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

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I. Introduction and summary

A. Overview

1. This report covers the technical assessment (TA) of the submission of Belgium on its forest management reference level (FMRL), submitted on 20 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. Zhang Xiaoquan (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 Belgium, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

B. Proposed reference level

3. Belgium has proposed an FMRL of -2.527 million tonnes of carbon dioxide equivalent (Mt CO₂ eq) per year applying a first-order decay function for harvested wood products (HWP) and -2.435 Mt CO₂ eq per year assuming instantaneous oxidation of HWP. Decay of HWP accounts for removals of -0.092 Mt CO₂ eq per year. Models were rerun on the basis of the expert review team (ERT) recommendations using the latest area data from the 2011 greenhouse gas (GHG) inventory submission, the latest country-specific age-class structure and the corrected harvest data. Reference levels from the model reruns differ slightly from the values submitted on 20 April 2011. New FMRL values are -2.499 Mt CO₂ eq per year applying a first-order decay function and -2.407 Mt CO₂ eq per year assuming instantaneous oxidation of HWP.¹

4. The values of the FMRL and the HWP pool given in paragraph 3 above include a correction² to the values contained in the official submission on the FMRL submitted by Belgium, by which the HWP account, applying a first-order decay function, changed from -0.066 Mt CO₂ eq per year to -0.092 Mt CO₂ eq per year in accordance with an official communication sent by the Party.

¹ See the annex.

² The correction was required because in the model version used for the calculation of the HWP pool an equation related to non-coniferous industrial round wood was not applied correctly, owing to a shifted cell in the calculation matrix.

II. General description of the reference level

A. Overview

5. Belgium is one of the 15 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,³ from the International Institute for Applied Systems Analysis (IIASA) 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 calibrated/adjusted using historical data from the country for the period 2000–2008.⁵

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. Removals or emissions from forest management as shown in GHG inventories and relevant historical data were taken into account by adjusting the results of the modelling exercise through an ex post processing of the model results (see para. 15 below). Belgium's submission states that the Belgian national forest inventory and forest statistics (Belgian Forest Resources Assessment Report 2010) and a specific study on land use in the framework of reporting under the Convention and its Kyoto Protocol provide the historical data used for Belgium's GHG inventory and for the calculation of the FMRL. Belgium's GHG inventory was compiled by the Interregional Environment Unit using the inventories prepared by the three regional agencies: the Department of Air, the Environment and Communications of the Flemish Environment Agency; the Walloon Agency for Air and Climate; and Brussels Environment. The FMRL is consistent with the GHG inventory, except for the differences noted below under "Pools and gases".

2. Age-class structure

7. Approximately 40 per cent of the forests during 2010–2020 will be composed of young forests (1–20 and 20–40 years). The share of age classes older than 80 years will be less than 20 per cent.

8. The evolution of the age-class structure as modelled by EFISCEN was provided in the submission. During the TA, the age-class structure from the last forest inventory was also provided. Although no major inconsistency between the inventory and the modelled age-class structure was identified by the ERT, Belgium provided additional data to modellers still refining the age-class structure. The refined age-class structure was used in

³ 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.

⁴ 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).

⁵ The EFISCEN data were taken from the 2010 inventory submission.

model reruns for the purpose of applying the biomass expansion factors to the EFISCEN model.

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

9. This is achieved by the provisions of factoring out (see chapter II.E.7).

4. Other elements

Forest management activities already undertaken

10. Belgium indicates that past forest management activities are indirectly taken into account through the use of the latest available forest time-series data (from the national forest inventory or other country statistics), but no concrete information was provided.

11. Belgium did not elect forest management as an activity under Article 3, paragraph 4, of the Kyoto Protocol.

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

12. Projected forest management activities are taken into account through the estimation of the evolution of harvest demand by 2020 based on macroeconomic drivers and the application of policies implemented in the EU member States by April 2009 and by legislative provisions adopted by April 2009.

C. Pools and gases

1. Pools and gases included in the reference level

13. Above- and below-ground biomass, soil organic matter on mineral soil, litter, dead wood and HWP are included in the FMRL. In the current modelling of the FMRL, living biomass is represented by the sum of its components above and below ground. Dead organic matter is taken to be the sum of dead wood and litter. Soil organic matter on mineral soil, litter and dead wood are included in the FMRL as a constant value (the average of those pools in 2000–2008 reported in the GHG inventory submission of 2010). Soil organic matter on organic soils and non-CO₂ GHGs are not included in the FMRL. Nitrogen fertilization and larger-scale liming do not occur in Belgium's forests. Biomass burning is not a common practice in Belgium and post-logging burning of harvest residues is banned by the new forest code.

2. Consistency with inclusion of pools in the estimates

14. The FMRL is consistent with the GHG inventory except when net emissions included in the FMRL from soil organic matter (mineral soil), litter and dead wood are kept constant in the FMRL (at the level of the average 2000–2008 values from the GHG inventory submission of 2011). The ERT agrees that this is likely to be a sound assumption, since the emissions and sinks from non-biomass pools in Belgium's GHG inventory submitted in 2011 do not show a clear upward or downward trend but have been fairly constant from 1990 to 2008.

D. Approaches, methods and models used

1. Description

15. Belgium is one of the 15 member States of the EU for which JRC of the European Commission, specifically the Institute for Environment and Sustainability, developed projections in collaboration with two EU modelling groups. The models, G4M developed by IIASA and EFISCEN 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 calibrated and adjusted using historical data from the country for the period 2000–2008. In this post-calibration, a constant offset was added to the results of the models for 2000–2020. Future harvest demand under a ‘business as usual’ scenario was derived from macroeconomic drivers (e.g. gross domestic product, population) and policies enacted in Belgium up to 2009. This information is used as data input to the model GLOBIOM (Global Biomass Optimization Model), which projects demand for timber.

16. The underlying methodological approach of all these models could provide useful future trends for Belgium. However, the quality of the timber demand projections will be dependent on how well macroeconomic variables can predict timber demand for the country.

2. Transparency and consistency

17. Belgium’s submission and the replies received to questions posed during the TA are transparent. The models and methods are described in the FMRL submission and the sources of the main parameters and characteristics as used in the models are provided.

18. The results provided by EFISCEN deviate notably from the historical inventory data reported in GHG inventories for the period 2000–2005. It is evident that there is a lack of consistency between the historical data provided by the country and the EFISCEN results for those years, even if the average of the models (–1667 Gg CO₂ eq per year) in the period 2000–2008 fits well with the average of the historical data (–1633 Gg CO₂ eq per year). During the TA it was clarified that there is a mistake in EFISCEN input data on how the harvest was allocated to 2000–2005 and the model was rerun with the corrected input data following questions by the ERT. After the rerun of the models the results for 2000 and 2005 from EFISCEN match the reported values in GHG inventories more closely. The difference in the reported values for those years is 11 per cent and 31 per cent, respectively.

19. The G4M model was also rerun with new harvest and area data. Belgium explained that G4M was rerun because two clear errors were noticed (harvest used by the model was higher than harvest demand in the first run and area data were not the latest ones reported by Belgium). In the rerun the latest forest management area data and corrected harvest data were used. The rerun of G4M resulted in a greater deviation between the model result and the inventory results than that produced in previous runs for 2000 and 2005. In total, reruns of both models resulted in, on average, a 55 per cent greater biomass sink in the reference level period 2013–2020 than that produced by previous runs. However, because reruns of the models produced on average a more highly overestimated sink for 2000–2008 (compared with values reported in the GHG inventory) than previous runs, the overall impact of reruns of the models was small (–28 Gg CO₂ eq) when model results for the reference period were calibrated with the 2000–2008 GHG inventory data.

20. The main forest parameters and characteristics used by the models and the GHG inventory are provided in table 11 of the submission. The models and the GHG inventory do not use consistently the same parameters (e.g. biomass expansion factors), which may be

reflected as differences in the levels of biomass in the model predictions and data reported in the GHG inventory. However, this should not have an impact on the trends of biomass pool development.

21. There is a contradiction in the trends in biomass development predicted by the two models for 2010–2020, for which EFISCEN predicts an increasing sink and G4M a decreasing sink. A rerun of the models did not change these differing trends. The ERT was informed that those differences are due to model behaviour with regard to how they allocate wood demand, but no corrections were planned. The ERT notes that these discrepancies could be investigated further.

E. Description of the construction of the reference levels

1. Area under forest management

22. Area data used by the models were provided in the submission; they deviate a little from the area data used in the GHG inventories. The forest area input into each model was assumed to slightly decrease in the period 2000–2020 (see table 4 in the submission). The model values are fairly similar to each other in each point in time.

23. In the rerun of the models, Belgium used the latest area data from the 2011 inventory submission, resulting in the area data used to construct the FMRL being comparable with the data used in the GHG inventories.

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

24. Belgium did not elect forest management as an activity in the first commitment period of the Kyoto Protocol. Area data used in the construction of the FMRL are based on area data from forest land remaining forest land from the 2011 GHG inventory submission.

3. Forest characteristics

25. Belgium's forests are adapted to a temperate maritime climate, with moderate temperature variability, prevailing westerly winds, heavy cloud cover and regular rain (national inventory report 2011). Belgium has about 712,000 ha of forest land, which extends over 23 per cent of the country's area (national inventory report 2011). About 77 per cent of the forests are in Wallonia, and practically all the rest in Flanders (the area of urban forests in Brussels is less than 0.5 per cent of the total forest area). Rotation lengths by tree species are provided in the submission.

4. Historical and assumed harvesting rates

26. Historical harvesting rates are provided for 1998–2007 in the FMRL submission. Since Belgium uses a stock change approach for most of its forests, the historical harvesting rates used by the models are those reported in the Belgian Forest Resources Assessment Report 2010, taking into account the Wallonia and Flanders regions and harvests in public and private forests. According to the model results on assumed harvesting rates, Belgium's harvesting rates will not increase on average during 2013–2020 compared with the current level. The model results show a slight decrease in the harvesting rate from 2010 to 2020.

5. Harvested wood products

27. The estimated annual accumulation of -0.092 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, chapter II, annex I, paragraph 27 with annual production data, specific half-lives for product types, application of the first-order decay function using equation 12.1 from 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 dating back to 1900 are taken into account. The estimates include exports. The ERT recommends a technical correction to the FMRL when final agreement on HWP estimation is reached.

6. Disturbances in the context of force majeure

28. Belgium did not consider force majeure in the construction of the FMRL; the post-calibration procedure applied automatically incorporates the average rate of past disturbances (for the period 2000–2008) into the projections. Belgium has not reported emissions from forest fires during 1990–2009 in GHG inventories.

7. Factoring out

29. The use of a projected reference level that 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 can be assumed to factor out.

F. Policies

1. Description of policies

30. The assumptions on policies and the economy underpinning the projection of the FMRL are the same as in the baseline scenario of the PRIMES⁶ model. Policy assumptions include current trends on the population and economic development, including the recent economic downturn, and take into account bioenergy markets. Assumptions also include policies and measures implemented by April 2009 and legislative provisions adopted by April 2009. The baseline does not include the biomass demand resulting from the renewable targets agreed as part of the EU Climate and Energy Package.

31. Information on how these EU-level policies provided in annex II to the submission are being implemented at the national level and on what is the anticipated impact on the FMRL is not provided.

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

32. All energy policies implemented at the EU and domestic levels are taken by the PRIMES model as input values for the estimation of wood fuel demand driven by these policies. The output of PRIMES is further used as input for models used in 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 through changes in the age-class structure. Furthermore, Belgium confirms that no domestic policies other than those included by PRIMES have been taken into account when estimating the FMRL. Belgium confirmed during the TA that it sees no need for additional country-specific policies impacting on the FMRL and no enlargement of the wood processing chain is foreseen.

⁶ <http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2030_update_2009.pdf>.

III. Conclusions and recommendations

33. Belgium has calculated an FMRL on a transparent basis suitable for consideration by the Conference of the Parties.
34. The ERT recommends a technical correction for the HWP component to Belgium's FMRL when final agreement on HWP estimation is reached.

Annex

Documents and information used during the technical assessment

A. Reference documents

Submission of information on forest reference management levels by Belgium, 20 April 2011. Available at http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_belgium_fm_l_2011.pdf.

Communication of 6 June regarding the harvested wood products value by Belgium. Available at http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_belgium_corr.pdf.

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

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

B. Additional information provided by the Party¹

1. Issues addressed in models runs according to ERT recommendations

New model runs were performed to address the recommendations of the expert review team (ERT) in paragraphs 19, 23, 27 and 33 of the Technical Assessment Report- draft version 1 (TAR). They are summarized in the table below.

Recommendations suggested by ERT:	G4M	EFISCEN
Correct the behavior of the EFISCEN model in regard to the allocation of harvesting for the years 2000-2005, and make a re-run of the model thereafter;	- Corrected the harvest rate 2000-2010, now harvest used by G4M reflects the harvest demand indicated previously	- Corrected harvest rate 2000-2005, now harvest used by Efiscen reflects the harvest demand indicated previously - Applied a slightly different aggregation of age structure for the purpose of applying the BEF - Based on new data from Belgium, a slight variation was applied in the age structure
re-run the models with the latest GHGI area data (2011 submission), and re-calibrate models-outputs on	- Used new area from the 2011 submission	- Used new area from the 2011 submission

¹ Reproduced as received from the Party.

Recommendations suggested by ERT:	G4M	EFISCEN
the basis of the historical data of the period 2000-2009		
apply a technical adjustment for the HWP component to Belgium's FMRL when final agreement on HWP estimation is arrived at	The data communicated by Belgium to UNFCCC on June 6 th , 2011 are considered as the final estimate of the HWP component.	

2. Model results:

The new model results following the implementation of the ERT recommendations are presented in table below, which replaces table 8 in the submission, submitted by Belgium on 20 April 2011.

		av. 2000-2008	2000	2005	2010	2015	2020	av. 2013-2020
Step 1: models' results (only biomass)	EFISCEN (1)	-1463	-1945	-1110	-1670	-1767	-1745	-1752
	G4M	-2912	-4221	-2358	-1858	-1312	-450	-1029
	Average of models	-2188	-3083	-1734	-1764	-1539	-1097	-1390
Step 2: ex-post processing	Offset (2)	biomass	554					
		non-biomass pools and GHG sources	-1570					
		total offset	-1016					
	Calibrated average of models (3)	-3204	-4099	-2750	-2780	-2556	-2113	-2407
Sensitivity analysis (4)	+10% harvest				-711	-2091	-1868	-2025
	-10% harvest				-3737	-3571	-3368	-3519

(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.

3. Area:

Areas used by the models are now in line with the 2011 submission data. The table below would replace Table 4 of the information on forest management reference level submitted by Belgium on April, 20th, 2011.

	AREA of FM in 2008						AREA of FM in 2020 used by models	
	from 2011 GHG inventories		used by models		difference % models vs. GHG inventories		G4M (7)	EFISCEN (8)
	area (kha)	source	G4M (6)	EFISCEN	G4M	EFISCEN		
Belgium	692	(2)	694	692	0.0	0.0	687	681

(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): 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.

(3): area of FM from KP LULUCF reporting, excluding overseas territories. For years between 2000 and 2007, the annual area of deforestation under KP reporting was considered.

(4): Since the FM area reported under KP is not correct, this estimate has been obtained as (e.g. (area of FL in 1990) - (area AR in 1990 (estimated as area AR in 2008 / 19)) - (area of D in 2008)). This estimate is very similar to FL-FL in 2008. For years between 2000 and 2007, the annual area of deforestation under KP reporting was considered.

(5): Forest under Kyoto definition, from CRF table 5A (2011)

(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

4. New age-class structure

Although no major inconsistency between the inventory and modelled age-class structure was pointed out by the ERT in paragraph 8 of the TAR Belgium provided additional data to modellers, still refining the age-class structure. The figure below would replace figure 2 in the submission, submitted by Belgium on 20 April 2011.

