



United Nations

FCCC/TAR/2011/EST



**Framework Convention on
Climate Change**

Distr.: General
3 October 2011

English only

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

Contents

	<i>Paragraphs</i>	<i>Page</i>
I. Introduction and summary	1–4	3
A. Overview	1–2	3
B. Proposed reference level.....	3–4	3
II. General description of the reference level.....	5–28	3
A. Overview	5	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.....	6–10	4
C. Pools and gases.....	11–12	4
D. Approaches, methods and models used	13–17	5
E. Description of the construction of the reference levels	18–25	6
F. Policies	26–27	7
G. Other issues	28	7
III. Conclusions and recommendations.....	29–31	8
Annex		
Documents and information used during the technical assessment		9

I. Introduction and summary

A. Overview

1. This report covers the technical assessment (TA) of the submission of Estonia on its forest management reference level (FMRL), submitted on 18 April 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 experts from the UNFCCC roster of experts: Mr. Xiaoquan Zhang (China), Mr. Richard Volz (Switzerland), Ms. Tuija Lapveteläinen (Finland), Mr. Hector Ginzo (Argentina), Mr. Sandro Federici (San Marino) and Mr. Justin Goodwin (United Kingdom of Great Britain and Northern Ireland). 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 Estonia, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Proposed reference level

3. Estonia has proposed an FMRL of -2.741 million tonnes of carbon dioxide equivalent (Mt CO₂ eq) per year applying the first-order decay function for harvested wood products (HWP) and -1.742 Mt CO₂ eq per year assuming instantaneous oxidation of HWP. The proposed value consists of net removals of -2.082 Mt CO₂ eq per year from living biomass, plus net emissions of 0.340 Mt CO₂ eq per year from non-biomass pools, caused mainly by drainage of organic soils, and net accumulations of -0.999 Mt CO₂ eq per year in the HWP pool.

4. The values for the FMRL and the HWP pool in paragraph 3 above include a correction¹ and a recalculation² to those values contained in Estonia’s official submission on its FMRL.

II. General description of the reference level

A. Overview

5. Estonia, together with 14 other member States of the European Union (EU), has adopted a common methodological framework to calculate its FMRL. This framework was

¹ There was an error in the model version used to calculate the HWP pool; an equation related to non-coniferous industrial round wood was not applied correctly, owing to a cell having shifted in the calculation matrix.

² The recalculation was performed in order to address the findings and comments provided by the expert review team (see chapter III below and the information provided in the annex to this document).

implemented by a team of research groups coordinated by the Joint Research Centre (JRC) of the European Commission.

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

6. The historical data are those contained in the Estonian 2010 greenhouse gas (GHG) inventory, including supplementary information reported under the Kyoto Protocol. The applied methodology ensures that historical data determine the magnitude of expected anthropogenic emissions and removals during the second commitment period.

2. Age-class structure

7. In the forthcoming decade (2011–2020), Estonian forests will be predominantly (more than 50 per cent) composed of middle-age (41–60 years) and pre-harvesting (61–80 years) classes. Forests containing harvesting and mature classes of trees (81–100, 101–120, 121–140 and over 141 years) will cover about 10 per cent of the total forest area. The high percentage of age classes which are characterized by active growth is expected to result in an increase of the annual increment of tree biomass over the decade.

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

8. No specific information reported; see paragraph 25 below.

4. Other elements

Forest management activities already undertaken

9. Forest management activities already undertaken are indirectly taken into account through the use of the latest available time-series data for forest land (from the national forest inventory (NFI) or other country statistics).

Projected forest management activities under a ‘business as usual’ scenario

10. The estimation of future harvest demand up to 2020 is based on macroeconomic drivers and the application of policies implemented in the EU member States by April 2009.

C. Pools and gases

1. Pools and gases included in the reference level

11. Estonia includes in its FMRL above- and below-ground biomass pools, the HWP pool and emissions of CO₂ from the drainage of organic soils and of non-CO₂ GHGs from forest fires. Dead organic matter and mineral soil organic matter have been assumed to be in equilibrium, consistent with the Intergovernmental Panel on Climate Change (IPCC) tier 1 practice.

2. Consistency with inclusion of pools in the estimates

12. The same pools and gases have been estimated in the forest land remaining forest land GHG inventory category as were used in the construction of the FMRL.

D. Approaches, methods and models used

1. Description

13. Estonia is one of the member States of the EU for which JRC developed projections in collaboration with two EU modelling groups. The models, G4M (Global Forestry Model)³ from the International Institute for Applied Systems Analysis and EFISCEN (European Forest Information Scenario Model)⁴ from the European Forest Institute, project annual estimates of emissions and removals for forest management until 2020 for the above- and below-ground biomass carbon pools. To estimate the FMRL, the emissions and removals estimated by the models for the time series 2000–2020 were post-calibrated using historical data from the country for the period 2000–2008.⁵ In this post-calibration, a constant offset is added to the model results for 2000–2020 based on the average historical data provided by each country for the period 2000–2008. This ensures consistency with historical data for Estonia in terms of the absolute level of emissions and removals and the coverage of pools and gases. In practice, this post-calibration fixes the magnitude of the projected net emissions/removals, while the model outputs determine only the trend in projected net emissions/removals and its shape. The FMRL has therefore been estimated by the combined and concurrent action of models and historical data; the trend in and magnitude of historical data and model outputs may be compared, ensuring full transparency.

14. The future harvest demand under a ‘business as usual’ scenario was derived from macroeconomic drivers (e.g. gross domestic product or population) and policies enacted in Estonia up to April 2009. This information is used as data input to GLOBIOM (Global Biomass Optimization Model), which projects demand for timber, and for the PRIMES model, which projects bioenergy demand.

15. Dead organic matter and soil organic matter pools, and other emissions, have been projected assuming a constant net change for the period 2009–2020 equivalent to the historical average change reported for the period 2000–2008. This is not a conservative assumption for accounting for a pool when stock changes are increasingly positive (i.e. net removals) or decreasingly negative (i.e. net emissions); in those cases the trend does matter.

2. Transparency and consistency

16. Estonia’s submission and the replies received to questions posed by the expert review team (ERT) during the review are transparent. The models and methods are described in the submission and the sources of the main parameters and characteristics as used in the models are also provided.

17. An inconsistency was found in the area data, as described in paragraph 18 below; other information contained in the FMRL submission is consistent with that provided in the GHG inventory.

³ G4M relies on spatial data. These data may or may not have been provided by countries. Other forest and forest management parameters (e.g. age-class structure, increment and historical harvest) were taken from the NFIs or other country statistics.

⁴ EFISCEN uses as data input forest area data from NFIs, scaled to match the forest area reported in the national inventory report (the forest land remaining forest land area, from which the deforested area is deducted, or the forest management area if elected under the Kyoto Protocol), and provides projections on basic forest inventory data (stem wood volume, increment, age-class structure, as well as carbon in forest biomass and soil).

⁵ For 2000 to 2008, forest management estimates were provided by the country.

E. Description of the construction of the reference levels

1. Area under forest management

18. The ERT noted that Estonia reported recalculated data in its 2011 GHG inventory submission. The ERT also noted an issue of consistency among the forest area figures used by the G4M model (2,138 kha in 2010), the EFISCEN model (2,072 kha in 2010) and the area reported as forest land remaining forest land for 2009 in the 2011 GHG inventory (2,155 kha). Estonia has rerun the EFISCEN model using the updated area data, in order to recalculate the FMRL. However, given the small difference in the forest area used by the G4M model and considering the post-calibration of the model outputs, such a small discrepancy in area can be considered negligible.

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

19. Estonia includes in the FMRL all managed forests reported under the category forest land remaining forest land.

3. Forest characteristics

20. Following Estonia gaining its independence in 1991, the new State moved to return all previously expropriated land to its initial owners or their descendants. Borders of the state forests were restored to those present in 1940, and the remaining land was set aside for privatization. In addition, changes carried out in the forest survey and a slowing in the land reform (which is still continuing today) created a situation where valid, current information was available only for one third of Estonian forests.

21. From 1999, an NFI system was put in place. Methodologically, the NFI is designed as an annual research effort, which should ensure continuous updating of information and the national forest database. A network of sample plots, covering the whole country (21,000 sample plots), has been designed and it has been planned that all plots will be covered in five years, with 20 per cent of them measured each year. Point estimates of parameters are calculated using data from the sample plots and form the basis for inferences drawn for the entire population.

4. Historical and assumed harvesting rates

22. Five-year averages for 2000 and 2005 are provided as historical harvest data. Data for 2020 were estimated by the models PRIMES (wood for bioenergy) and GLOBIOM (timber). Data for between 2008 and 2020 have been interpolated. The assumed harvesting rate for 2013–2020 is 35 per cent higher than the five-year average for 2005. This increase seems justifiable based on the high (and still increasing) share of the age class 61–80 years, available for harvesting during the next decade.

5. Harvested wood products

23. The estimated annual accumulation of -0.999 Mt CO₂ eq per year in HWP pools included in the FMRL is estimated using the approach proposed in document FCCC/KP/AWG/2010/18/Add.1, with annual production data, specific half-lives for product types, and application of the first-order decay function as in equation 12.1 of the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, with default half-lives of two years for paper, 25 years for wood panels and 35 years for sawn wood and instantaneous oxidation assumed for wood in solid waste disposal sites. Historical data from 1900 onwards are taken into account. The estimates include exports.

6. Disturbances in the context of force majeure

24. Estonia did not consider force majeure in the construction of its FMRL; the post-calibration procedure applied automatically incorporates the average rate of past disturbances (for the period 2000–2008) into the projections. The annual average emissions from forest fires for the period 1990–2008 (26.5 Gg CO₂ eq per year) seems to represent the major natural disturbance type; it represents 0.06 per cent of the total GHG emissions in 1990 and is always lower than 0.36 per cent of the total GHG emissions of the country in 1990.

7. Factoring out

25. The use of a projected reference level which includes age-class structure is 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 this approach adequately addresses factoring out.

F. Policies

1. Description of policies

26. Energy policies taken into consideration in the FMRL of Estonia are provided in annex II to its submission. Besides the EU energy policies implemented until April 2009, national measures are not listed in that annex. Information on how these EU-level policies are being implemented at the national level and their anticipated impact on the FMRL is not provided.

2. How policies are taken into account in the construction of the reference level

27. All energy policies implemented at the EU and domestic levels are taken by the PRIMES model as input values for estimation of wood fuel demand driven by these policies. Output from PRIMES is further used as input for next-step models. Forest management policies are not directly taken by models as input parameters, but the impact of forest management policies is integrated into the projection process through increment, harvesting rates and changes in age-class structure. Furthermore, Estonia confirms that no domestic policies other than those included in PRIMES were taken into account when estimating the reference level.

G. Other issues

28. The estimates for forest land in the 2011 GHG inventory have been based on NFI data showing a high inter-annual variability in net removals that cannot be explained by trends in harvesting data (see table 1 in the annex to this document). The ERT notes that, although a stock change method has been applied to estimate net changes in the living biomass pools, Estonia reports on CO₂ emissions from forest fires in common reporting format (CRF) table 5(V) of its 2011 GHG inventory, and is therefore accounting for carbon losses twice. This double accounting contributes to a significant year-on-year change in its estimates. In addition, the Party could consider that a cause of variability is that the number of plots sampled in a year is not representative of the variability of the forest population of Estonia. In this case, instead of inferring annual population statistics from the subset of plots sampled in the year, the Party, with the aim of providing annual estimates, could model expected annual variation in the plots not sampled in that year and then use the annual data (sampled and estimated) for all plots for inferring population statistics. For

modelling, additional data sets, including harvesting data and disturbance records, may be used.

III. Conclusions and recommendations

29. The ERT concludes that Estonia's use of an approach common to the other EU member States as mentioned in paragraph 5 above further strengthens the comparability of its proposed FMRL. Moreover, the interaction of more models and the post-calibration of model outputs with the historical data build confidence in the proposed FMRL. Some inconsistencies in the data used as inputs to the models and in those used for preparing the GHG inventory have been detected during the TA and were addressed by the Party when rerunning the models to prepare the revised FMRL value. This figure was then used as the proposed FMRL for Estonia for the second commitment period of the Kyoto Protocol. In assessing the revised FMRL value, the ERT noted that it addressed all inconsistencies previously found.

30. Regarding the high inter-annual variability of the estimates for forest land in the 2011 GHG inventory, the ERT encourages the Party to avoid using those estimates for any potential revision of its FMRL, unless causes of such variability are detected and estimates consequently reassessed. Moreover, the ERT recommends that CO₂ emissions from forest fires reported in CRF table 5(V) not be included in any recalculation of the FMRL based on the 2011 GHG inventory. The ERT notes that the Party is considering making a future technical correction to its FMRL taking into account the comments of the ERT.

31. In accordance with the information provided in paragraph 23 above, the ERT recommends a technical correction to the FMRL when the HWP estimate has been finalized.

Annex

Documents and information used during the technical assessment

A. Reference documents

Submission of information on forest reference management levels by Estonia, 18 April 2011. Available at http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_estonia_fmrl_2011.pdf.

Communication of 10 May 2011 regarding the harvested wood products value for Estonia. Available at http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_estonia_corr.pdf.

National greenhouse gas inventory of Estonia submitted in 2010. Available at <http://unfccc.int/5270.php>.

National greenhouse gas inventory of Estonia submitted in 2011. Available at <http://unfccc.int/5888.php>.

B. Additional information provided by the Party¹

1. Model results:

		<i>av. 2000–2008</i>	<i>2000</i>	<i>2005</i>	<i>2010</i>	<i>2015</i>	<i>2020</i>	<i>av. 2013–2020</i>
Step 1: models' results (only biomass)	EFISCEN (1)	-4502	-4050	-5247	-2652	-197	2061	466
	G4M	-1654	-1016	-2266	-804	475	1944	930
	Average of models	-3078	-2533	-3756	-1728	139	2003	698
Step 2: ex-post processing	biomass	-2780						
	Offset (2) non-biomass pools and GHG sources							
		total offset	340					
	Calibrated average of models (3)	-2440						
Sensitivity analysis (4)	+10% harvest	-5518	-4973	-6196	-4168	-2301	-437	-1742
	-10% harvest				-3213	-796	721	-320
					-4461	-2653	-1416	-2271

(1) Efiscen does not estimate data for all countries for 2000 and 2005. When data were missing, backward extrapolation was applied as follow: sink in 2005 = sink in 2010 x ratio of harvest 2010/2005; this approach assumes that in the short term harvest is the main factor determining the sink. Estimates were extrapolated for the following countries: Bulgaria, Czech Republic, Estonia, Hungary, Italy, Latvia, Lithuania, Netherlands.

(2) The "offset" is distinguished between:

¹ Reproduced as received from the Party.

- Biomass: calculated as difference between [average of country's emissions and removals from biomass for the period 2000-2008] and [average of models' estimated emissions and removals from biomass for the period 2000-2008]
 - Non-biomass pools and GHG sources: calculated as the sum of non-biomass pools and GHG sources as reported by the country for the period 2000-2008.
- (3) The calibrated average of models, which is used for the setting of reference level, is obtained by adding the offset to the models' average.
- (4) Preliminary simulation of the impact of +/-10% harvest as compared as BAU harvest on the emissions and removals from FM. Data are calibrated averages of models' results.

2. Area:

<i>AREA of FM in 2008</i>		used by models		difference % models vs. GHG inventories		<i>AREA of FM in 2020 used by models</i>	
from 2011 GHG inventories	source	G4M (6)	EFISCEN	G4M	EFISCEN	G4M (7)	EFISCEN (8)
<i>Estonia</i>	2155	(2)	2142	2156	-0.6	0.0	2112 2137

(2): area of FL-FL in 2008 from GHG inventory 2011. For years between 2000 and 2007, the annual area of deforestation under KP reporting was considered.

(6): Given the amount of work required for adjusting the area of G4M, no correction of area was done in cases where the difference with GHG inventories is very small (Bulgaria, Estonia, Latvia, Luxembourg, Netherlands). Given the ex-post calibration of models' results, the impact of the remaining area discrepancies on FMRL can be considered absolutely negligible.

(7): from 2008 onward FM area was estimated considering the deforestation estimated by G4M (as explained in the Annex of EU submission).

(8): from 2008 onward FM area was estimated assuming the continuation of the deforestation trends (average 1990-2008) reported under the KP

C. Supplementary information prepared by the expert review team

Table 1
Comparison of harvesting rates collected from different sources and net changes in the living biomass pools for the period 1990–2008

<i>Year</i>	<i>Harvesting</i>			<i>Net change</i>
	www.stat.ee	NFI - NIR2010	FMRL	CRF2011
			thousands m3	kt C
1990		3,819	2,881	2,846
1991	3,212	4,176	4,289	2,322
1992	2,246	2,920	2,981	2,506
1993	2,548	3,312	3,383	2,506
1994	3,745	4,869	5,037	2,506
1995	3,993	5,191	5,534	2,506
1996	4,251	5,526	6,130	2,435

<i>Year</i>	<i>Harvesting</i>			<i>Net change</i>
	www.stat.ee	NFI - NIR2010	FMRL	CRF2011
			thousands m3	kt C
1997	5,737	7,458	8,947	2,504
1998	6,319	8,215	9,717	2,293
1999	12,697	12,697	12,517	1,166
2000	12,748	12,748	12,746	-1,193
2001	11,976	11,525	11,973	-1,339
2002	11,526	11,526	11,525	-1,157
2003	9,953	9,717	9,717	-1,152
2004	7,012	7,012	6,858	112
2005	6,380	6,380	6,316	1,586
2006	5,310	5,197	5,197	-175
2007	5,268	5,310	5,223	2,580
2008	5,904	5,268	5,898	-245

Note 1: Source: National statistical office of Estonia, GHGI of 2010, and submissions made by Estonia on the FMRL.

Note 2: Data from Statistics Estonia (www.stat.ee) in 1991–1998 and 2008 is based on pre-felling documentation (logging permits) and does not represent the real harvesting rate. The values in the “NFI-NIR2010” column are those corrected values used, after a re-calibration as reported in column “FMRL”, for calculating the FMRL. These values are presented in NIR2011, table 7.11. Area and volume of forest biomass harvested in 1990–2009).