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# Report of the technical assessment of the forest management reference level submission of Lithuania 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 Lithuania on its forest management reference level (FMRL), submitted on 15 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 (LULUCF) 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. Zhang Xiaoquan and Mr. Richard Volz acted as lead reviewers. The TA was coordinated by Ms. Maria José Sanz Sanchez (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 Lithuania, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

## B. Proposed reference level

3. Lithuania has proposed an FMRL of –4.552 million tonnes of carbon dioxide equivalent (Mt $CO_2$ eq) per year applying a first-order decay function for harvested wood products (HWP) and –4.139 Mt $CO_2$ eq per year assuming instantaneous oxidation of HWP. Decay of HWP accounts for removals of –0.413 Mt $CO_2$ eq per year.

4. The values of the FMRL and of the HWP pool referred to in paragraph 3 above include a recalculation and a correction to those values contained in Lithuania's official FMRL submission. The recalculation was done in order to address findings and comments provided by the expert review team (ERT) (see the "Conclusions and recommendations" section and information provided in the annex). The difference between the new estimate of the FMRL (–4139 Gg $CO_2$ eq) and the original one (–4034 Gg $CO_2$ eq) is about 2.6 per cent and comes from corrected area data. The correction, by which the HWP value applying a first-order decay function changed from –0.352 to –0.413 Mt $CO_2$ eq per year in accordance with an official communication sent by the Party on 1 June 2011, 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. Lithuania is one of the 15 member States of the European Union (EU) for which the Joint Research Centre of the European Commission developed projections in collaboration

with two EU modelling groups. The models G4M (Global Forestry Model)[1] (from the International Institute for Applied Systems Analysis) and EFISCEN (European Forest Information Scenario Model)[2] (from the European Forest Institute) were used (see para. 13 below).

## 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. Lithuania's national forest inventory and its State forest cadastre provided the data used in the Party's greenhouse gas (GHG) inventory; these data were used for the calculation of the FMRL values. The FMRL is consistent with the pools and GHG emission sources taken into account in the GHG inventory.

### 2. Age-class structure

7. Information on the age-class structure in Lithuania is taken into account in the construction of the FMRL. Age-class structure is modelled with EFISCEN. The modelled age-class structure shows a noticeable change from forests characterized by the dominance of trees between 41 and 80 years of age in 2005 to forests characterized by the abundance of trees older than 61 years and fewer trees between 21 and 60 years, in both 2015 and 2020 (see figure in the annex). This evolution is indicative of non-sustainable management of the Lithuanian forests. In response to a question on this matter from the ERT, Lithuania stated that its 2005 data on age-class distribution do not agree with the modelled distribution, and that these data are not much different from corresponding 2010 data.[3] In responding to a request for clarification from the ERT on whether the difference between the current age-class structure and the modelled one substantially modifies the current estimation of FMRL, Lithuania gave the satisfactory explanation that the approach it used is bound to produce conservative estimates of FMRL, because EFISCEN cannot use data with the level of aggregation provided by the country (the Party's full explanation can be found in the annex).

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

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

[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.

[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 data for 2005 are published in State of Europe's Forests 2007, a report jointly prepared by the Ministerial Conference on the Protection of Forests in Europe, the United Nations Economic Commission for Europe and the Food and Agriculture Organization of the United Nations. Available at <http://www.foresteurope.org/filestore/foresteurope/Publications/pdf/state_of_europes_forests_2007.pdf>.

### 4. Other elements

Forest management activities already undertaken

9. Forest land has been steadily increasing since 1945 in Lithuania, according to its 2011 national inventory report (NIR). Average annual increase of forest area was highest in the period 1947 to 1960 (14 thousand hectares (kha)), and slightly decreased thereafter to the current annual average of 10 kha. In the period 1990–2009, the forested area increased at an average annual rate of 9.55 kha (estimated from data in table 7-4, 2011 NIR). The timber demand by 2020 will be based on macroeconomic drivers and the application of policies implemented in the EU member States by April 2009, and the legislative provisions adopted by April 2009. According to Lithuanian Forest Law, the clear cut areas should be reforested within three years and are under the strict control of forest management and State inspection. Temporarily unstocked areas after harvesting remain forests and are not accounted for as deforestation (2011 NIR).

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

10. Projected forest management activities will be formulated on the basis of macroeconomic drivers and the application of policies implemented in the EU member States by April 2009, and the legislative provisions adopted by April 2009.

## C. Pools and gases

### 1. Pools and gases included in the reference level

11. The pools included are above-ground and below-ground biomass reported together as living biomass, litter, dead wood and soil organic matter in both mineral and organic soils. The HWP pool was estimated with the C-HWP model. Dead organic matter is taken to be the sum of dead wood and litter. Non-$CO_2$ emissions from biomass burning have also been included. Non-$CO_2$ GHG emissions from fertilization (nitrous oxide) and carbon from liming are not included, because Lithuanian forests are not fertilized or limed.

### 2. Consistency with inclusion of pools in the estimates

12. The FMRL is consistent with the GHG inventory, except that non-biomass pools and GHGs are kept constant in the FMRL (at the level of average values for the period 2000–2008 from the GHG inventory submission of 2011). The ERT considers this a sound assumption because the emissions from the non-biomass pools and GHG emission sources were practically invariable from 1990 to 2008.

## D. Approaches, methods and models used

### 1. Description

13. The models, G4M[4] and EFISCEN,[5] as referred to in paragraph 5 above, project annual estimates of emissions and removals for forest management until 2020 for the above-ground and below-ground biomass carbon pools. To estimate the FMRL, the emissions and removals estimated by the models for the time series 2000 to 2020 were calibrated/adjusted using historical data from the country for the period 2000–2008.[6] In this post-calibration, a constant offset is added to models' results for 2000–2020 to match the average historical data provided by each country for the period 2000–2008 to ensure consistency with national historical data in terms of the absolute level of emissions and removals and coverage of pools and gases.

14. Future harvest demand under a 'business as usual' scenario was derived from macroeconomic drivers (e.g. gross domestic product, population) and policies enacted in Lithuania up to April 2009. This information is used as data input to GLOBIOM (Global Biomass Optimization Model), which projects demand for timber.

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

16. In both the EFISCEN and the G4M models living biomass removals have been projected to steadily decrease in the period 2010–2020. In the official FMRL submission, the estimated net removal values for the year 2000 computed using G4M are fairly close to those produced by EFISCEN, but they increasingly diverge from each other at later points in time (see table 8 in the submission). In the second computation (as shown in the annex), net removals diverge in the period 2000–2008 and become fairly close in the period 2013–2020.

### 2. Transparency and consistency

17. Lithuania's submission plus the replies received to questions posed during the TA allow the assessment to be made on the basis of transparent information. The approaches taken for the construction of the FMRL and for the calculation of emissions and removals in the future are consistent.

## E. Description of the construction of the reference levels

### 1. Area under forest management

18. The forest area input into each model was assumed constant for the period 2000–2020 (see table 4 in the submission). The input values for the two models were very similar

[4] 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 structure, increment, historical harvest) were taken from national forest inventories or other country statistics.

[5] EFISCEN uses as data input the forest area data from national forest inventories scaled to match the forest area reported in the NIRs (either the forest land remaining forest land area deducting the deforested area 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.

[6] 2008 forest management data are taken as provided by the country in the 2010 GHG inventory submission. From 2000 to 2007, forest management estimates were provided by the Party.

to each other. This consistency in area did not reflect the time trend of the area data provided in table (a) in section 5(I) of the FMRL submission. Lithuania explained that those data are contradictory, and suggested that it would "correct calculations in the models according to national tendencies of forest coverage change in the past and country plans to change forest area in future". This discrepancy has been solved in the second run of the models and following recalculation of the FMRL (see section B.2 of the 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

19. The historical area under forest management reported under the Kyoto Protocol is the same as the area of forest land remaining forest land reported under the Convention, but for 2009 the area of forest land remaining forest land reported under the Convention is smaller (by about 11 per cent) than that reported under the Kyoto Protocol for the same year.[7] In response to a request for clarification by the ERT on the discrepancy between the area used for calculating the FMRL and that reported under the Convention in its latest NIR (2011), Lithuania explained that corrected values of forest area were input into the models for computing a new value for the FMRL (see section B.2 of the annex).

### 3. Forest characteristics

20. Lithuanian forests are classified as coniferous and deciduous (table 7-4, 2011 NIR). Annual increment in volume per area (table 9) was estimated by G4M as slowly decreasing (–16.7 per cent) from 6.7 cubic metres per hectare ($m^3$ $ha^{-1}$) in 2000 to 5.6 $m^3$ $ha^{-1}$ in 2020. EFISCEN also estimated a slowly decreasing annual increment from 5.7 $m^3$ $ha^{-1}$ in 2005 to 5.3 $m^3$ $ha^{-1}$ in 2020 (–7 per cent).

21. In response to a request by the ERT, Lithuania provided a table showing the rotation lengths of its most important tree species (see the table "Minimal age for final felling in Lithuanian forests" in section B.3 of the annex), and further information on its forest management activities under 'business as usual' (see section B.4 of the annex).

### 4. Historical and assumed harvesting rates

22. Both G4M and EFISCEN attribute to forest management all harvested timber predicted to be realized up to 2020; this assumption implies that in the modelled period negligible areas of lands afforested/reforested or deforested since 1990 would be harvested compared with areas categorized under forest management. The five-year average of round wood harvested in 2003–2007 (6,925,000 $m^3$) was 12 per cent larger than the five-year average for 1998–2002 (6,163,000 $m^3$), which could be taken as a practically constant harvesting rate in that comparatively brief timespan. The 'business as usual' scenario projects a steady decrease in the round wood harvesting rate, down to 6,257,000 $m^3$ in 2020; this figure is 4.4 per cent smaller than the average of the 2000 and 2005 five-year averages. In the period in which both models calculate decreasing increments, the net sink in living biomass is decreasing slightly.

## 5. Harvested wood products

23. The estimated annual accumulation of –0.413 Mt $CO_2$ eq per year in HWP pools included in Lithuania's 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*,

[7] Modellers resolved this discrepancy by averaging the Convention and the Kyoto Protocol values.

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.

### 6. Disturbances in the context of force majeure

24. Lithuania 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. The emissions from forest fires for the period 1990–2008 represented about 0.1 per cent of the total GHG emissions in 1990 (without LULUCF).

### 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 $CO_2$ concentrations and indirect nitrogen deposition occur in the reference level and in the estimates of the commitment period, and therefore they can be assumed to factor out.

## F. Policies

### 1. Description of policies

26. Energy policies taken into consideration in the FMRL are provided in annex II to the submission. Along with the EU energy policies implemented by April 2009, national measures are listed in this annex. Information on how these EU-level policies are being implemented at the national level and the 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 the estimation of wood fuel demand driven by these policies. Output of 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 and harvesting rates, and changes in age-class structure. Furthermore, Lithuania confirms that no domestic policies other than those included by PRIMES were taken into account when estimating the FMRL.

# III. Conclusions and recommendations

28. Lithuania has transparently calculated FMRL values on the basis of information provided in the country's FMRL submission and additional information provided during the review process. The ERT recommends that Lithuania make a technical adjustment to the HWP component of the FMRL when final agreement on the HWP estimation is reached.

# Annex

## Documents and information used during the technical assessment

### A. Reference documents

Information on forest reference management levels by Lithuania, 15 April 2011. Available at <http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_lithuania_2011.pdf>.

Communication of 1 June 2011 regarding the harvested wood products value by Lithuania. Available at <http://unfccc.int/files/meetings/ad_hoc_working_groups/kp/application/pdf/awgkp_lithuania_corr.pdf>.

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

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

### B. Additional information provided by the Party[1]

#### 1. On age-class structure

The modeling team has incorporated all the information on age structure available from latest official country statistics (e.g FAO) in some cases integrated by addition information from the country. In some cases the age structure used is referred to the total forest area, because more precise information related only to FM area has not been made available to modelers. In some case, it was made available during the review but the level of disaggregation was not enough to be usable in the models (e.g. Efiscen needs need age structure disaggregated by region, species, etc. and with associated values of increments). In these cases, area of each age class was scaled proportionally to ensure that total area matched the FM area reported by the country. This approach may mean that the share of the first ages class (0-20 yrs) was slightly overestimated as compared to the "real" share of this age class in FM area. We kept this approach because no alternatives were available and, for the purpose of setting the FMRL, it produces conservative estimates. The reason for conservative estimates is the following:

- the current increment in EU forest (excluding plantations) typically peaks after the first age class, i.e. for FM areas the increment in age class 20-40 yrs is always higher that increment in age class 1-20 yrs.

- an overestimation of age class 1-20 yrs means overestimating (slightly) the future increase of increment and, therefore, the future sink.

In conclusion, the cases of small divergences between age structure used by models and age structure communicated by countries during the review cannot be fully reconciled because the level of aggregation provided by these countries is not enough to be usable by models. This means that, in some cases, the simplified approach on age structure used by models introduced a bias which is likely to be negligible or very small in most cases and, in all cases,

[1] Reproduced as received from the Party.

the direction of the bias is toward higher sink in the future, and thus is conservative for the purpose of setting the FMRL.

## 2. Computation of a new value for FMRL

| | | | *av. 2000–2008* | *2000* | *2005* | *2010* | *2015* | *2020* | *av. 2013–2020* |
|---|---|---|---|---|---|---|---|---|---|
| Step 1: models' results (only biomass) | | EFISCEN (1) | -4329 | –4664 | –4151 | –4207 | –3999 | –3817 | –3946 |
| | | G4M | -5419 | –6280 | –5124 | –4450 | –4354 | –4293 | –4339 |
| | | Average of models | -4874 | –5472 | –4637 | –4329 | –4177 | –4055 | –4143 |
| Step 2: ex-post processing | Offset (2) | biomass | 1268 | | | | | | |
| | | non-biomass pools and GHG sources | –1265 | | | | | | |
| | | total offset | 3 | | | | | | |
| | Calibrated average of models (3) | | -4871 | –5469 | –4634 | –4326 | –4174 | –4052 | –4139 |
| Sensitivity analysis (4) | +10% harvest | | | | | –2101 | –3283 | –3013 | –3228 |
| | –10% harvest | | | | | –5234 | –5060 | –4690 | –4950 |

(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.

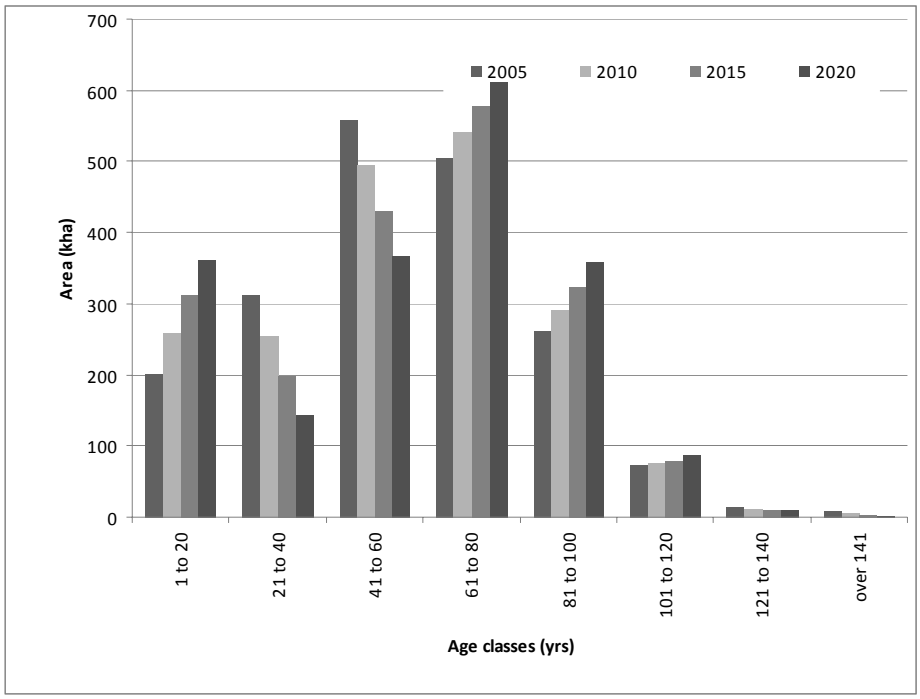
## 3. Information provided on rotation lengths and class-age distribution

Minimal age for final felling in Lithuanian forests:

| Dominant tree specie | Minimal age for final felling |
|---|---|
| Pine (Pinus sylvestris) | 101 |
| Spruce (Picea abies) | 71 |
| Birch (Betula sp.) | 61 |
| Aspen (Populus tremula) | 41 |
| Black alder (Alnus glutinosa) | 61 |
| Grey alder (Alnus incana) | 31 |
| Oak (Quescus robur) | 121 |

| | |
|---|---|
| Ash (Fraximus excelsior) | 101 |

Note: *Source*: This information was provided by the Party in responses to questions and clarifications raised by the ERT




Age-class distribution of trees in Lithuanian forests as calculated by the EFISCEN model for 2005, 2010, 2015 and 2020.

## 4. Information on forest management activities in Lithuania (under "business as usual")

Forests cover 33.2% of the territory of Lithuania. According to the data of State Forest Inventory forest land area increased in the last 10 years by about 150 thousand. ha, the cumulative total timber volume increased in the same time by 38 mill. $m^3$. The average timber volume per hectare over the past ten years has increased by 13 $m^3$, and is now 237 $m^3$/ha. Artificial afforestation in 2001-2010 took place on about 22.5 thousand ha of abandoned and agricultural used land.

According to the Lithuanian forestry policy and strategy document (approved in 2002), continuation of the sustainable forest management and further increasing of forest coverage and forest resources as well as strengthening of economical viability of forestry are under the main strategic goals for the next future in Lithuanian forestry. Additionally in the National Forest Sector Development Program for the period until 2020 (under preparation) the new strategic objectives regarding better use of wood biomass (especially cutting residues) as renewable source for biofuel production are formulated. There is planed increasing of utilization of logging residues and small wood for production of biofuel from about 70 thousand $m^3$/year (currently) up to 500 thousand $m^3$/year (in 2020).

Yearly amount of all types of forest cutting in Lithuanian state and private forests together makes 5.7 to 7.3 million. $m^3$ over the past decade. Such logging volumes are in accordance

with the principles of sustainable forestry, when the timber harvesting does not exceed the timber increment, at the same time such amounts constitute sufficient conditions for effective functioning of the country's forestry sector. According to strategic documents mentioned above, the continuation of keeping the timber harvesting volumes lower than the increment of wood will ensure smooth and uninterrupted supply of wood in the raw and biofuel-wood for industry and society, while at the same time will maintain the potential of forests for future needs.