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**Report of the technical assessment of the forest management
reference level submission of New Zealand submitted in 2011**

Contents

	<i>Paragraphs</i>	<i>Page</i>
I. Introduction and summary	1–3	3
A. Overview	1–2	3
B. Proposed reference level	3	3
II. General description of the reference level	4–32	3
A. Overview	4	3
B. How each element of footnote 1 to paragraph 4 of decision 2/CMP.6 was taken into account in the construction of the reference level	5–10	4
C. Pools and gases	11–14	5
D. Approaches, methods and models used	15–22	5
E. Description of the construction of the reference levels	23–30	7
F. Policies included	31–32	8
III. Conclusions and recommendations	33–38	9
Annex		
Documents and information used during the technical assessment		11

I. Introduction and summary

A. Overview

1. This report covers the technical assessment (TA) of the submission of New Zealand on its forest management reference level (FRML), submitted on 28 February 2011 in accordance with decision 2/CMP.6. The TA took place (as a centralized activity) from 30 May to 3 June 2011 in Bonn, Germany, and was coordinated by the UNFCCC secretariat. The TA was conducted by the following team of nominated land use, land-use change and forestry (LULUCF) experts from the UNFCCC roster of experts: Mr. Sandro Federici (San Marino), Mr. Justin Goodwin (United Kingdom of Great Britain and Northern Ireland), Mr. Hector Ginzo (Argentina), Ms. Tuija Lapveteläinen (Finland), Mr. Richard Volz (Switzerland), and Mr. Xiaoquan Zhang (China). Mr. Xiaoquan Zhang and Mr. Richard Volz were the lead reviewers. The TA was coordinated by Ms. María José Sanz-Sánchez (UNFCCC secretariat).

2. In accordance with the: “Guidelines for review of submissions of information on forest management reference levels” (decision 2/CMP.6, appendix II, part II), a draft version of this report was communicated to the Government of New Zealand, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Proposed reference level

3. New Zealand’s proposed FMRL is 10.78 million tonnes of carbon dioxide equivalent (Mt CO₂ eq) per year for the period 2013–2017 or 11.15 Mt CO₂ eq per year for the period 2013–2020.

II. General description of the reference level

A. Overview

4. New Zealand’s FMRL uses the pre-1990 age-class structure from the national exotic forest description (NEFD)(2009),¹ pre-1990 yield tables and forest area values from the NEFD (2009), and post-1989 yield tables and forest area values from New Zealand’s greenhouse gas (GHG) inventory submitted in 2010. The FOLPI (Forestry Oriented Linear Programming Interpreter) has been used to estimate greenhouse gas emissions and removals of all carbon pools for New Zealand’s GHG inventory reporting submitted before 2010, and projected harvesting volumes for New Zealand’s fifth national communication.

¹ New Zealand noted that its GHG inventory reports submitted in 2010 and 2011 are based on pre-1990 planted forest age class with a base period as at 1990, sourced from the 2007 NEFD.

B. How each element of footnote 1 to paragraph 4 of decision 2/CMP.6 was taken into account in the construction of the reference level**1. Historical data from greenhouse gas inventory submissions**

5. New Zealand's FMRL uses historical forest data contained in the national exotic forest description, pre-1990 yield tables from the NEFD, and post-1989 yield tables from New Zealand's GHG inventory reporting. New Zealand has stated that its FMRL will be updated to reflect continued improvements in its GHG inventory and in data availability.

2. Age-class structure

6. New Zealand's FMRL uses the NEFD pre-1990 planted production forest age-class structure as at 1 January 2009 (see appendix 2 in New Zealand's submission) and LUCAS (the land use and carbon analysis system) post-1989 planted production age-class structure. Radiata pine is the dominant species (88 per cent) in New Zealand's planted production forest, with a typical harvest rotation of 26–32 years. New Zealand's pre-1990 planted production forest area increased by 45 per cent between 1980 and 1989. In 2009, the age class of pre-1990 production forests peaked at 23–25 years (with each age class representing 3.2–3.3 per cent of the total forest area, 4.97–5.15 per cent of the pre-1990 forest area). Less than 4 per cent of pre-1990 production forests are over 32 years old.

3. The need to exclude removals from accounting in accordance with decision 16/CMP.1, paragraph 1

7. This is achieved by the provisions for factoring out, which are described in chapter II.E.7. below.

4. Other elementsForest management activities already undertaken

8. New Zealand has a long history of production forests planted to protect indigenous natural forests and to sustain wood demand. Planted production forests are subject to clear felling at maturity (27.8 years old on average between 1995 and 2010 with a range of 26.8–28.4 years), followed by replanting (within 1–3 years) or in limited circumstances, land-use change (deforestation). Accepted practices for felling in New Zealand are in the age range of 26 to 32 years. Standard silvicultural practices (e.g. thinning of small trees and pruning of low branches) are established and applied.

Projected forest management activities under a 'business as usual' scenario

9. New Zealand indicated that it foresees no change in current silvicultural practices over the period to 2020. During the review, the ERT looked at the description of the harvest modelling inputs from New Zealand that imply an increase in harvesting of mature pre-1990 planted forest stocks during the period 2013–2020. The ERT noted that New Zealand's assumptions on constraints in the form of both a maximum volume suitable for harvesting and a minimum necessary to sustain existing mill infrastructure (see para. 15 below) are used to control any unrealistic dips and jumps in harvest volumes between years. The ERT also noted that the FOLPI model used by New Zealand projects an average harvest age of 31.3 to 32.1 years during the reference period; this rotation period differs from the average one of 27.8 years for the years between 1995 and 2010.

Continuity with the treatment of forest management in the first commitment period

10. New Zealand did not elect to account for the Article 3, paragraph 4, of the Kyoto Protocol activity forest management in the first commitment period.

C. Pools and gases**1. Pools and gases included in the reference level**

11. Above- and below-ground biomass, soil organic matter, dead wood, litter and soil organic matter are included. Harvested wood products (HWP) and non-CO₂ GHGs are not included.

2. Consistency with inclusion of pools in the estimates

12. The ERT notes that when reporting Kyoto Protocol supplementary information on forest management during the first commitment period, pools are only to be excluded when it can be demonstrated, in accordance with the *Land Use, Land-Use Change and Forestry Good Practice Guidance* (2003), that these are not a source of GHG.

13. The FMRL is consistent with the GHG inventory with regards to the inclusion of carbon pools. The ERT notes that HWP is omitted from both the GHG inventory submission on 2010 and its FMRL submission. New Zealand has indicated in its submission that it intends to calculate and incorporate a HWP pool into its reference level in the future.

14. Non-CO₂ gases from nitrogen fertilization and biomass burning are currently reported in the GHG inventory under the agriculture sector and are therefore excluded from the proposed construction of the FMRL. The ERT noted that non-CO₂ is an insignificant source of GHG emissions in New Zealand's forestry sector, and therefore is not included in its FMRL.

D. Approaches, methods and models used**1. Description**

15. New Zealand's FMRL is calculated using the FOLPI model. FOLPI uses the NEFD pre-1990 planted production forest age-class structure as at 1 January 2009, pre-1990 yield tables from NEFD, and post-1989 yield tables from New Zealand's GHG inventory submitted in 2010 to project volumes of timber harvested. The information about how New Zealand's forest estate would be managed has been improved in line with New Zealand's Wood Availability Forecast 2010–2030 (WAF 2010–2030). New Zealand considers that the WAF improves the forecasting of harvesting, as it, among other things, provides a more sophisticated disaggregation of the forest estate (on the basis of different species and owner types). New Zealand assumes that soil carbon reaches a steady state 20 years after conversion (Intergovernmental Panel on Climate Change (IPCC) tier 1 method) and thus all soil under pre-1990 planted forests is assumed to be at a steady state after 2010. New Zealand projected its harvesting levels based on the age-class structure as at January 2009, as presented in appendix 2, of the FMRL and the simulation of FOLPI. The FOLPI is an economic optimization model that operates according to economic optimization until such point as the practical constraints associated with harvesting are met. These constraints are in the form of both a maximum volume able to be harvested and a minimum necessary to sustain existing mill infrastructure.

16. New Zealand also states that all pre-1990 planted forests are assumed to be on mineral soils.

2. Transparency and consistency

17. The ERT commends New Zealand for providing detailed yield tables (appendix 1) and age-class structure for pre-1990 exotic planted forests (appendix 2) in its FMRL submission.

18. The ERT notes that New Zealand harvest forecasts for total planted forests data from its WAF 2010–2030 are lower for all scenarios compared with data provided as part of New Zealand’s FMRL submission for total forest harvest (FMRL submission, para. 32).

19. During the review, New Zealand indicated that in constructing the FMRL, it has adopted several of the most instructive aspects of the WAF 2010–2030, including the disaggregation of the forest estate. However, New Zealand does not consider it appropriate to use any of the WAF scenarios for the construction of the reference level due to the following:

- (i) This data does not distinguish between pre-1990 and post-1989 forests;
- (ii) The WAF survey was prepared prior to the introduction of New Zealand’s Emissions Trading Scheme (ETS), and at a time when there was considerable uncertainty about how forestry would be treated in any scheme. The ETS has had a fundamental effect on foresters’ decisions to harvest pre-1990 or post-1989 forests, with the latter being delayed and the former increased during the reference level period;
- (iii) The WAF was prepared based on the harvesting intentions of forest owners between 2005 and 2007. This period coincided with a historically low global demand for timber and consequently provides an overly pessimistic view of supply.

20. New Zealand does not provide emissions/removals with respect to different carbon pools in FMRL. During the review, New Zealand provided approximate figures for net emissions/removals for different carbon pools (see table 1 of annex), but lack of gross carbon gain from forest growth and carbon loss from harvesting in the living biomass pool as the FOLPI model does not disaggregate the gains and losses to carbon stock by pool (see annex). The ERT notes that New Zealand did disaggregate the living biomass pools in the GHG inventory.

21. In calculating the FMRL, the FOLPI model assumed that 85 per cent of stem carbon is instantaneously oxidized at the time of harvesting. New Zealand’s GHG inventory assumes 70 per cent of above-ground biomass is instantaneously oxidized at the time of harvesting. These two calculations are roughly comparable. The ERT notes that consistency in the fraction of harvested biomass instantaneously oxidized should be maintained when estimating emissions from harvest during the commitment period.

22. The ERT noted that the Party used the same yield tables (reported in appendix 1 of New Zealand’s submission) as are used in its GHG inventory for calculating emissions and removals from pre-1990 forest. The ERT also noted that the Party recognized the need for ensuring consistency between the GHG inventory and the FMRL and, therefore, the updating of the current FMRL when new data/information becomes available.

E. Description of the construction of the reference levels

1. Area under forest management

23. New Zealand's total natural forest area was 8.1 mha in 2010. New Zealand's FMRL includes this area. Carbon stored in natural forests is assumed to be in a steady state. The area of pre-1990 forests is presented differently in the FMRL as 1.2 mha (as an effective harvestable area based on the NEFD) and in the GHG inventory, the area is 1.45 mha (as gross area based on satellite image classification). This difference is to be expected as noted in paragraph 24 of New Zealand's submission. It can be explained by the different methodologies used by NEFD and LUCAS, with NEFD using net stocked area and LUCAS using gross stocked area for their calculations. New Zealand also indicates that the post-1989 planted forest area associated with Article 3, paragraph 3, of the Kyoto Protocol activities is 0.558 mha (New Zealand GHG inventory (1990–2008)). Taking into consideration the deforested area post-1989 forests, this value presented in the FMRL is consistent with the 2010 national inventory report (NIR) of 0.580 mha. The pre-1990 planted production forest and natural forest area under forest management is expected to remain constant for the reference level period with a minimal level of deforestation.

24. New Zealand indicated that, consistent with the flexible land use rule it is proposing (see paras. 33–35 in the LULUCF chapter of FCCC/KP/AWG/2011/CRP.1), New Zealand's projected harvest includes activities to harvest pre-1990 forests in its FMRL which result in land-use change for that particular location (deforestation) where an equivalent forest is established elsewhere (this would be required under the flexible land use rule proposal). New Zealand further indicated that an adjustment to the FMRL would be applied if the flexible land use rule (being negotiated under the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol) is not agreed. The ERT notes that New Zealand has provided the ERT with the amount of emissions included in its FMRL that result from the harvesting of pre-1990 planted forests that are subject to land-use change and replanting elsewhere (see annex).

2. Relationship of the forest land remaining forest land category with the forest management activity reported previously under the Convention and the Kyoto Protocol

25. The FMRL generally has the same area basis as forest management, which is consistent with the forest land remaining forest land category. The difference in the pre-1990 planted production forest area between FMRL and GHG inventory is that the harvested pre-1990 forest area subject to land use change is included in FMRL but not in the GHG inventory.

3. Forest characteristics

26. According to New Zealand's 2010 NIR, 1.4 mha of pre-1990 planted forests comprise radiata pine (88 per cent), Douglas fir (6 per cent), Eucalyptus (4 per cent), and cypress species and numerous other softwood and hardwoods (2 per cent).-

4. Historical and assumed harvesting rates

27. New Zealand has historically (between 1995 and 2010, 2010 NEFD) had an average rotation length of 27.8 years with a range between 26.8 and 28.4 years for radiata pine. The ERT noted that New Zealand projected in its FMRL that the proportion of total pre-1990 production forests to be harvested averages at 5.58 per cent for the period 2013–2017 and 5.46 per cent for the period 2013–2020. This is higher than the historic harvesting rate of pre-1990 planted production forests, that is 3.6–3.8 per cent between 2007 and 2010.

Furthermore, the ERT noted that the projected harvesting area for 2009 and 2010 are below the actual harvested area in 2009 and 2010 sourced from 2009 NEFD and 2010 NEFD, as well as an actual harvested area in 2000–2008 (39,000 ha–43,000 ha). At the same time, the projected mean harvesting age for 2009 (33.4 years) and for 2010 (32.2 years) are higher than the actual mean harvesting age (28.2 years and 28.4 years respectively) due to the projected harvesting of areas² older than 32 years. The ERT notes that both the underestimate of harvested areas and the high share of over 32 year forest areas among those projected as harvested, for the years 2009, 2010 and 2011, determined a higher availability of harvestable area at maturity for years in the period 2012–2020 and therefore a potential overestimate of emissions included in the FMRL.

5. Harvest wood products

28. While New Zealand supports and intends to include in the future estimates data related to harvested wood products, it was not able to consolidate its data for these calculations in time and has therefore assumed for the reference level that all material removed from the site is instantaneously oxidized according to IPCC defaults (see chapter II.C.2 above). This approach is consistent with New Zealand’s latest GHG inventory. The ERT recommends New Zealand to treat the HWP pool consistently in the FMRL and in the period for accounting when including it in the future.

6. Disturbances in the context of force majeure

29. New Zealand has not included force majeure in its reference level as its historical forest data does not include an event that could be classified as a force majeure. The ERT notes that a level of natural disturbance is included in New Zealand’s reference level, as the yield tables are based on the observed volume of wood and carbon stocks in New Zealand’s forests.

7. Factoring out

30. New Zealand uses a projected reference level which includes age-class structure considered to factor out dynamic age-class effects. With the present state of scientific knowledge, the effects of elevated CO₂ concentrations and indirect nitrogen deposition occur in the reference level and in the estimated period (i.e. the commitment period), and therefore they can be assumed to factor out.

F. Policies included

31. Pre-2010 domestic policies on forests listed in its FMRL submission include the following:

(a) The New Zealand Government regulates the removal of timber from natural indigenous forests under the Forests Act, 1949. Timber can only be harvested from forests that are managed in a way that maintains continuous forest cover and ecological balance. Approximately 300,000 ha of natural indigenous forest are managed under the Forests Act, 1949. In addition, 57,000 ha of natural indigenous forests were transferred to South Island Māori under the South Island Landless Natives Act, 1906, which provides for the harvesting of this forest subject to the provisions of the Resource Management Act, 1991;

² The high amount of harvested areas is in contrast with the evidence reported in the “New Zealand Wood Availability Forecasts 2010–2040” that a proportion of the area with trees older than 32 years of age was removed from the modelling since that area was not expected to be harvested.

(b) New Zealand's ETS includes forestry. The scheme is legislated for under the Climate Change Response Act, 2002. Owners of exotic pre-1990 forest land who deforest are liable under the Act for emissions associated with that activity. This is the only obligation on owners of pre-1990 exotic forests under ETS;

(c) The Climate Change Response (Emissions Trading) Amendment Act, 2008, amended the Climate Change Response Act, 2002, (the Act) to provide for a domestic offsetting scheme. Under the Climate Change Response (Emissions Trading) Amendment Act, 2008, section 53, the Minister responsible for the Act must recommend the making of the Order in Council under section 2(1) if he or she is satisfied that an international agreement to which New Zealand is a party has the effect of permitting any liability of New Zealand in relation to the deforestation of pre-1990 forest land in a period after 31 December 2012 to be offset by the planting of new forest land. The Climate Change Response (Emissions Trading) Amendment Act, 2008, section 165, provides for the regulations relating to the offsetting of pre-1990 land, and section 182 provides for offsetting in relation to pre-1990 forest land.

(d) New Zealand assumes that its biofuel policies do not have an impact on the forests included in its forest management reference level. New Zealand states that biofuel feedstocks are expected from non-forest products and from using wooden waste produced by the timber industry.

32. New Zealand's FMRL estimates assume that its policies prevent any significant deforestation of pre-1990 forest areas. The FMRL assumes that policies protecting existing natural forests (Forests Act, 1949) and planted forest areas (Climate Change Response Act, 2002) make it illegal or not economically viable to reduce the pre-1990 planted production forest area in the reference level period. The ERT also notes that New Zealand expects that the ETS for its post-1989 forests will make it preferential for pre-1990 forests to be harvested during the FMRL period.

III. Conclusions and recommendations

33. The ERT found New Zealand's FMRL submission and supporting material informative and transparent. It also found the Party's responses to its questions during the TA process helpful and essential for the completion of the assessment.

34. The ERT notes that New Zealand has indicated that a technical correction for the "flexible land use rule" components of the FMRL would be made if these rules are not agreed as part of the LULUCF modalities being negotiated for a second commitment period of the Kyoto Protocol. The ERT notes that New Zealand identified the portion of emissions due to harvesting followed by land-use changes (deforestation) included in the FMRL (see annex).

35. The ERT noted that New Zealand's FMRL does not disaggregate gains and losses for biomass, unlike in its GHG inventory submissions. It notes New Zealand's explanation that the FOLPI model is not able to provide this data. The ERT considers that this is a weakness in the FMRL and encourages New Zealand to make efforts to disaggregate gains and losses.

36. The ERT recommends that New Zealand provides further information on how forest owners will be able to move from historic/current harvesting practice to the longer rotation length projected in the FOLPI model. The ERT notes that the difference in both harvested areas³ and harvesting age as calculated by FOLPI vis-à-vis their corresponding observed

³ The FOLPI harvested area is 30 per cent and 24 per cent lower than observed for 2009 and 2010 respectively. This is calculated based on the projected harvest area in table 2 of the annex and the

data could be explained in more detail, and encourages New Zealand to compare the results provided in its submission with a rerun of the FOLPI model in which the harvesting of overmature forests (over 32 years of age) is constrained, and to modify its reference level accordingly if necessary.

37. The ERT recommends that, in case New Zealand will provide estimates for natural forests in future GHG inventory submissions, it proposes a technical adjustment of the FMRL.

38. The ERT notes that New Zealand has indicated that a technical correction for the HWP components of the FMRL would be made if these rules are agreed as part of the LULUCF modalities being negotiated for a second commitment period of the Kyoto Protocol.

observed harvest area as provided in NEFD 2009 (41,800 ha) and NEFD 2010 (43,500 ha).

Annex

Documents and information used during the technical assessment

A. Reference documents

New Zealand Ministry of Agriculture and Forestry. 2009. New Zealand wood availability forecasts 2010–2030.

New Zealand Ministry of Agriculture and Forestry. 2006. National Exotic Forest Description as at 1 April 2005. Available at <<http://www.maf.govt.nz/news-resources>>.

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Manley B, Papps S, Threadgill J and Wakelin S. 1991. *Application of FOLPI: A Linear Programming Estate Modelling System for Forest Management Planning*. FRI Bulletin No.164. Forest Research Institute, New Zealand.

B. Additional information provided by the Party¹

1. Information provided by New Zealand during the review in response to questions raised by ERT

Table 1. Change in Carbon Stock by Biomass Pool (tonnes of carbon), as provided by New Zealand during the review process.

Year	Above ground t C	Below ground T C	Deadwood t C	Litter t C	All Pools t C
2009	1,497,000	313,000	-159,000	-109,000	1,542,000
2010	734,000	162,000	107,000	67,000	1,070,000
2011	-115,000	-14,000	321,000	185,000	377,000
2012	-973,000	-198,000	477,000	257,000	-437,000
2013	-2,289,000	-473,000	697,000	364,000	-1,701,000
2014	-3,141,000	-646,000	750,000	372,000	-2,665,000
2015	-3,227,000	-668,000	559,000	258,000	-3,078,000
2016	-3,332,000	-693,000	409,000	182,000	-3,434,000
2017	-3,418,000	-710,000	299,000	137,000	-3,692,000
2018	-3,398,000	-704,000	207,000	113,000	-3,782,000
2019	-2,567,000	-534,000	-106,000	-31,000	-3,238,000
2020	-2,307,000	-480,000	-218,000	-48,000	-3,053,000

Note: Numbers do not add to the submitted reference level due to successive rounding.

Table 2. Projected pre-1990 planted production forest area harvested by year and average age at harvest, as provided by New Zealand during the review process.

Year of harvest	New Zealand's projected harvest	
	Area (hectares)	Average age of trees harvested
2009	29143	33.4
2010	33008	32.2
2011	37391	31.8
2012	41262	31.8
2013	46260	32.1
2014	49993	31.4
2015	49604	31.6
2016	49629	31.7
2017	49908	31.6
2018	50192	31.3
2019	45823	31.4
2020	44479	31.5

¹ Reproduced as received from the Party.

Table 3. Estimated contribution of emissions from harvesting and replanting elsewhere, as provided by New Zealand during the review process.

Period	Total area where replanting occurred elsewhere	Removals in forest land remaining forest land	Harvest from forest land remaining forest land	Net change in the reference level
2013-2017	10,000ha	-0.18	-1.03	-1.21
2013-2020	16,000ha	-0.32	-0.93	-1.25

Note: In line with the Common Reporting Format a positive number is an emission. The value is the average per year in million tonnes CO₂