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

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Contents

I. Introduction and summary

A. Overview

1. This report covers the technical assessment (TA) of the submission of Hungary 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. Atsushi Sato (Japan), Ms. Thelma Krug (Brazil), Ms. Marina Shvangiradze (Georgia), Ms. Rosa Rivas Palma (New Zealand), Mr. Karsten Dunger (Germany) and Mr. Kumeh Assaf (Liberia). Mr. Atsushi Sato and Ms. Thelma Krug 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 Hungary, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Proposed reference level

3. Hungary has proposed an FMRL of –0.452 million tonnes of carbon dioxide equivalent (Mt CO_2 eq) per year applying a first-order decay function for harvested wood products (HWP); and –0.572 Mt CO_2 eq per year assuming instantaneous oxidation of HWP. However, in response to the comments of the expert review team (ERT) in the draft version of this report and using new data from the latest annual greenhouse gas (GHG) inventory, Hungary has provided a revised FMRL equal to –1.000 Mt CO_2 eq per year applying a first-order decay function for HWP, and –0.892 Mt CO_2 eq per year assuming instantaneous oxidation of HWP. Decay of HWP accounts for an annual accumulation of –0.108 Mt CO_2 eq per year in the revised FMRL proposal.

4. The new data referred to in paragraph 3 above relate to historical harvesting rates and the latest data from Hungary's National Forestry Database. Additionally, inconsistencies in the input data used in the two models used to project annual estimates of net emissions for forest management until 2020 (see para. 5 below), in particular the area under forest management, have been corrected, making the data consistent with those reported in the 2011 GHG inventory.

II. General description of the reference level

A. Overview

5. Hungary is one of the member States of the European Union (EU) for which the Joint Research Centre (JRC) of the European Commission developed projections in collaboration with two EU modelling groups. The models, G4M (Global Forestry Model)[1]

[1] The G4M model 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 NFIs or other country statistics.

(from the International Institute for Applied Systems Analysis (IIASA)) and EFISCEN (European Forest Information Scenario Model)[2] (from the European Forest Institute), project annual estimates of net emissions for forest management until 2020 for the living (above- and below-ground) biomass carbon pool. To estimate the FMRL, the emissions and removals estimated by the models for the period 2000 to 2008 were calibrated/adjusted using an offset, defined as the difference between the average of the historical forest management net emissions for 2000–2008, and the average of the mean values from the two models for the same period. The offset is applied to the model results in order to make the projection and the historical forest management values more consistent.

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 mean of the forest management net emissions for the period 2000–2008 (–1.728 Mt CO_2 eq)[3] has been used to define the offset value, equal to 3.224 Mt CO_2 eq in the original FMRL submission (or approximately 65 per cent of the mean of the modelled data for the same period). In response to the comments of the ERT in the draft version of this report, the models were rerun with new input data, resulting in a new offset value of 0.082 Mt CO_2 eq. In this new run, the offset value was 4.53 per cent of the mean of the modelled data for the 2000–2008 period.

2. Age-class structure

7. Hungary provided, in the FMRL original submission, a detailed species description of the age-class structure for its forests under forest management for the years 1990 and 2008. This indicates a decreasing area of young stands (31.0 per cent) and an increasing area for all other age classes, with the largest one being that above 101 years (133.5 per cent). In response to the comment of the ERT regarding the discrepancies between the forest management data reported in the GHG inventory and those modelled by EFISCEN, Hungary explained that the original model runs had not been based on the latest data from the National Forestry Database. In the model rerun, using updated data, EFISCEN captured the steadily decreasing area with increasing age of Hungarian forests in 2008, but generally projected a smaller area under each age-class that in the National Forestry Database, with the exception of the age class 1–20 years, for which the estimate by EFISCEN is approximately 27 per cent higher than the corresponding data from the National Forestry Database. However, in both cases (national database and model projection) the largest area (more than 50 per cent) is allocated to young stands (less than or equal to 40 years in age) characterized by high annual growth and reduced harvest. Hence, using EFISCEN estimates in the construction of the FMRL is not expected to have a very different effect on the total net carbon stock change in forest management from using the national data. In addition, the use of the EFISCEN estimates in the construction of the FMRL is more conservative than the national data owing to the larger area being in the youngest age class and the associated annual biomass growth.

[2] EFISCEN uses as data input the forest area data from national forest inventories 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.

[3] The mean has not been directly derived from the annual net emissions from forest land remaining forest land (–2.667 Mt CO_2 eq).

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

8. This item is addressed in chapter II.E.7.

4. Other elements

Forest management activities already undertaken

9. In Hungary, forests are regulated through the new Forest Act, approved by Parliament in April 2009. The Forest Act prescribes the elaboration of district forest management plans. The forest management activities implemented in Hungary include the preparation of forest management plans for the majority of the stands, regular survey and inspection of stands, various types of thinning and forest protection operations and road construction. For most indigenous species, Hungary practises natural regeneration of forests after the clearing of mature stands.

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

10. Hungary informed the ERT during the review that it plans to continue to manage its forests under a 'business as usual' scenario with respect to the intensity and type of interventions, with gradual changes to move towards a 'close-to-nature' state in the stands of indigenous species. For individual stands, this may lead to increasing or decreasing the rotation cycle, and changing the way the regeneration cuttings are carried out.

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

11. Does not apply.

C. Pools and gases

1. Pools and gases included in the reference level

12. The only pools that Hungary has included in the construction of the FMRL are above- and below-ground biomass pools. The dead organic matter (litter and dead wood) and the soil organic carbon pools have not been included. However, Hungary provided in its latest national inventory report (NIR) (2011) an explanation for the exclusion of these pools, indicating that they are not GHG sources. CO_2, methane and nitrous oxide emissions from biomass burning have been included. The pools and gases included in the FMRL are the same as those reported in the 2011 NIR, and are consistent with previous reporting.

2. Consistency with inclusion of pools in the estimates

13. The approach is consistent, since the models include only the living biomass pool to generate the estimate of net emissions from forest management, and the data used, including those related to pools and sources, for the construction of the FMRL are the same as those reported in the GHG inventory.

D. Approaches, methods and models used

1. Description

14. The FMRL proposed by the Party results from the application of the two models referred to in paragraph 5 above (G4M and EFISCEN) which, in turn, use input data from other models (e.g. GLOBIOM (Global Biomass Optimization Model) and PRIMES). The

FMRL proposed by the Party is equal to the mean of the adjusted projected forest management from G4M and EFISCEN, for the period 2013–2020, taking into account the policies implemented before the mid-1990s. Since the data input for the models include the entire forest management time series for the period 2000–2008, emissions and removals from natural disturbances, if these occurred, have been included in the FMRL. HWP have also been included in the model projection assuming a first-order decay function. The FMRL was derived using projections of emissions and removals from forest management, carried out by JRC, based on the results of independent EU modelling groups, coordinated by IIASA, as referred to in paragraph 5 above. The two models used to produce the projections differ in the way they allocate harvest demand to thinning and final felling (including rotation length), with implications on the estimated net emissions from forest management. However, this does not imply that one model provides better estimates than the other.

2. Transparency and consistency

15. In response to the observation by the ERT in the draft version of this report that transparency could be improved, particularly on data inputs to the models, including population increase, development of gross domestic product (GDP), demand for HWP and for bioenergy production, imports and exports, Hungary provided additional information, thus improving transparency on the way its FMRL was constructed. Hungary explained that GDP and population values relevant to projecting future timber demand were retrieved from international statistics and present only minor changes in the next decade. Market/trade effects were projected using the GLOBIOM model. No specific additional policies affecting timber demand were included in G4M and EFISCEN, given the difficulty of quantifying their effect. However, the Party indicates that these effects are likely to be modest in the next few years. Hungary informed the ERT that although the effect of country-specific policies affecting energy wood demand can be generally quantified and observed in the short term, they have not been included in the models since there were no specific policies before 2010 which could have affected energy wood production.

16. The model results in the original submission deviated notably from the historical data provided by the Party for the period 1990–2008. Whereas the trend from the historical data for forest management for the period 2000–2008 indicated an increasing sink, both the G4M and the EFISCEN models projected a progressively decreasing sink for the period 2000–2020. There was an inconsistency between the trend of the historical and the modelled data. However, use of the latest data sets in both models for the period 2000–2020 resulted in net removal trends consistent with those resulting from a linear extrapolation of the historical forest management data (including all pools and gases), which indicates a decreasing sink for forest management from 2010 onwards. This is less pronounced in the G4M model. However, the EFISCEN estimates are more consistent with those from the linear extrapolation of forest management data for the same time period (2000–2020).

E. Description of the construction of the reference level

1. Area under forest management

17. During the review, Hungary provided the data for the area under forest management for the period 1990–2008 used to estimate the net removals and define the offset to calibrate the models' results. The ERT noted that the area under forest management changed only slightly from 1990 to 2009, the difference between the minimum and maximum values for this period being approximately 0.5 per cent. This minor change is due to the rather low rate of deforestation in the country.

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

18. For the period 1990 to 2009, the areas of forest land remaining forest land and forest management, which were very similar in 1990 (with approximately 94 per cent corresponding), increasingly departed from each other owing to an increasing forest land remaining forest land area from afforestation and 'found forests' (which is partly due to natural expansion of the forest area, and partly due to methodological improvements in land area identification) and a decreasing area under forest management due to deforestation. In 2009, the forest management area corresponded to 83.3 per cent of the forest land remaining forest land area. The net CO_2 removals from forest management accounted for 68.9 per cent and 61.5 per cent of the net CO_2 removals from forest land remaining forest land for 2008 and 2009, respectively.[4]

19. In the original submission, the net emissions from forest management modelled by EFISCEN and G4M tended to overestimate the historical trend for Hungary. The projections from the models using the revised data are more consistent with the linear extrapolation of the historical data (all pools and gases), although for 2008 both models, particularly EFISCEN, underestimated the net removals and for 2009 G4M slightly overestimated the net removals, whereas EFISCEN underestimated them. This estimate is highly sensitive to the assumed harvesting rate because an increase or a decrease of only 10 per cent in the assumed harvest value can result in significantly different results and direction (from sink to source and vice versa), which indicates the importance of a sound projection of the future harvesting rates.

20. Hungary provided estimates for the mean annual volume increment from G4M for the years 2000, 2005, 2010, 2015 and 2020 in the original submission, which ranged from 6.1 m^3 ha^{-1} per year for 2000 to 6.6 m^3 ha^{-1} per year for 2020. Estimates from EFISCEN have been provided for the years 2010, 2015 and 2020, and range from 6.7 m^3 ha^{-1} per year for 2010 to 6.9 m^3 ha^{-1} per year for 2020. However, during the model reruns, these values were changed to 7.5 m^3 ha^{-1} per year, 7.6 m^3 ha^{-1} per year, 7.6 m^3 ha^{-1} per year, 7.4 m^3 ha^{-1} per year and 7.3 m^3 ha^{-1} per year for the years 2000, 2005, 2010, 2015 and 2020, respectively. The ERT notes that Hungary could have provided an additional explanation regarding the change in the mean annual volume increment, but notes that the higher values result in a more conservative FMRL.

3. Forest characteristics

21. Unlike most countries in Europe, the majority of the forests in Hungary is covered/dominated by broadleaved species, including introduced species such as black locust and improved poplars. In particular, the young forest stands under 20 years include black locust and poplar, which are fast growing species. In the forest land remaining forest land area, the mean stock volume and the mean above-ground biomass were 186 m^3 ha^{-1} and 95 t ha^{-1}, respectively, in 2009. Details of the age-class distribution of the forests in Hungary are provided in chapter II.B.2.

4. Historical and assumed harvesting rates

22. Hungary provided historical and projected harvesting rates in the original FMRL submission for all years from 1990 to 2008. The mean annual harvesting rate was approximately 6,781 thousand m^3 per year (with a standard deviation of 494 thousand m^3 per year). The Party also provided a projected harvesting rate for 2020, estimated by the models PRIMES (wood for energy) and GLOBIOM (timber), amounting to 7,728 thousand

[4] Data from the 2011 NIR.

m^3 per year. The latest data from Hungary´s National Forestry Database indicate slightly smaller values for 2000 and 2005, equal to 6,957 thousand m^3 per year and 6,992 thousand m^3 per year, respectively, representing a decrease of 4.6 per cent and 2.4 per cent relative to the values provided in the submission. The projected 'business as usual' harvest demand for round wood overbark used by the models for 2010, 2015 and 2020 were 7,562 thousand m^3 per year, 8,132 thousand m^3 per year and 8,702 thousand m^3 per year, respectively. For 2020, this represents an increase of 12.6 per cent from the initial estimate.

23. During the review, Hungary explained that, as a country whose economy has been undergoing the process of transition from a centrally planned to a market economy, the impact of an unstable economy has been felt since 1990, with a partial recovery in the late 1990s and 2000s. More recently, the economy shrank again as a result of the global economic crisis. However, as Hungary moves towards a wider market economy, production is expected to accelerate. This will affect the demand for wood as raw material and wood for bioenergy. Owing to similar increased demands in neighbouring countries with similar conditions, no major increase in imports is expected.

5. Harvested wood products

24. The contribution of HWP to the FMRL of Hungary amounts to 0.120 Mt CO_2 eq in the original submission, and was estimated using the approach proposed in document FCCC/KP/AWG/2010/18/Add.1, chapter II, annex I, with annual production data, specific half-lives for product types, application of the first-order decay function using equation 12.1 from the Intergovernmental Panel on Climate Change (IPCC) *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 dates back to 1964. Hungary assumes that all harvesting is allocated to forest management and that all forests in Hungary are managed. The estimates include exports. Hungary provided a revised value for the contribution of HWP to the FMRL, which accounts for a net accumulation of –0.108 Mt CO_2 eq. The ERT recommends that the Party carry out an evaluation of the need to revise the FMRL after agreement is reached on the treatment of HWP in the construction of the reference level.

6. Disturbances in the context of force majeure

25. The construction of the FMRL relies on all historical net emissions from forest management from 2000–2008 (used to define the offset). According to the 2010 NIR, "all changes in biomass carbon stocks of the forests due to any causes from growth through harvest, natural disturbance and deforestation are captured by the forestry statistics of each stand at least on a decadal scale". Hence, the mean value used to calibrate the model results incorporates effects from natural disturbances and extreme events, if these occurred during the period 2000–2008. The ERT noted that the annual emissions from fires have so far not made a substantial contribution to the total annual GHG emissions, ranging from a minimum of zero to a maximum of 0.11 per cent. The ERT notes that depending on the decision of the Conference of the Parties on the treatment of force majeure, it may become necessary for Hungary to carry out a technical correction of the proposed FMRL.

7. Factoring out

26. The indirect effect of elevated CO_2 concentrations above the pre-industrial level and indirect nitrogen deposition was not directly factored out when constructing the reference level. Hungary explained that the IPCC managed land proxy was used to estimate anthropogenic emissions/removals. Thus, only emissions and removals occurring on managed lands were estimated. The Party also explained that natural and indirect effects

will be cancelled out once the reference level is established and the annual results subtracted from it. The ERT notes that the FMRL approach may eliminate most of the natural and indirect effects on the changes in carbon stock in forest management.

27. Regarding factoring out, it is not clear how the age-class dynamic effect (legacy effect) from forest management prior to 1990 is treated, but this applies generally to all countries. Ensuring consistency in the annual removals from forest management in the construction of the FMRL and in the estimation of future forest management net emissions may eliminate this effect. The ERT notes that the full removals from forest management in the youngest age class (1–20 years) should be accounted for, whereas for the older classes, only removals which are additional to those that would otherwise not occur should be accounted (e.g. if additional management practices are initiated). The submission does not provide transparency on this issue.

F. Policies included

1. Description of policies

28. Energy policies taken into consideration in the FMRL are provided in annex II to the submission. Hungary has no specific policy so far to address the EU requirements on the use of renewable energy (bioenergy). However, some elements of the biofuels directive 2003/30/EC (tax exemptions and obligation to blend fuels) are reflected in the PRIMES model, which implies that this policy has been partially implemented.

29. Hungary explained in its original submission that the requirement of 5.75 per cent of all transportation fuels to be replaced with biofuels by 2010 is only indicative, and has not been imposed as a target. Support to biofuels is assumed to continue, and the biofuel blend is assumed to be available on the supply side.

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

30. All energy policies implemented at the EU and domestic levels are taken by the PRIMES model as input values for estimating the wood fuel demand driven by these policies. Output of PRIMES is further used as input for models used in the next steps in the process of constructing the FMRL. 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 and harvesting rates, and changes in age-class structure. Furthermore, Hungary confirms that no domestic policies other than those included in PRIMES have been taken into account when estimating the reference level.

III. Conclusions and recommendations

31. Hungary provided an FMRL derived from the use of two models (EFISCEN and G4M) that, in turn, use input data from other models (GLOBIOM and PRIMES), based on assumptions, including on population growth, GDP development, biofuels production and future harvest demand. The reference level proposed is the mean of the results of two models (EFISEN and G4M) for the period 2000–2008, calibrated/adjusted using the historical forest management net emissions data in order to seek consistency between the modelled and the observed data. As in any other modelling approach, the construction of the FMRL is based on assumptions regarding future developments, particularly concerning the effect on the harvesting rate. The model results are particularly sensitive to the assumed harvesting rate (see para. 19). Other variables, such as increments, forest management future area and age-class distribution, are equally important. The ERT notes that generally

the FMRL will work well if the projections for the parameters used in the EFISCEN and G4M models correspond to the actual developments.

32. The pools included in the models (above- and below-ground biomass) are consistent with those included in the NIRs. The excluded pools are not considered to be sources. GHG emissions from fires are included.

33. The Party presented in the submission a list of policies and measures included in the FMRL at the EU level, but did not specify which ones directly apply to Hungary. Moreover, information on the effect of the policies in the FMRL is not provided. In response to the draft report Hungary explained that it is not possible at present to assess the effect of the policies, noting that sensitivity analysis for changes in the harvesting rate might provide an insight into the possible effects.

34. The ERT notes that while factoring out the effects on changes in carbon stock due to natural and indirect effects might be mostly eliminated by the nature of the approach taken for the construction of the FMRL (net–net), it is not clear how the age-class dynamics effects are treated. The ERT suggests that Hungary seeks an explanation from the modelling groups of how the age-class dynamics were considered and reflected in the future harvesting rates and total annual increases in carbon stocks.

35. The ERT notes that Hungary uses the full historical forest management data and that the effects of possible force majeure or natural disturbance events are not factored out. It also notes that depending on the results of the negotiations, a technical correction may need to be applied to the FMRL, in order to make consistent the construction of the FMRL and the future treatment of force majeure.

Annex

Documents and information used during the technical assessment

A. Reference documents

Submission of information on forest management reference levels by Hungary, 18 April 2011. Available at <http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_hungary_2011.pdf>.

Revision of the forest management reference level of Hungary of 19 May 2011. Available at <http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_hungary_corr.pdf>.

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

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

B. Additional information provided by the Party[1]

1. Revised submission of information on forest management reference levels by Hungary

Table 1. Value of proposed reference levels (Gg CO2eq).

Proposed Reference Level (1), (4) ($GgCO_2eq$ per year)	
applying first order decay function for HWP (2)	assuming instantaneous oxidation of HWP (3)
-1000	-892

Note that:

(a) Area under forest management

Table 4. Area for FM as used by models (kha).

AREA of FM in 2008					AREA of FM in 2020 used by models	
from 2011 GHG inventory (1)	used by models		difference % models vs. GHG inventories			
area (kha)	G4M (2)	EFISCEN	G4M	EFISCEN	G4M (3)	EFISCEN (4)
1657	1657	1657	0.0	0.0	1622	1652

[1] Reproduced as received from the Party.

Notes:
(1): area of FM from KP LULUCF reporting (2011). For years between 2000 and 2007, the annual area of deforestation under KP reporting was considered.
(2): 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.
(3): from 2008 onward FM area was estimated considering the deforestation estimated by G4M (as explained in the Annex of EU submission).
(4): from 2008 onward FM area was estimated assuming the continuation of the deforestation trends (average 1990-2008) reported under the KP

Table 7. Emissions and removals from FM as estimated by models (above and below-ground biomass, Gg CO2eq), calibration of models' results, and sensitivity analysis.

Derivation of data			average 2000-2008	2000	2005	2010	2015	2020	average 2013-2020
Step 1: models' results (only	EFISCEN (1)		-1394	-1413	-1406	-1300	-365	522	-103
	G4M		-2225	-2055	-2382	-2020	-1981	-1611	-1845
	Average of models		-1809	-1734	-1894	-1660	-1173	-545	-974
Step 2: ex-post processing	Offset (2)	biomass	53						
		non-biomass	28						
		total offset	**82**						
	Calibrated average of models (3)		-1728	-1652	-1812	-1578	-1091	-463	**-892**
Sensitivity analysis (4)	*+10% harvest*					*-552*	*-28*	*209*	*98*
	-10% harvest					*-2151*	*-1677*	*-1267*	*-1512*

Notes:
(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:
- 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.

Table 9. Increments as estimated by models (m^3 ha^{-1} yr^{-1}).

Year	2000	2005	2010	2015	2020
G4M	6,1	6,3	6,5	6,6	6,6
EFISCEN			6,7	6,8	6,9

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Table 11. Historical and projected harvest rate and projected BAU harvest demand used by models (round wood overbark).

6957	6992	7562	8132	8702	1,19	1,19	country data June 2011

Table 13. Historic time series of amounts (first row, in 1000t C) and share of accountable carbon Inflow to the HWP pool (second row, %).

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
179	175	190	192	177	186	200	215	245	242	258	281	280	274	332	396
55.4%	54.1%	54.4%	46.3%	43.5%	40.6%	38.8%	41.6%	44.0%	40.1%	40.9%	43.7%	44.5%	41.5%	46.3%	55.1%

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
397	393	374	393	403	391	345	332	350	379	409	321	258	274	371	265
52.9%	53.0%	54.3%	54.4%	53.3%	52.6%	45.8%	44.6%	47.1%	49.3%	61.2%	55.3%	52.3%	66.8%	86.3%	73.3%

1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
270	324	310	316	345	341	361	326	316	416	413	416	409	248
69.1%	74.3%	65.2%	68.0%	70.8%	71.6%	71.5%	63.0%	61.9%	79.9%	80.5%	75.7%	83.4%	69.4%

Table 14. Projection of carbon Inflow to the HWP pool.

Average of historic harvest (2003-2007) [in 1000m3]	6,992									
Average HWP pool Inflow* (2003-2007) [in 1000t C]	377									
years	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Projected harvest rate [in 1000m3]	7562.14	7676.09	7790.03	7903.98	8017.93	8131.88	8246	8360	8474	8588	8701.62
Change as cp to historic harvest (2003-2007) [in %]	8.15%	9.78%	11.41%	13.04%	14.67%	16.30%	17.93%	19.56%	21.18%	22.81%	24.44%
Projected carbon Inflow to HWP pool [in 1000t C]	408.182	414.333	420.483	426.634	432.784	438.935	445.086	451.236	457.387	463.537	469.688

Table 15. Historic (up to 2009) and projected net-emissions from HWP pool (in 1000t CO_2)

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
-639	-286	-57	-125	-445	-13	-18	-190	-111	-110	-187	-140	-189	-52	-14	-333

2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
-251	-222	-185	389	-177	-142	-120	-107	-101	-100	-101	-105	-110	-116	-122