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EUROPEAN COMMISSION

SUBMISSION BY BELGIUM AND THE EUROPEAN COMMISSION ON BEHALF OF THE EUROPEAN UNION AND ITS MEMBER STATES

Brussels, 23th of July 2010

Subject: reference levels for Forest Management

1 - Introduction and scope of the submission

In its 14 December 2009 submission[1] the EU informally submitted data covering proposals for forest management accounting, based on the format proposed by the co-chairs. The data are available on the UNFCCC website.

Since December 2009, updates to the methodologies used in national GHG inventories and revisions of information have become available that lead to modifications of the reference levels proposed for some EU Member States. The purpose of this submission is to present these updated reference levels as well as relevant information supporting the changes made. The EU is also using the opportunity to answer requests for additional information received since Copenhagen. The submission does not prejudice the EU position on other accounting options.

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[1] http://unfccc.int/files/kyoto_protocol/application/pdf/awgkplulucf_eu151209.pdf

In establishing national reference levels, the EU and its Member States have used projected net emissions/removals from forest management for the period 2013-2020. The methodology used for projections is described below. All data, including projections, revisions and updates of historical data, are open for review.

The Reference Levels presented in this submission are to facilitate the negotiations and are being submitted on the basis of the EU's understanding of the Reference Levels, including the use of the elements in the current draft text (para 11 footnote 2; force majeure; and treatment of the harvested wood products pool). If, in the course of negotiations, Reference Levels are to be understood, substantially modified or used in a different way, or when there is substantially improved data available by the Member States, the EU may revisit these reference levels before their adoption in a LULUCF decision.

2 - Updated reference level

Party	Reference level (MtCO2e/yr)
Austria	**-2,121**
Belgium	**-3,402**
Bulgaria	**-10,077**
Cyprus	**-0,164**
Czech Republic	**-3,864**
Denmark	**0,179**
Estonia	**-1,970**
Finland	-13,700
France	**-66,977**
Germany	**-2,067**
Greece	**-1,383**
Hungary	**-0,501**
Ireland	**-0,073**
Italy	**-15,606**
Latvia	**-12,929**
Lithuania	**-11,481**
Luxembourg	-0,260
Malta	-0,049
Netherlands	**-1,687**
Poland	**-34,671**
Portugal	**-0,919**
Romania	**-29,428**
Slovakia	**-0,506**
Slovenia	**-2,730**
Spain	**-41,535**
Sweden	-21,844
UK	-3,438
EU-27	**-283,203**

Reference levels included in the table above are based on projected net emissions/removals from forest management for the period 2013 -2020. For further information related to how projections for the period 2013-2020 relate to historical net emissions/removals, please refer to the updated entry data table presented below as well as country specific information presented in the country notes in Annex.

Reference levels modified in comparison to values indicated in the Appendix to Option 2 paragraphs 11-11bis of document FCCC/KP/AWG/2010/6/Add.2 are indicated **in bold**.

3 - Description of main elements used in the calculation of the reference level

Pools and gases included in the calculation of the reference level

In general, all carbon pools and gases reported to the Kyoto Protocol (if available) or the UNFCCC were included in the calculation of individual Member States' reference level. The exceptions are noted in the footnotes. The EU will maintain consistency in accounting between pools included in the reference level and reported in GHG inventories. The table below summarises the carbon pools and gases included in the reference level by each of the 27 EU member States.

	Changes in carbon pools included in the reference level						GHG sources included in the reference level					
	Above-ground biomass	Below-ground biomass	Litter	Dead wood	Soil		Fertilization	Drainage of soils	Liming	Biomass burning		
					mineral	organic	N_2O	N_2O	CO_2	CO_2	CH_4	N_2O
Austria	yes	yes	yes	yes	no	no	no	no	no	yes	no	no
Belgium	yes	yes	yes	yes	yes	no	no	no	no	no	no	no
Bulgaria	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Cyprus	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Czech Republic	yes	yes	no	no	no	yes	no	no	yes	yes	yes	yes
Denmark	yes	yes	no	yes	no	no	no	no	no	no	no	no
Estonia	yes	yes	no	no	no	yes	no	no	no	yes	yes	yes
Finland	yes	yes	yes	yes	yes	yes	no	yes	no	no	no	no
France	yes	yes	yes	yes	yes	no	no	no	no	yes	yes	yes
Germany	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes
Greece	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Hungary	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Ireland	yes	yes	yes	yes	no	yes	no	no	no	yes	yes	yes
Italy[(1)]	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Latvia	yes	yes	no	no	no	yes	no	yes	no	yes	yes	yes
Lithuania	yes	yes	yes	no	no	yes	no	yes	no	yes	yes	yes
Luxembourg	yes	yes	no	no	no	no	no	no	no	no	no	no
Malta	yes	yes	no	no	no	no	no	no	no	no	no	no
Netherlands	yes	yes	yes	yes	no	no	no	no	no	no	no	no
Poland	yes	yes	no	no	yes	no	no	no	no	no	yes	yes
Portugal	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Romania	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Slovakia	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Slovenia	yes	yes	no	yes	no	no	no	no	no	yes	yes	yes
Spain	yes	yes	no	no	no	no	no	no	no	yes	yes	yes
Sweden	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	yes
UK	yes	yes	yes	yes	yes	yes	no	no	no	yes	yes	yes

Yes/No indicate if the pool or gas is included or not in the projections used to set the reference level.

(1) Non-biomass pools were excluded from the historical time series used to set the reference level. Consistency in the coverage of carbon pools will be mantained for accounting purposes.

Area under forest management

Emissions and removals from forest management for the period 2013-2020 were estimated based on areas reported under “Forest Management”, if elected, or under the category 'Forest Land remaining forest land'. For the EU, the area reported under 'managed forest' under the UNFCCC generally corresponds to the area reported under 'forest management' under the Kyoto Protocol.

Time series

Projected net emissions/removals from forest management for the period 2013 -2020 were estimated using historical national time series covering the period 1990/2008. Projections used for reference levels are consistent with underlying historical data in GHG inventories.

Age class structure, species composition, increments

Projections used latest available national forest inventories data on age class structure, species composition and increments.

Harvesting rates and wood consumption

Harvest rates up to 2007/2008 come from country statistics or submissions to UNFCCC. The evolution of the EU forest management sink is estimated from Members States business as usual (BAU) harvest rate based only on policies and measures enacted up to July 2009.

Natural disturbances

Some MS included the average level of natural disturbances in the proposed reference level. The EU is of the view that emissions from force majeure events should not be included in the calculation of the reference level. The EU may review its proposed reference levels once the threshold for force majeure will be agreed in order to check the consistency of its proposed reference level with the agreed force majeure provisions.

Factoring out according to para 1(h) Decision 16/CMP.1

The EU does not see the need to separate indirect effect of elevated carbon dioxide concentrations above the pre-industrial level and indirect nitrogen deposition when using the reference level approach as these effects cancel out when substracting the reference level from net emissions/removals occurred during the commitment period. The use of projected reference levels therefore implicitly exclude, to a first approximation, indirect effect of elevated carbon dioxide concentrations above the pre-industrial level and indirect nitrogen deposition in its proposed reference levels.

Harvested Wood Products

For this submission, the HWP pool has been included in the calculation of Reference Levels on the basis of instantaneous oxidation. Technical adjustments of the reference level may be necessary to include HWP as described in option 2 of the draft decision text.

4 - Updated entry data table

	Entry data Net Removals (-) or Net Emissions (+) (1 000 tCO_2eq)								Sources	
	1990		Average 1990-2007 (1)		Projection 2008-2012 (1)		Projection 2013-2020 (1)			
	FM net-removals / net emissions	Emissions from natural disturbances in the year(2)	FM net-removals / net emissions	Emissions from natural disturbances in the period	FM net-removals / net emissions	Emissions from natural disturbances in the period	FM net-removals / net emissions	Emissions from natural disturbances in the period	Historical data (1990-2007)	Projections (2008-2012) (2013-2020)
Austria	-11511	nsq	-14061	nsq	**-4380**	nsq	**-2121**	nsq	Country data	Country data
Belgium	**-4463**	nsq	**-3990**	nsq	**-3420**	nsq	**-3402**	nsq	UNFCCC	JRC
Bulgaria	**-14038**	nsq	**-12784**	nsq	**-10416**	nsq	**-10077**	nsq	UNFCCC	JRC
Cyprus	**-154**	nsq	**-146**	nsq	**-162**	nsq	**-164**	nsq	EU Monitoring Mechanism	JRC
Czech Republic	**-4667**	nsq	**-6624**	nsq	**-4339**	nsq	**-3864**	nsq	UNFCCC	JRC
Denmark	**-884**	nsq	**-850**	nsq	**2**	nsq	**179**	nsq	Country data	Country data
Estonia	**-8032**	nsq	**-5966**	nsq	**-4968**	nsq	**-1970**	nsq	UNFCCC	JRC
Finland	-23933	nsq	-30530	nsq	-24712	nsq	-13700	nsq	Country data	Country data
France	-44729	nsq	-59196	nsq	**-75839**	nsq	**-66977**	nsq	UNFCCC	JRC
Germany	**-65424**	13	-54842	8	**-4890**	nsq	**-2067**	nsq	Country data	Country data
Greece	**-1296**	nsq	**-1879**	nsq	**-1893**	nsq	**-1383**	nsq	UNFCCC	JRC
Hungary	-3913	nsq	-4012	nsq	**-1765**	nsq	**-501**	nsq	Country data	Country data
Ireland	-1251	19	-974	18	**-639**	20	**-73**	20	Country data	Country data
Italy	**-17983**	nsq	**-25097**	nsq	**-23629**	nsq	**-15606**	nsq	Country data	JRC
Latvia	**-13463**	nsq	**-14922**	nsq	**-14346**	nsq	**-12929**	nsq	UNFCCC	JRC
Lithuania	**-14528**	nsq	**-12855**	nsq	**-11998**	nsq	**-11481**	nsq	UNFCCC modified	JRC
Luxembourg	205	nsq	-399	nsq	-376	nsq	-260	nsq	EU Monitoring Mechanism	Country data
Malta	-49	nsq	-49	nsq	-49	nsq	-49	nsq	EU Monitoring Mechanism	JRC
Netherlands	**-2317**	nsq	**-2450**	nsq	**-1985**	nsq	**-1687**	nsq	UNFCCC	JRC
Poland	**-36012**	nsq	**-39384**	nsq	**-39446**	nsq	**-34671**	nsq	UNFCCC	JRC
Portugal	**4533**	**3750**	**55**	**2970**	**-657**	**2198**	**-919**	**2077**	Country data	Country data
Romania	-35583	nsq	**-37784**	nsq	**-32883**	nsq	**-29428**	nsq	UNFCCC	JRC
Slovakia	-4436	nsq	-4098	nsq	**-1634**	nsq	**-506**	nsq	UNFCCC	JRC
Slovenia	-3186	**71**	-4810	**111**	**-4920**	**100**	**-2730**	**150**	UNFCCC	Country data
Spain	**-38995**	nsq	**-38971**	nsq	**-40474**	nsq	**-41535**	nsq	UNFCCC	JRC
Sweden	-35569	18	-33835	143	-20778	348	-21844	55	Country data	Country data
UK	-12178	nsq	-12907	nsq	-8326	nsq	-3438	nsq	Country data on FM	Country data
EU-27	-393854		-423358		-338922		-283203			

(1) All intervals are inclusive of start and end years

(2) Natural Disturbances: nsq = non separately quantified

Annex – Country Notes

Individual country notes provide specific information that could not be included in the main part of the submissions, focusing in particular on the description of methodological updates that led to changes in individual country's reference level, pools and gases, harvesting rates and the treatment of natural disturbances in the establishment of a country's reference level. Methodological information related to projections elaborated by the Joint Research Centre of the European Commission (JRC) is presented at the end. This submission builds on information submitted previously by the EU and has to be read in conjunction with information submitted so far.

Austria

See http://unfccc.int/files/kyoto_protocol/application/pdf/awgkplulucf_eu151209.pdf

The results of the latest national forest inventory conducted in 2000-2002 form the basis for reporting and accounting under the UNFCCC; these data have for consistency reasons also been used for modelling the forest carbon stock changes up to 2020.

Method

Austria has already provided detailed information on the PROGNAUS model used to project carbon stock changes up to the year 2020 in former submissions prepared by the European Union. Additional information can be found in the fifth national communication submitted to the UNFCCC secretariat in February 2010.

The reference level (-1.52 Mio. t CO2), provided in the submission of the European Union from 14th December 2009, was based on information about the ‘aboveground biomass’ and ‘belowground biomass’ pools. In addition the ‘litter pool’ was considered according to tier 1 methodology, currently used for reporting litter under the UNFCCC.

The ‘dead wood’ pool, which is reported using tier 3 methodology, has so far not been considered in calculating the reference level. To maintain consistency in pools, the value reported for increases in the ‘dead wood’ pool which has been quite stable since many years (-0.6 Mio t CO2), has been added to the reference value of -1.52 Mio. t CO2, resulting in a reference value of -2.12 Mio. t CO2. The forecast for 2008-2012 changes accordingly from -3.78 Mio t CO2 to -4.38 Mio. t CO2.

Different biomass prices were considered as input parameters for the model runs, based mainly on historic biomass prices and on trends in development of fuel prices.

Special importance was attached to preliminary cuttings and thinnings in deriving the projections. As final cutting such stands were declared, which had a negative growth of the economic value. Additionally to the silvicultural management activities, economic and ecological aspects were considered in the calculations. The harvesting costs were estimated via different harvesting models and opposed to revenues gained from the different biomass price scenarios. Harvests on inventory plots with a positive profit margin free of harvesting costs were up-scaled to the attainable harvesting potential. The results were converted into cubic metres of stem wood over bark (m^3 o.b.) on the basis of the timber assortment classifications, and finally translated into t C of whole tree biomass – for the three periods 2010, 2015 and 2020.

It is assumed that the projected harvesting rates do not impact gross increment in C-stocks, which remained quite stable during the last decades.

Pools and gases

See table in Chapter 3 of this submission.

Harvesting

The historic biomass harvest rates (in mio. cubic metres stem wood over bark) listed below are taken from the national timber harvest reports. The values for 2010, 2015 and 2020 are derived from the model runs.

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010	2015	2020
19.0	13.9	14.8	14.8	17.4	16.7	18.1	17.8	17.0	17.0	16.0	16.3	17.9	20.6	19.9	19.9	23.1	25.8	26.4	28.5	29.7	31.0

The harvest rates increased by more than 60% in the period 2000 – 2008 and are projected to slightly further increase by 1,4% annually up to 2020.

Natural disturbances

Emissions from natural disturbances are not separately quantified (see entry data table in Chapter 4 of this submission).

Belgium

Uses JRC projections. See below for more information on JRC projections.

Updated projections presented in this submission use the most recent available harvest data, which have been produced after December 2009.

Bulgaria

Uses JRC projections. See below for more information on JRC projections.

Cyprus

Uses JRC projections, based on linear extrapolation.

Czech Republic

Uses JRC projections. See below for more information on JRC projections.

Denmark

Method

Denmark's proposed reference level is using the prognosis for carbon stock during the period 2013 - 2020. The proposed reference level is an update of the number Denmark proposed in December 2009 using the same method but based on the availability of one additional year of NFI data.

The prognosis for carbon stock during the period 2009 - 2020 is based on the NFI data on carbon stock in species and age classes pools using NFI measurements from 2004-2008 as three or five year average of NFI data collected in 2002-2009. Forecasts are based on the present allocation to

age classes and species specific models for probabilities of rejuvenation of each management class. It assumes a constant distribution of species (no species change), but a calculation of percentage of area rejuvenated each year with the same species. For each year, these calculations are combined with NFI data for carbon stocks in each management class. Evolution of the total carbon pool can then be calculated. The probabilities for rejuvenation is estimated based on the forest census data from 1990 and 2000 (Nord-Larsen & Heding 2002). The article 3.4 forest area is assumed to be constant during the period 2013-2020.

In this submission and in order to maintain consistency between pools covered in the projection and historic data, the change in the carbon pool litter has been removed from the period 1990-2008. This explains the difference between historical data presented here with emissions and removals reported in the recent NIR from 27th May 2010.

The proposed reference level includes only policies and measures already in place. Uncertainties in the projection are linked to possible changes in forest management, which may affect the development of forests. Thus, the postponement of cutting old trees will postpone the decline in carbon storage. Conversely, increased harvesting (e.g. due to increased demand, increased price or similar) may lead to a sharper decline in carbon stock.

The forecast for the period 2009 - 2020 show a decrease in forest carbon stock. This is due to the current high proportion of old trees, which face rejuvenation. Hereby large old trees felled and replaced by new small trees. The net result is that the total carbon stock decreases.

Pools and gases

See table in Chapter 3 of this submission.

The projection includes above ground and below ground living biomass and dead wood.

Methods are still improving and a number of projects to provide more detailed knowledge are ongoing e.g. estimating N2O emissions from drained forest soils, estimating carbon pools of forest soils and a project on biomass expansion functions for Danish forest tree species (Norway spruce, beech and oak) which will provide national information for more reliable estimation of the carbon stock of the forest biomass and will be included in the reporting for 2009 submitted in 2011.

Harvesting

As the projection is based on NFI data using a carbon stock change approach, it involves no estimation of growth or harvesting.

The reported annual harvest in Danish forest has been 2,3-2,5 mio m3 in the period 2006-2008. This is an increase from an annual harvest of approximately 2 mio m3 during the period 1990-2000. Approximately 50 % of the harvest is wood for energy. This percentage has been increasing in the same period. The NFI will in due time provide estimates for wood harvest based on sample plots.

Natural disturbances

Emissions from natural disturbances are not separately quantified (see entry data table in Chapter 4 of this submission).

Natural disturbances in Danish forests have mostly been storms causing wind throws. By using two successive forest censuses (1990 and 2000) to develop the probability functions for rejuvenation the effects of wind throw (especially occurring in conifers e.g. Norway spruce) are to some degree included directly in the model.

Further information

Historical data as well as the projections are presented in the final report of a recent government report (July 2010).

http://www.sl.life.ku.dk/upload/wp54_unfccc.pdf

Estonia

Uses JRC projections. See below for more information on JRC projections.

Finland

See http://unfccc.int/files/kyoto_protocol/application/pdf/awgkplulucf_eu151209.pdf

Method

The projection of emissions and removals for forest land combines estimates of carbon stock change in tree biomass, dead wood, litter and soil organic matter. Forest land was divided into mineral and organic soils and the applied methods were somewhat different. The process started with the simulations of economic situation of forest sector (SF-GTM model) and proceeded to the scenario of the development of forest resources. Forest resources were modeled with the MELA forestry model, which consist of a simulation part (forest resources) and a optimization package for forest management. In the last phase, the emissions and removals due to the changes in carbon stocks were estimated.

Pools and gases

See table in Chapter 3 of this submission.

The scenarios include estimates for CO2 and N2O emissions from drained organic soils. These emissions are not included in the UNFCCC/KP reporting as the method for estimating the corresponding emissions is still under development. They are expected to increase in the future as the weather is warming. Uncertainties are very high.

Mineral soils have been a sink in Finland but, according to the model used, they seem to turn to a source as the weather is warming. Uncertainties are very high.

Harvesting

2000	2005	2010	2020	ratio (av. 2016-2025/ 2000)	ratio (av. 2013-2020/ 2005)
60 608	60 356	62 787	66 179	1,09	1,10

These values express 5 years average: 2000 is the average 1998-2002, 2005 is the average of 2003-2007.

Natural disturbances

Emissions from natural disturbances are not separately quantified (see entry data table in Chapter 4 of this submission).

France

Uses JRC projections. See below for more information on JRC projections.

France reference level and related data are provided on a facilitative basis and do not prejudge a final choice on the accounting option of Forest Management.

Germany

Method

The historical data are taken from the last National Inventory Report (NIR, CRF) to the UNFCCC from April 15, 2010. Data are based on two national forest inventories (NFI 1987 and NFI 2002) and data from the national forest inventory study 2000.

The projection for above ground and below ground biomass development is calculated by WEHAM baseline model (BAU scenario). WEHAM has been used as the core instrument for nation-wide future forest resource assessments since 1987 and has been reviewed, improved and adjusted continuously. The applied model estimates the potential round wood availability and related potential forest development, especially the growing stock over the next 40 years under BAU conditions. WEHAM is a single tree model consisting of three sub-models for tree growth (growth simulator), for exploitation / harvest (management simulator), and for timber assortments (grading model), respectively and considers the German guidelines for sustainable forest management. The growth sub-model is based on data mentioned above under 'historical data'. It is used for extrapolating tree increment on a regional and species' related scale. The exploitation sub-model implements assumptions about parameters such as thinning intensity and frequency, age and the minimum threshold diameter of the final harvest cut. WEHAM provides estimates for the growing stock volume of the dominant crop only. The WEHAM-model excludes economic parameters, technical conditions for logging (e.g., slope, forest road density) and tree mortality. . The management simulator of WEHAM runs according to the national silvicultural guidelines. These guidelines for sustainable forest management have been developed and continuously improved for all kinds of forests stands under the specific climatic and soil conditions in Germany. In the last 30 years they have been amended by including safeguards and specific management goals for biodiversity.

The provided data assume a BAU scenario (e.g. describes the course of forest management services planned in 2003) which is:

1.) A high and nearly constant level of growing stock in private forests,

2.) A growing stock in the state forests comparable to the level of private forests,

3.) A further increase of growing stocks for coniferous tree species (as current stem diameters for spruce and pine in the dominant age classes are below the threshold values for harvesting), and

4.) A decrease of growing stocks for deciduous tree species (as the current stem diameters for beech and oak in the dominant age classes have reached the threshold values for harvesting).

The projection for soil organic matter, litter, and dead wood was conducted as a technical adjustment based on a conservative extrapolation of historical data. In case of increasing historical emissions a linear extrapolation was applied (dead wood) and in case of declining emissions the mean of historical emission (litter and soil as well as emissions from forest fires, drainage and fertilization) was used. In the period 2002-2008 big storms happened and therefore an extraordinary high accumulation of deadwood above business as usual was observed.

As dead wood does not accumulate endlessly and the used technical adjustments contain large uncertainties in particular for dead wood and soil the calculations have to be validated resp. updated with more sophisticated models when the data from new forest measurements (NFI3 in 2012) respectively from the second forest soil inventory become available. Then recalculation of NIR-data is planned.

This resulted in an adjustment of the reference level compared to the Copenhagen submission where above and below ground biomass was included in the projections only. The difference is -2,915 Mio tCO2e .

Pools and gases

See table in Chapter 3 of this submission.

Time series

Historical time series is based on forest inventories in 1987, 2002, and 2008. Detailed information can be found in the NIR at the UNFCCC website.

Age class, species composition, increments

Currently in the German forests one of the highest carbon amounts (per ha and in total) in Europe and in the German history as well is stored. Huge clear cuts during and after the First and, Second World War with subsequent reforestation caused relatively high increment rates in the past decades. In the 1990s the net removal amounted to some 65 Mio ton of CO2eq /a. Since than more stands reached harvestable diameter, while at the same time the increment rate decreased because the forest became older. The result was a continuously diminishing sequestration rate up to some 17 Mio ton CO2eq /a in the period 2002 – 2008 (latest forest inventory). These age-class structure effects are the main drivers for emissions and removals.

Harvesting

Historical and projected harvest data (roundwood overbark 1000 m3)

2000	2005	2010	2015	2020	ratio (av. 2013-2020)/2000	ratio (av. 2013-2020)/2005	Source of historical data
62,310	81,175	95,723	101,573	104,099	1.64	1.26	country data

Note: values in the table express 5-yrs average (e.g. 2000 is the average 1998-2002, 2005 is the average 2003-2007). Till 2008, data are economic account for forestry. From 2009 to 2020 data were estimated by the model WEHAM (see text on additional methodological information for more details.

Natural disturbances

Emissions from natural disturbances are not separately quantified (see entry data table in Chapter 4 of this submission).

In the past mostly storms were causing emissions from forest because of wind throws. These emissions are explicitly contained in the historical data but not in the projections.

Forest fires are included in the historical data where these emissions are explicitly calculated in the actual reporting (non-CO2 gases) and in the projections. Small areas only are concerned by forest fires.

Further information

Further explanation on the reference level can be found under: http://www.holzundklima.de/lulucf

Greece

Uses JRC projections. See below for more information on JRC projections.

Hungary

Method

Hungary has not yet finalized the estimation of AR, D and 3.4 FM emissions and removals for the 1990-2008 period. However, some data have already been recalculated that can be used to obtain updated although still preliminary value for the FM reference level. The updated country-specific assessments submitted in this submisison can and will be revised later.

The updated projections for net removals (-) or net emissions (+) for forest management in thousand t CO2 for 2008-2020 are the following:

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
x 1000 tCO2	-3808	-1435	-1302	-1168	-1114	-1029	-878	-727	-576	-426	-275	-124	27

The mean value for the 2013-2020 period is -501 thousand t CO2, which is smaller that the previous estimate. Again, this is still a preliminary value.

The method used the estimate historic data is the following:

(1) First, the net removals of all forests were re-estimated for 1990-2008 (and were submitted to the UNFCCC earlier this year).

(2) Second, the removals of AR land since 1990 were estimated using a country-specific forest carbon accounting model, CASMOFOR.

(3) Third, the removals of AR land in 2008 were estimated using forest inventory methodology. This is a preliminary estimate.

(4) Then, the estimates obtained by CASMOFOR were adjusted by multiplying the estimates for each year by the ratio of the estimate for 2008 and the model value for 2008.

(5) Finally, the removals of FM land (for 1990-2008) were obtained by taking the difference between the estimate for ALL forests and the estimate for the AR land. Note that we do not as yet have estimates for D land, however, it is not really important in Hungary.

Projected data were obtained by linearly extrapolating the historical data of FM (1990-2008) for the period of 2009-2020.

Pools and gases

See table in Chapter 3 of this submission

Harvesting

2000	2005	2010	2015	2020	ratio (av. 2013-2020/2000)	ratio (av. 2013-2020/2005)	Source of historical data
7289	7167	6925	6880	6835	0,94	0,96	National Forest Database

The projected data is based on a linear extrapolation of the harvesting data of 1970-2008. Note that this extrapolation doesn't reflect the possible increase of harvest due to increased needs of fuelwood.

Natural disturbances

Emissions from natural disturbances are not separately quantified (see entry data table in Chapter 4 of this submission).

Ireland

Method

The BAU scenario modeled in this submission in based on long standing silvicultural management practices, which include thinning, clearfelling and replanting, the objective being sustained yield from the forest estate. Forest Inventory information from the state forest sector, in addition to the results of the latest National Forest Inventory (NFI, 2007) enable silvicultural practices to be attributed at stand level (see http://www.coford.ie/iopen24/pub/euforestdata-nov09.pdf).

Pools and gases

See table in Chapter 3 of this submission.

The projection includes CO2 emissions and reduction in above ground and belowground living biomass, dead wood, organic soils and litter. It assumes that carbon stocks in mineral soils are constant. Emission of CO2, CH4 and N20 are included for forest fires (natural disturbance). The model does not include estimates on N20 emissions from drained soils. Liming of forest soils is deemed not to occur. Emissions associated with N20 form fertilizer application are reported in the agriculture sector based on fertilizer sales; this can not be disaggregated for forest land.

Harvesting

See http://www.coford.ie/iopen24/pub/euforestdata-nov09.pdf

Natural disturbances

Natural disturbances have now been included in the reference level, in order to maintain consistency between the reference level and accounting in the commitment period:

2013-2020: The previously reported reference level of -0.085 Mt CO2e/year does not include emissions from natural disturbances. Emissions form natural disturbance have been estimated to be 0.02 MtCO2e/year, due mainly to fire in Afforestation/reforestation (A/R Article 3.3) and Forest Management (FM Article 3.4) lands. Based on the assumption that the FM area (463 k ha) in 2020 will represent 60% of the total forest cover (see previous submissions), it is estimated emissions from natural disturbance on FM area would be 0.012 MtCO2e/year. Therefore the net reference value would be -0.073 Mt CO2e/year

2008-2012: The same adjustment is applied to the 2008-2012 time series, but the proportionate FM area is assumed to be 64 %, representing a natural disturbance emission on FM land of 0.013 MtCO2e/year and a net reference value of -0.639 Mt CO2e/year

1990-2007: Emissions from natural disturbances are already included in the historic values.

Italy

Uses JRC projections. See below for more information on JRC projections.

Latvia

Uses JRC projections. See below for more information on JRC projections.

Latvia provides updated data and the related new reference level due to change of methodology.

Methodology of GHG inventory in LULUCF sector is going to be changed from default method to stock change method until the end of the first commitment period. Preliminary comparison of both approaches demonstrated that application of the default method is associated with considerable risk of overestimations of removals in living biomass. It also has been notified by the country reviewer in the year 2009.

Conservative approach (adjustment of the activity data according to the stock change method - preliminary results of comparison of the first and second cycle of the inventory) is used to estimate net removals on forest lands. Scientifically verified recalculations for the whole time series will be implemented into the UNFCCC and Kyoto protocol reporting in 2011 when validation of the National forest inventory will be completed. JRC projections were calculated using updated emissions data in LULUCF sector.

Lithuania

Uses JRC projections. See below for more information on JRC projections.

Luxembourg

See http://unfccc.int/files/kyoto_protocol/application/pdf/awgkplulucf_eu151209.pdf

Malta

Uses JRC projections, based on linear extrapolation.

Netherlands

Uses JRC projections. See below for more information on JRC projections.

Poland

Uses JRC projections. See below for more information on JRC projections.

Historical data come from data provided to the UNFCCC.

Poland is currently revising its forest inventory data due to a major upgrade in its approach towards the national forest inventory. The country recently concluded the first round of its new NFI program that introduced a systematic and all-area inclusive system of resource assessment focusing on stocking and increment of forest resources. Before 2005, Poland applied non-universal approach towards assessing forests representing different types of ownership. While public forests administered by the state forest service constitute a majority (78%) of the resources, the remaining forest land is still of considerable size. The later one did not enjoy equally rigorous inventory system. In addition, public and private areas were inventoried at various times and at different scales, what made consolidation of data very challenging.

Portugal

Method

The reference level was calculated using the following variables and considerations:

1. **Evolution of forest area under 3.4 during the period 2013-2020**

   Estimated as the area in the last NFI (2005) minus accumulated afforestation 1990-2005 minus accumulated deforestation 2006-2020 (annual deforestation rate = average 1990-2008)

2. **Estimates of growth (sequestration) during the period**

   Same growth rates/models as in NIR2010

3. **Estimates of wood and biomass harvest taking place in that forest area and during the period**

   Same harvest rate, expressed as % of standing volumen

4. **Estimates of harvesting wood products during the period**

   Emissions from HWP have been included, using the instantaneous oxidation approach. Emissions from HWP are, therefore, implicit in total harvesting emissions.

5. **Estimates of burnt areas during the period**

   Emissions from "normal" fires have been included. Annual burnt area was estimated as the average of burnt areas in the period 1990-2008, excluding the two lower years (2007 and 2008) and the two higher years (2003 and 2005)

6. **Methodologies for estimation of emissions and removals**

   The same methodologies, models and constants as in the NIR2010 have been considered in the calculation of the FM-RL

NB. Due to unavailability of detailed information, this exercise was carried out only for the forests of mainland Portugal, i.e., excludes forests from the archipelagos of Azores and Madeira.

The scenario described above can be summarised in the following table.

Variable	Value in the scenario 2013-2020
Forest Area under Article 3.4 Forest Management	3.117.302 ha
Total annual harvest	14.130.057 m3/year
Total annual burnt area	51.410 ha/year

A summary of historic emissions and removals of greenhouse gases in “Forest Land Remaining Forest Land” and estimates of future emissions and removals for the first and second commitment periods is presented in the following table.

	1990 NIR2010	1990-2007 NIR2010	2008-2012 Annual Estimate	2013-2020 Annual Estimate
Total Sequestration	-17 509	-18 767	-20 791	-20 669
Emissions from harvesting	+18 292	+15 852	+17 936	+17 673
Emissions from Fires	+3 750	+2 970	+2 198	+2 077
Net GHG emissions (+), or removals (-)	+4 533	+55 [Min -3 539; Max +7 407]	-657	Reference Level -919

Units: thousand tCO2eq./year

Pools and gases

All pools and gases considered in the NIR2010 have been considered in the calculation of the FM-RL. See table in Chapter 3 of this submission for details.

Harvesting

Same harvest rate, expressed as % of standing volume, which results in a projected total annual harvest for 2013-2020 of 14,13 million m3/yr.

Natural disturbances

Emissions from "normal" fires have been included. Annual burnt area was estimated as the average of burnt areas in the period 1990-2008, excluding the two lower years (2007 and 2008) and the two higher years (2003 and 2005). The reference level is calculated using a projected annual burnt area for 2013-2020 of 51 410 ha/yr.

Romania

Uses JRC projections. See below for more information on JRC projections.

Slovakia

Uses JRC projections. See below for more information on JRC projections.

Slovenia

Method

Slovenia proposes only a minor change (0.6 %) in comparison to the EU submission of December 2009. The method for calculating the reference level is the same as used for national inventory reports until 2009, where default IPCC method (biomass growth minus biomass loss) for assessing the removal was used. The proposed reference level is set as projection agreed in the National Forest Programme of 2007, where felling should attain 75 % of increment. The stock change method applied in the national inventory report of 2010 returns much greater values than the default method and has not yet been properly reviewed. As long questions this method raises in comparison to previous one are not answered, the data of NIR 2010 cannot be taken into account.

Pools and gases

See table in Chapter 3 of this submission.

Harvesting

Historical and projected harvest data (roundwood overbark 1000 m3)

	1990	1990 - 2007	2008 - 2013	2013 - 2020
Slovenia	3.018	2.617	4.219	6.000

Natural disturbances

Emissions from natural disturbances reported in December 2009 included timber that had to be felled because of impacts of small and middle scale fires, wind-, snow- and ice-breaks, as well as damages caused by insects. Salvage wood represented the bulk of the reported emissions.

In this submission, salvage wood has been removed from the emissions reported under natural disturbances, which now only include emissions from forest fires.

Spain

Uses JRC projections. See below for more information on JRC projections.

Sweden

Method

No changes have been made to the proposed reference level for Sweden compared to the EU submission of the 14th of December 2009. The information below is mainly due to further inform on the most important assumptions used in the projected reference level. Most of the information is also available in the EU-Submissions of September, November and December of 2009.

The proposed reference levels are the expected average annual net removals in 2013-2020 based on reported Forest management data and business-as-usual scenarios for 2015 and 2020. In the scenarios present forest management practices are assumed, including environmental measures in forestry and environmental policy aimed at preserving biological diversity. In addition, the recent trend of increased removal of forest residues has been included. The methods used are open for future review. To increase transparency in the discussion on reference levels, some of the underlying data and assumptions used for the calculation of the reference level is described below.

Sweden reports carbon stock changes in living biomass using the stock change method based on the estimated standing stock on permanent NFI sample plots (NIR 2010)[2]. Therefore separate estimates of gains and losses have not been reported to the UNFCCC. To illustrate the key elements of the trend in net removals for Forest management figure 1 below illustrate the total harvest level and the growth. Harvest represents gross fellings, which is the amount of wood annually supplied to the forest industry and the energy sector in Sweden and other countries. Growth is 5-year averages of measured annual increment. Projected net removals for 2015 and 2020 have been estimated using the HUGIN modelling tool, which simulates the future development of the forests on the basis of assumptions on how they are managed and harvested over a hundred-year period, also taking into account the age class distribution. Detailed assumptions for growth and harvest are the same as in the reference scenario for the long term forest state calculations made by the Swedish forest agency in 2008 (SKA-VB 08)[3]. The calculations encompass living trees on forest soil. Production forests as well as forests in national parks, nature reserves and habitat protection areas are included in the results. The structure of the standing stock at the start of the model simulation is based on the Swedish NFI which also form the base for the annual reporting to the convention.

In the scenarios used for the projection, annual felling is assumed to be at the level of what is regarded as sustainable in the long term i.e. a level that will maintain the standing stock in the production forests, also taken into account present nature conservation measures.

[2] http://www.naturvardsverket.se/upload/05_klimat_i_forandring/statistik/2008/SE_NIR_submission_2010_15_januari.pdf

[3] http://www.skogsstyrelsen.se/episerver4/templates/SFileListing.aspx?id=41399, (SKA-VB 08 Resultat - Referens.xls in Swedish)

The dead organic matter pool and the soil organic carbon pool is mainly based on measurements on permanent NFI sample plots. Since the number of plots with soil samples are much less than plots with biomass measurements the reported figures are affected with large uncertainties and trends in these pools should be interpreted with caution. Additional information can be found in the NIR (NIR 2010)[4]. The projection for dead organic matter is included in the model system tool (HUGIN) whereas soil organic carbon is based on the mean value between 1993 and 2005 and calculations of the future effect on the soil of an increased use of forest residues, using the Q-model. Other emissions, such as biomass burning, are based on the mean values for 2003-2007.

In summary, the following approach has been used:

- The proposed reference level includes only policies and measures already in place.
- Age structure is considered in the model used to calculate the projection for 2015 and 2020.
- The forecasts comprise all carbon pools (living biomass, dead organic matter and soil organic carbon) currently reported to the UNFCCC.
- Models used for forecasts can be used to simulate historical data based on the state of the forest in 1990 and observed harvest levels. The structure of the standing stock at the start of the model simulation is based on the Swedish NFI, which also form the base for the annual reporting to the convention.
- Forecast for 2008-2012 use most recent national data 1990-2008 (FM) and the projections for 2015 and 2020 are based on available forest statistics at the time of the simulation.
- The methods used are open for future review. Historical data as well as the projections are presented in the NIR and in the final report of a recent government commission[5].

[4] http://www.naturvardsverket.se/upload/05_klimat_i_forandring/statistik/2008/SE_NIR_submission_2010_15_januari.pdf

[5] http://www2.slu.se/foma/Prognoser/SLU_rapport_dec2009.pdf

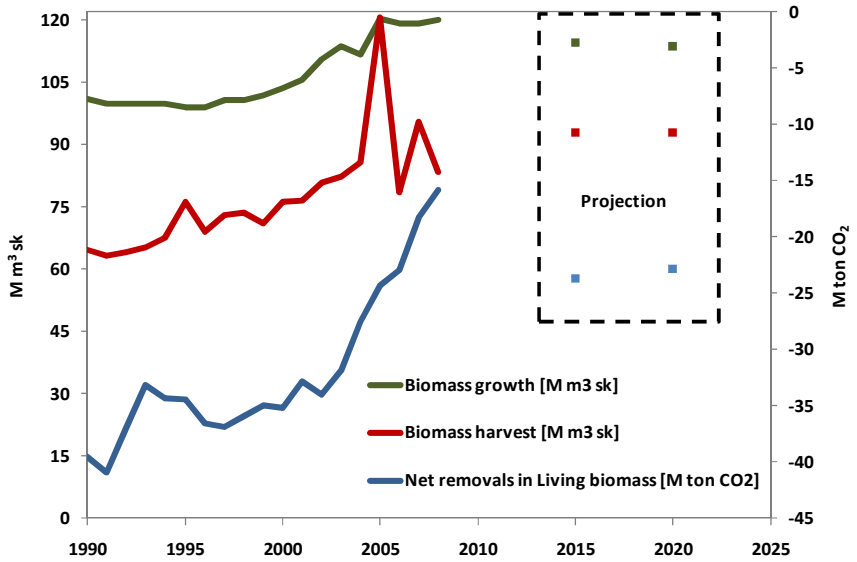


Figure 1. Historical and projected growth and harvest rates and net removals in the living biomass pool. The historical data includes the effects of natural disturbances while projected data excludes natural disturbances.

Pools and gases

See table in Chapter 3 of this submission.

Harvesting

See graph above.

Natural disturbances

Natural disturbances by fire and by storms are included in the reported values 1990-2008, but only forest fire is explicitly reported. The annual net effect of storms are not explicitly displayed in the reported figures since the Swedish system for reporting to UNFCCC includes, but also levels out the effect of storms of this magnitude.

Estimates by the Swedish forest agency indicate that well over 100 000 ha were damaged by the two storms in 2005 and 2007. In the storm in 2005, approximately 75 million m³ sk were wind thrown or damaged which corresponds to nearly an entire year's cutting for the whole of Sweden and represents ca 2.5 % of the total standing stock. The effect was an increased harvest by approximately 50 % of an annual harvest thus increasing emissions due to natural disturbances. About 12 million m³ sk was estimated to be damaged in the storm that swept southern Sweden in January 2007.

The projected reference level does not include any estimates of emissions due to natural disturbances. The effect of forest fires at the current level are negligible (less than 0,05 M ton CO2-eq).

Uncertainties

The major part of the net carbon emission/removals in the LULUCF sector in Sweden comes from the carbon pool changes on Forest land. Net changes in the pools depend on gains and losses of carbon and since these two variables as well as the pools are very large, even small relative changes in them will largely affect the annual values of net emission/removals. To deal with these large annual fluctuations and also to decrease the uncertainties, Sweden uses permanent sample plots of the NFI where subsample of 6000 plots is re-inventoried in a five-year cycle. The years between the inventories are interpolated and consequently the annual carbon stock and the annual changes calculated using the stock change method can be based on up to 30000 plots halving the uncertainties compared to a system based on only 6000 sample.

The uncertainty range for FM, in case of instant oxidation approach for harvested wood products, is -+/- 4 M ton CO2 per year. The overall uncertainty in the projection originates from the uncertainty in relation to historical data, as well as from uncertainty related to the simulation. Important uncertainties related to the simulation arise from the applied climate effect that in turn affects several factors that are of major importance for the development of the forest (increment, disturbances, increased forest area etc.).

Sensitivity analysis - 2020

The projected removals are based on the assumption that the available annual growth in the production forests is harvested. This harvesting level constitutes the result of investments made by forest owners available for harvest until 2020 given present forest management practices, while maintaining the standing stock.

However, since it is foreseen that the demand for bioenergy (also from other countries) will increase due to the introduction of climate change policies in the energy sector, the harvest rate may increase above this level during the coming decade. A sensitivity analysis assuming an increased harvest rate by 10 % to 2030, everything else unchanged, indicated an annual decrease in net removals by 17 M ton CO2 whereas a long term increase of the use of forest residues by an additional 10 TWh will have a minor effect (0,6 M ton CO2). This in turn would call for reinforced silvicultural investments to increase the yield, or restrictions limiting the fellings, to maintain the standing stock in the production forests.

United Kingdom

Method

See http://unfccc.int/files/kyoto_protocol/application/pdf/awgkplulucf_eu151209.pdf

Pools and gases

See table in Chapter 3 of this submission.

Harvesting

Both the inventory and the projections assume that harvesting occurs at the time of maximum annual increment, which occurs at 57-59 years for conifers and 92 years for broadleaves. Changes in the harvesting rate are therefore driven by historical planting rates.

Natural disturbances

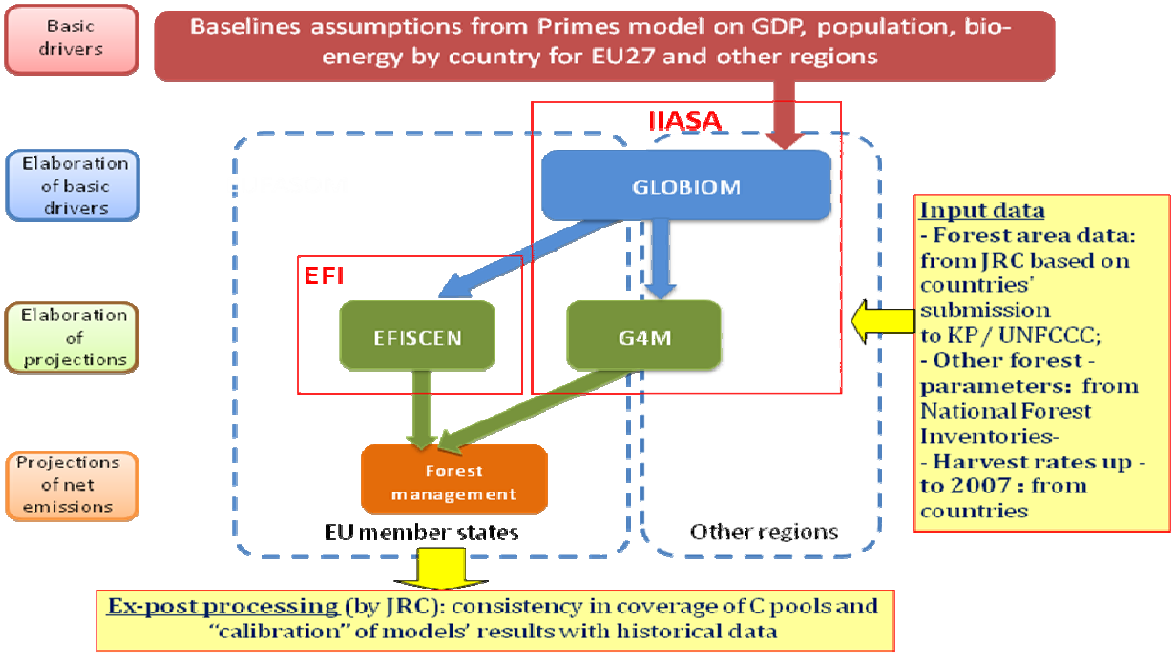
Emissions from natural disturbances are not separately quantified (see entry data table in Chapter 4 of this submission).

Additional methodological information related to projections elaborated by the JRC based on modelling work by IIASA and EFI.

Method

Projections provided by the Joint Research Centre of the European Commission (JRC) are based on elaboration of the results of independent EU modeling groups, coordinated by the International Institute for Applied Systems Analysis (IIASA), assisted by the JRC and funded by the European Commission Directorate General of Climate Action (DG CLIM). The 14 member states which used these projections to set their FM reference level (RL) cover about 50% of forest area, 75% of the sink and 42% of the harvest of EU in 2008.

The models used to project GHG from FM are G4M (from IIASA) and EFISCEN (from the European Forest Institute, EFI). The graph below provides an overview of the modeling architecture. While here it is presented only some essential feature or the modeling work, more details and references were provided in the EU submission in Barcelona (Nov 2009).



Harvest rates up to 2007 come from country statistics or submissions to UNFCCC (i.e. EU submission in Barcelona, Nov. 2009).

The evolution of the EU forest management sink is estimated considering the EU business as usual (BAU) harvest demand in 2020, derived from key drivers (GDP, population, EU bio-energy demand from the model Primes) modeled based only on policies and measures enacted by Member States up to July 2009 (the EU 2020 renewable target and the 20% GHG reduction targets are not included in this baseline)6.

Considering the 14 member states which used IIASA/EFI/JRC projections to set their reference levels (RL), the models used a BAU harvest rate for the period 2013-2020 which is about 12% higher on average than the 2000 value, or 6% higher than the 2005 value (see table below). This BAU increase in harvest rate foreseen up to 2020 is much smaller than increase observed in the past (at the EU level, harvest rate nearly doubled between 1990 and 2005, see EU submission in Barcelona for details).

Historical and projected harvest data used by models (roundwood overbark 1000 m3)

	2000	2005	2010	2015	2020	ratio (av. 2013-2020)/2000	ratio (av. 2013-2020)/2005	Source of historical data
Belgium	3.457	4.104	4.066	4.028	3.990	1,16	0,98	Country data
Bulgaria	4.798	6.427	6.194	5.961	5.727	1,23	0,92	FAO
Czech Republic	15.710	18.147	18.989	19.831	20.673	1,28	1,11	FAO
Estonia	9.664	7.455	8.602	9.749	10.895	1,04	1,35	FAO
France	63.637	57.498	59.425	61.352	63.279	0,97	1,08	EU subm Barcelona
Greece	2.183	1.855	2.229	2.602	2.976	1,24	1,46	FAO
Italy	14.271	14.489	15.972	17.454	18.937	1,25	1,24	Country data
Latvia	11.040	10.864	11.356	11.848	12.341	1,09	1,10	EU subm Barcelona
Lithuania	6.165	6.943	6.715	6.487	6.259	1,04	0,92	FAO
Netherlands	1.096	1.209	1.193	1.177	1.162	1,07	0,97	FAO
Poland	28.689	37.431	36.501	35.571	34.640	1,23	0,94	FAO
Romania	14.758	17.019	16.844	16.670	16.495	1,13	0,98	FAO
Slovakia	6.606	8.862	9.141	9.419	9.698	1,44	1,07	FAO
Spain	17.061	17.781	18.278	18.776	19.273	1,11	1,06	FAO
TOTAL	199.136	210.085	215.505	220.925	226.345	1,12	1,06	

Note: values in the table express 5-yrs average (e.g. 2000 is the average 1998-2002, 2005 is the average 2003-2007). Till 2007, data are from statistics or other country data. From 2008 to 2020 data were estimated by the models Primes and Globiom.

[6] For details see chapter 3 of http://ec.europa.eu/environment/climat/pdf/26-05-2010working_doc2.pdf

An **"ex-post processing"** of models results was carried out by the JRC in order to ensure consistency with regard to:

- **Coverage of carbon pools**: final projections include only the pools also reported by the country in KP/UNFCCC submissions (except for Italy – the country will ensure consistency between RL and the GHG reported in 2nd CP). In particular: Efiscen (through the YASSO model) estimates all the pools, but values of each pool were added only if also reported by the country; G4M estimates only biomass: in this case, the average GHG for the other pools reported by the country for the period 2000-2008 is added to model' results.
- **Countries' historical emissions:** the models' results indicated a total sink for the period 2000-2008 in the 14 Member States considered which is about 1/3 less than what reported in the GHG inventories. To make models' results comparable (in absolute levels) with historical data, the GHG estimated by the models for the entire time series (up to 2020) were "calibrated" for each country with historical data submitted by countries to UNFCCC, i.e. models' results were adjusted to match the average historical data provided by each country for the period 2000-2008. The calibration automatically incorporates the average rate of past disturbances (2000-2008) into the projections. It is important to note that, to maintain consistency in the future, technical adjustments to the RL (through the calibration procedure) would be needed for any future change in historical data for the period 2000-2008. These adjustments would be needed in the following cases: (i) if the threshold to be selected for the "force majeure" indicates that an event in the 2000-2008 period can be consider "force majeure", this event should be removed from historical emissions; (ii) any recalculations and/or different coverage of carbon pools carried out by member states.

Modeled projections presented in this submission are the best possible estimates to date using currently available information. All member states had the possibility to provide more updated data and/or comment the methodology used.

Pools and gases

See table in Chapter 3 of this submission.

Area under Forest Management

Areas under FM are from the JRC, taken from the latest countries' submissions to KP (if available) or estimated from UNFCCC reporting. In the latter case, in the absence of country-specific data, the area of "forest remaining forest" in 1990 was taken (assuming that "managed forest" under UNFCCC= "forest management" under KP) and from this it was deducted the area deforested since 1990 to obtain the FM area for 2008. The FM area projected to 2020 also included the foreseen deforestation in each country.

Age class structure, species composition, increments

Other forest inventory data (age structure, species composition, increment, etc.) come from latest available national forest inventories when provided, including any additional information provided by the country.

Harvesting

See table above.

Natural disturbances

Emissions from natural disturbances are not separately quantified (see entry data table in Chapter 4 of this submission).

Comparison with results shown in COP 15

As compared to the data included in the EU submission in COP 15, the decline in the sink projected by models for the 14 member states considered is now slightly less pronounced: while in COP 15 the RL was 17% lower than the average 1990-2007, now it is only 11% lower. This difference is mainly due to: (i) new historical time series in GHG inventories submitted by member states to UNFCCC, reflecting recalculations and/or different coverage of carbon pools; any change in historical time series affected the "calibration" procedure; (ii) new data on future wood demand: in the COP 15 submission, the total wood demand used by models for all 14 member states considered was 20% higher for the period 2013-2020 compared to 2000 (average 1998-2002), while now this increase is 12% on average; (iii) comments and/or new data provided by member states to models; (iv) slightly different "calibration" procedure: now, calibration of models' results with historical country data is always done for the period 2000-2008.

Sensitivity analysis

A sensitivity analysis was also performed by models for the period 2013-2020. Results indicate that, for the sum of the 14 member states considered, a +/- 20% of harvest compared to the BAU levels would lead to a decrease/increase of the projected BAU sink of about 20%. This corresponds to +/-1.4% of total KP base yr of the 14 countries considered.