least the same carbon stock over the same period as would have occurred had the area of harvested “planted production forest” been re-established;

iii) “Equivalent forest” shall not be included in a Party’s assessment of emissions and removals from afforestation and reforestation activities and must be included in a Party’s accounting of Forest Management under Article 3.4, if elected.

Element 3: Harvested Wood Products Accounting as Part of Forest Management and Article 3.3 Activities

New Zealand proposes an approach to improve the accuracy of accounting for emissions from forests. Under this approach, all carbon removed from the forest area in wood and other biomass is oxidised when the emissions occur. The emissions are accounted for by the producing country. This more accurately reflects what the atmosphere sees and creates incentives to produce longer lived wood products.

Emissions from harvesting and from wood products are currently assumed to occur instantly when the carbon leaves the area of land on which it was harvested. This assumption fails to recognise the reality of the oxidation process and the carbon stored in wood products. It also poses a significant short term cost to Parties, which bears no relationship to the actual flux of carbon to the atmosphere. We suggest the Emissions to Atmosphere Approach is a simple and transparent way to improve this. **The proposal is explained in some detail in Annex I.**

³ Adapted from FAO definition

Element 4: Afforestation/ Reforestation Debit Rule

New Zealand believes that there should be a continuation and refinement of the Afforestation/ Reforestation Debit Rule⁴ (sometimes referred to as the “Fast-growing Forest Fix”).

Carbon accumulated between 1990 and 2008 as a result of afforestation/ reforestation activities is not credited within the 2008-2012 accounting period. However, at the time of harvest, if all carbon stock changes had to be accounted for, this would result in debits resulting from harvesting for land afforested/reforested since 1990 being greater than credits accounted for on that unit of land. For the first commitment period this was addressed with the Afforestation/ Reforestation Debit Rule (Fast forest fix). This rule ensures that activities that increase carbon stocks relative to 1990 are not counted as debits under Article 3.3. The same rationale that led to its confirmation for the first commitment period needs to also apply for second and subsequent commitment periods. This was noted during the original negotiations.

In addition, it should be clarified that the Debit rule applies to all disturbances to Afforestation and Reforestation forests such as, inter alia, harvesting, pests or fire. Credit for growth during the first commitment period needs to be balanced by an equivalent liability. We do not consider it is appropriate for a Party to suffer debits greater than credits for a forest that did not form part of the 1990 carbon stock. Compared with 1990, no net emission or removal results from post-1990 afforestation with subsequent disturbance, and the accounting rules should reflect this. In addition, the use of biomass from Article 3.3 forests can result in increases in the wood products pool (a temporary but potentially long term store of carbon), can be used for bio-energy (thus reducing emissions from fossil fuels), and can be a substitute for greenhouse gas intensive building materials such as steel and concrete (thus reducing emissions associated with the production of these products).

New Zealand proposes continuation of the A/R Debit Rule with text along the following lines:

“Debits arising from a unit of land, that was subject to afforestation and reforestation since 1990, shall not be greater than credits accounted for on that unit of land.”

Element 5: Caps on LULUCF for Annex I compliance

Limiting the use of LULUCF generated credits to meet emissions reduction objectives of Annex I Parties has been raised by some Parties. The credit flow from LULUCF is directly affected by the rules in place. However, it would be inappropriate to attempt to manipulate the credit supply by manipulating the rules as this would fail to provide the correct incentives for the long term behavioural changes required to harness the full capacity of the LULUCF sector to mitigate and adapt to climate change. For example, all afforestation and reforestation activities must be directly human-induced

⁴ Paragraph 4 of the Annex to decision 16/CMP.1 refers.

and are additional since 1990 so should continue to be fully credited (with any reversal of those credits debited at the appropriate time).

To avoid the need for special ‘fixes’, and to allay concerns of some Parties, the accounting framework and rules that apply post-2012 for the LULUCF sector must be agreed before the agreement of quantified emission reduction commitments.

8. Comments on Selected Cross-Cutting Issues

Natural disturbances

The influence of natural effects and control by humans refers to the fact that many natural phenomena have an impact on increases and decreases in carbon stocks; consequently human efforts to influence terrestrial carbon sequestration are constrained by phenomena over which they have only limited control. For example, by droughts; storms; diseases; insect attacks; and changes in temperature and rainfall.

These factors are largely beyond the control of land managers, although their effects might be somewhat modified by management decisions such as choice of crop, irrigation, fire control, biosecurity and disease control.

At present, natural variability appears not to be a major issue for New Zealand, though this is expected to change as increased climatic variability and other factors driven by climate change create greater risk factors. New Zealand is aware that a number of parties are considering options to address natural disturbances and we look forward to exploring these with them.

Symmetry in the accounting of emissions and removals

As a principle, there should be symmetry in the accounting of emissions and removals. Concern has been expressed that revegetation is not balanced by accounting for devegetation. Similarly, any new ‘additional activities’ introduced in Article 3.4 should have symmetry in accounting (for example rather than Wetland Restoration the activity could be Wetland Management).

This principle of symmetry should be extended to emissions from harvesting and removals from sequestration. In the current rules, carbon is credited over time as it accumulates in forests, yet on harvest it is assumed to oxidise instantaneously. Clearly this is asymmetrical and efforts should be made to balance the accounting approach for harvesting to achieve this. Simply put, accounting for harvesting emissions ‘when they occur’.

Difference between length of Commitment Period, Rules Period and Accounting Period

When considering time periods we need to understand the differences between Commitment Period, Rules Period and Accounting Period and the interactions between them.

- **The commitment period** is the period of time over which Parties agree to reduce their overall emissions of greenhouse gases to a specified level or take responsibility for any excess. This will be set outside the LULUCF process.
- **The rules period** relates to the length of time that the rules governing the accounting of greenhouse gas emissions and removals are in effect. Rules are in effect for as long as they are mandated by the Kyoto Protocol and by decisions of the CMP. Many rules currently last longer than the first commitment period, but some were agreed “for the first commitment period” only such as those relating to LULUCF.
- **The accounting period** is the time over which a Party accounts for their emissions and removals. For CP1 Parties had to identify in their Initial Reports whether, for each activity under Article 3, paragraphs 3 and 4, they intend to account annually or for the entire commitment period⁵

When considering issues associated with Commitment Period, Rules Period and Accounting Period and the interactions between them, Parties should take into account the following factors:

- Longer rule periods provide more certainty for investors, but also reduce the opportunity to make further improvements to the rules.
- A longer commitment period allows the forestry stock to recover to a greater degree following a significant natural disturbance.
- Lengthening of the commitment period increases the ability of forests to be managed in response to natural disturbances. However, a natural disturbance close to the end of an accounting period (of any length) provides limited opportunity for Parties to respond.

In principle, New Zealand supports longer commitment periods for LULUCF to provide investor certainty and to smooth out inter-annual variability and natural disturbance. New Zealand also supports Parties being able to choose the period of accounting that suits them. In CP1, Parties could choose annual or whole period accounting. Some flexibility could be shown to Parties so that they could elect to account on whatever basis they wish but this decision would need to be clearly stipulated in their initial reports for CP2. New Zealand considers that the length of the rules period should be at least the length of the Commitment Period, and potentially longer. The length of commitment period, accounting period and rules period needs consideration at Accra.

⁵ FCCC/KP/CMP/2005/8/Add.2 Annex of decision 13/CMP.1 Para 8 (d)

Annex I

The ‘Emissions to Atmosphere Approach’ to address emissions from all wood-based material removed from the forest at harvest

New Zealand proposes an approach to improve the accuracy of accounting for emissions from forests. In this approach, all carbon removed in wood and other biomass from forests is oxidised when the emissions occur. The emissions are accounted for by the producing country. This more accurately reflects what the atmosphere sees and creates incentives to produce longer lived wood products.

Background

At the meeting of the Fifth meeting of the AWG KP in Bangkok (April 2008) New Zealand suggested that, as an alternative to the approaches for accounting for Harvested Wood Products (HWP), the international community should consider focusing on approaches to address emissions that arise from forest harvesting using a simplified methodology, such as a variation of the *Simple Decay Approach*⁶.

Accounting for existing HWPs is extremely challenging due primarily to the partial global coverage of the Kyoto Protocol. The partial coverage of the Kyoto Protocol means that potentially large volumes of wood products may have been originally sourced from forest activities that were not covered by the Kyoto Protocol’s emission cap and/or are produced unsustainably, such as from deforestation and degradation in developing countries. To address these concerns, accounting rules for HWPs would presumably have to track where the wood entering the HWP pool comes from, whether it is accounted for under LULUCF and /or whether it is sustainably produced. The result is that HWP accounting is likely to be very complex to implement with potentially high administrative burden and residual concerns over environmental integrity.

New Zealand believes there is an alternative model that, at least as an initial step, would still capture many of the benefits of improving the incentives for increasing the long term storage of carbon in wood products, but without the complexities and challenges of the HWP accounting approaches that have been discussed to date.

The Emissions To Atmosphere Approach

New Zealand is proposing a variation on the simple decay approach, tentatively termed the ‘Emissions To Atmosphere Approach’. This approach is applied only to forests that are covered by Kyoto Protocol accounting and not to the existing wood products pool. The approach would account for emissions when they occur, thus moving away from the current instant oxidation approach to one that recognises more accurately when the emissions occur.

The current instant oxidation approach is clearly not accurate in the case of long-lived forest products and does not create incentives to produce longer lived wood products.

⁶ <http://www.maf.govt.nz/forestry/publications/harvested-wood-products-accounting/harvested-wood-products-accounting-technical-paper.pdf>

Under the Emissions To Atmosphere Approach, all carbon that is removed in wood and other biomass from a forest area is allocated to different end-uses. An aggregate lifetime is calculated based on the average lifetime of these different end-uses.

Under the Emissions To Atmosphere Approach:

- All emissions are accounted for when they occur;
- The responsibility for emissions from all carbon removed in wood and other biomass from a forest area is with the wood producer;
- Only emissions from forests that fall within the Kyoto accounting system are covered;
- Like the current instant oxidation approach, it is unnecessary to consider the existing wood products pool because the total emissions from the forest are being accounted for by the producer;
- There is no problem in moving from the CP1 instant oxidation accounting approach to the Emissions To Atmosphere Approach in CP2 because emissions from carbon removed from areas that were harvested in CP1 will have already been accounted for via instant oxidation;

The approach could also be applied to A/R projects under the Clean Development Mechanism (CDM).

Accounting under the Emissions To Atmosphere Approach

New Zealand proposes the following as a means to account for emissions from harvesting within the Kyoto Protocol accounting framework. Emissions from all carbon removed in wood and other biomass from the forest area in forests accounted for under Articles 3.3 (A/R/D) and 3.4 (if Forest Management is elected), and potentially Articles 6 and 12, is accounted for over time using one of the following methods:

Tier 1: Instant oxidation - to be exercised when no better data are available, or when parties wish to adopt a highly simplified approach.

Tier 2: Default internationally-agreed lifetimes - apply a set of default internationally-agreed lifetimes for a standard set of wood products and by-products (paper, timber, fuelwood etc...). These lifetimes could be derived from those found within the IPCC's Guidelines and would be used to calculate emissions from carbon removed in wood and other biomass from the forest area.

Tier 3: Country-specific lifetimes - apply a set of country-specific lifetimes for a standard set of wood products and by-products (paper, timber, fuelwood etc...). The country-specific lifetimes would have to be developed in a transparent and credible manner, and pass the same standards of review as for any other country-specific emissions factors in other sectors.

The formula below is for illustrative purposes and provides an example of how emissions might be calculated. For simplicity the example uses a linear equation.:

$$\text{Emissions} = (P_p * C * g_p) + (P_t * C * g_t) + (P_b * C * g_b) + (P_x * C * g_x)$$

P is proportion of carbon being removed from an area of harvest being used for p (paper), t (timber), b (fuelwood) x (other products⁷), where $P_p + P_t + P_b + P_x + \dots = 1$
 C is carbon stock to be accounted for, i.e. the carbon removed from the area.⁸
 g is lifetime of carbon being removed from area (expressed as percent of original volume of carbon removed from the forest area emitted each year).

For example:

If we assume that three harvesting events (Harvest₂₀₁₃, Harvest₂₀₁₄, Harvest₂₀₁₅) take place in 2013, 2014 and 2015 and in each event we assume that 1000 tonnes CO₂ eq is removed in wood and other biomass from the forest area in each harvesting event. We calculate the volume of carbon entering each end-use (timber, paper, fuelwood, other) and the different end-use lifetimes (g) to derive the aggregate lifetime of all carbon removed from area of harvest for each harvesting event. Carbon remaining onsite is allocated to the appropriate carbon pool.

To derive the total emissions for each year that result from these different harvesting events (Harvest₂₀₁₃, Harvest₂₀₁₄, Harvest₂₀₁₅) that occur over successive years, we need to work out the cumulative emissions of all events. This is done by applying the following formula and is illustrated in Table 1 below:

$$\begin{aligned} \text{Emissions Year 1} &= \text{Harvest}_{2013 \text{ Year 1}} \\ \text{Emissions Year 2} &= \text{Harvest}_{2014 \text{ Year 1}} + \text{Harvest}_{2013 \text{ Year 2}} \\ \text{Emissions Year 3} &= \text{Harvest}_{2015 \text{ Year 1}} + \text{Harvest}_{2014 \text{ Year 2}} + \text{Harvest}_{2013 \text{ Year 3}} \\ &\dots \text{and so on} \dots \end{aligned}$$

Harvest_{2013 Year 1} refers to the emissions from harvest event in 2013 in Year 1. Harvest_{2014 Year 1} refers to the emissions from harvest event in 2014 in Year 1. Harvest_{2013 Year 2} refers to the emissions from harvest event in 2013 in Year 2

⁷ There is no limit to the number of other products that might be included

⁸ That is total harvest less any allowance for A/R debit rule if applicable

Table 1: Indicative emissions as a result of three separate harvesting events

	Harvest ₂₀₁₃				Harvest ₂₀₁₄				Harvest ₂₀₁₅				Cumulative emissions from Harvest ₂₀₁₃ + Harvest ₂₀₁₄ + Harvest ₂₀₁₅
	Timber	Paper	X (other)	Total	Timber	Paper	X (other)	Total	Timber	Paper	X (other)	Total	
Volume of carbon removed from area of harvest	500 g = 0.1	300 g = 0.33	200 g = 0.05	1000	500 g = 0.1	300 g = 0.33	200 g = 0.05	1000	500 g = 0.1	300 g = 0.33	200 g = 0.05	1000	
Emissions 2013	50	100	10	160									160
Emissions 2014	50	100	10	160	50	100	10	160					320
Emissions 2015	50	100	10	160	50	100	10	160	50	100	10	160	480
Emissions 2016	50	0	10	60	50	100	10	160	50	100	10	160	380
Emissions 2017	50	0	10	60	50	0	10	60	50	100	10	160	280
Emissions 2018	50	0	10	60	50	0	10	60	50	0	10	60	180
Emissions 2019	50	0	10	60	50	0	10	60	50	0	10	60	180
Emissions 2020	50	0	10	60	50	0	10	60	50	0	10	60	180
Emissions 2021	50	0	10	60	50	0	10	60	50	0	10	60	180
Emissions 2022	50	0	10	60	50	0	10	60	50	0	10	60	180
Total emissions	500	300	100	900	450	300	90	840	400	300	80	780	2520
Carbon removed from area of harvest as yet unemitted at end of 2022	0	0	100	100	50	0	110	160	100	0	120	220	480

Note:

If emissions following a harvesting event in a given year are calculated to be greater than the carbon stock remaining from that harvesting event, then the harvesting emission should be limited to the remaining carbon stock.

A g value of 0.1 means a lifetime of 10 years; a g value of 0.33 means a lifetime of 3 years; a g value of 0.05 means a lifetime of 20 years. (g values are the percent of original volume of carbon removed from the forest area that is emitted per annum.)

Proposal for how to include the Emissions To Atmosphere Approach in accounting under the Kyoto Protocol

For simplicity and continuity of accounting, emissions of carbon removed in wood and other biomass from the forest area could be accounted for within the existing five carbon pools (above-ground biomass, below-ground biomass, litter, dead wood and soil organic carbon).

In order to account for emissions from harvesting activities we simply account for the carbon that enters and exits the five carbon pools each year. We can take the volume of carbon removed in wood and other biomass from the forest area and include it as a subset of the deadwood pool as “off-site deadwood” (in the example above 1000 tonnes). The aggregate emissions of this carbon are then estimated according to the average lifetimes of its various end-uses.

At the end of each year, the residual carbon stock in this “off-site deadwood pool” is added to the carbon stock remaining in the rest of the deadwood pool (i.e. deadwood remaining on site) and to the other four carbon pools to calculate the net carbon stock change in areas under LULUCF accounting.