

**Submission of information
on forest management reference levels
by Poland**

**Submission of information on forest management reference levels (FMRL)
by Poland as requested by Decision 2/CMP.6: The Cancún Agreements:
Land use, land–use change and forestry**

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1. Forest management reference level values

The figures provided in Table 1 represent the averages of the projected forest management (FM) data series for the period 2013–2020, taking account of policies implemented before mid–2009. The table represents two approaches, one considering emissions/removals from harvested wood product (HWP) using the first order decay functions (A), and another assuming instant oxidation (B).

Table 1. Values of proposed reference levels for forest management including calculated HWP based on the first order decay function (A) and with calculated HWP based on instant oxidation (B) [Gg CO₂ eq. per year]

		Reference levels	
		(A)	(B)
Poland		-27133	-22750

This submission replaces previous information informally submitted by Belgium and the European Commission on behalf of the European Union and its Member States to the UNFCCC dated 23rd July 2010. The projections are methodologically consistent with assumptions described in the current inventory report, minor changes are introduced due to input new data on projected harvesting rates which have been aligned with those used as inputs in the estimations applied in the Poland’s National Inventory Reports of 2010 as well as 2011.

2. General description

The approach was to calculate the FMRL as an average of projected net CO₂ annual balances of emissions and removals for the period 2013–2020, including the impacts of policies adopted and implemented by mid–2009, to address the notion of additional action during the next commitment period.

The elements contained in footnote 1 of paragraph 4 of the decision 2/CMP.6 on LULUCF are considered as follows:

(a) Removals or emissions by forest management as shown in greenhouse gas inventories and relevant historical data.

Approach described in the “Submission of information on forest management reference levels by Poland” was focused on analysis and selection of main drivers affecting GHG balances. Party used latest available country specific inventory data as described in Poland’s National Inventory Report 2011, the FMRL is also based on “Forecast of wood fiber availability in light of NATURA 2000 constrains” by Dr. J. Głaz of Forest Research Institute (2010).

(b) Age–class structure:

The age class structure is taken into account by using the latest available country specific inventory data (2010 National Forest Inventory; Forests in Figures 2008).

(c) Forest management activities already undertaken:

The FMRL is calculated inter alia on historical data as well as on first cycle of 2010 National Forest Inventory (NFI), thus comprising all management activities with meaningful impact on the projected period.

(d) Projected forest management activities under a business-as-usual scenario:

Projected FM activities considered in the construction of RL are based on the silvicultural guidelines and national forestry practices in the last two decades. No post 2009 domestic policies are included.

(e) Continuity with the treatment of forest management in the first commitment period:

Not applicable

(f) The need to exclude removals from accounting in accordance with decision 16/CMP.1, paragraph 1:

There is no need to exclude removals from the establishment of the reference level. Including all removals in the reference level is a conservative approach. There might be a need to exclude removals from accounting in case of future discounting or capping or factoring out.

3. Pools and gases

The table 2 presents the list of pools and gases included in the reference level.

Table 2. Carbon pools and GHG sources included in the reference level

Change in C pool 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 ⁽²⁾		
				mineral	organic	N ₂ O	N ₂ O	CO ₂	CO ₂	CH ₄	N ₂ O
yes	yes	IE*	yes	yes	no	no	no	no	yes	yes	yes

* this pool is calculated in conjunction with mineral soil pool

Above and below ground biomass, dead wood, litter, soil organic matter in mineral soil and harvested wood products (HWP) are included. Area of organic soils in forest land is subject to FM activities, but emissions from organic soils are not estimated in national GHG inventory and excluded from the FMRL as well. Non-CO₂ GHG emissions from biomass burning is included. Emissions from fertilisation, liming and drainage are excluded

4. Approaches and methods used in projections

The methodologies used for the Polish National GHG Inventory are applied for calculation of the projected emissions and removals in the period 2010–2020 are consistent with the obligatory IPCC guidelines (GPG LULUCF). The national input data was derived from the analysis of historical data, including emissions and removals, that was used in the National Inventory Report 2011 (CRF Submission 2011 v2.1) submitted to the UNFCCC on May 25, 2011. The GHG balance was estimated mainly based on 2010 National Forest Inventory (NFI 2010), statistical information generated by Central Statistical Office (CSO) and information derived from country-wise forest research and inventory projects.

The area of cultivated histosols in Poland was estimated as a case study by Oświecimska–Piasko (2008) for the purposes of 2011 National GHG Inventory. The area of histosols was assessed for mid–1970s and mid–1990s Based on information collected from Computer database on peat lands in Poland “TORF” as well as from the system of Spatial Information on Wetlands in Poland the area of histosols was assessed for mid–1970s and mid–1990s. Estimation of cultivated histosols area for entire time series was made using interpolation for the 1975–1995. Total organic soils area in 2009 was estimated for 242 740 ha, with the following split for subcategories: forest land under FM – 235,575 ha, land converted to forest land – 9345 ha. Additionally the area of cultivated histosols was assessed for 2015 for the purpose of GHG emission projections which amounts to 680 thousand ha [PL NC5 2010]. Similarly to the previous period interpolation of histosols areas was applied between

1995 and 2015. Described approach was used to exclude cultivated organic soils from GHGs estimation process concerning carbon changes in mineral soils on forest land being a subject of FM.

Consistent with the methodology described in the latest version of NIR 2011, carbon stock changes in litter as mentioned above were included as internal part of carbon stock changes in mineral soils. Nevertheless, currently Party is not able to present relevant information on carbon stock changes in litter pool, therefore corresponding litter pool was indicated as "IE" in the Table 2. Carbon stock changes of litter pool is included in the calculation of mineral soil pool in the same manner as in Poland's National GHG Inventory.

This approach was affected by few reasons. Firstly, estimation of carbon stock changes is a subject of setting methodology for estimation, secondly there is not applicable data or factors which can be used for estimation with the low level of uncertainties. Therefore values provided for carbon stock change in mineral soils contain carbon stock changes for both pools. Moreover the soil sampling scheme at national level is not providing any suitable information to divide both pools: soils to the IPCC categories and litter. Sampling strategies included in the submission are consistent with the general principles of the IPCC Good Practice Guidance, which required quality assurance and quality control data and information to be documented, archived and reported, quantification of uncertainties at the source or sink category level and for the inventory as a whole (IPCC 2003, p.1.6).

As explained in the preceding section, time series observations are needed to divide and detect changes in SOM (soil organic matter) and litter. Nevertheless ongoing research will provide applicable data which will allow to divide and estimate appropriate carbon stock changes in SOM and litter separately.

Carbon stock changes in dead wood pool are reported as constant and equal to zero in GHG's Inventory as a result of the estimation using IPCC Tier 2 method with country specific data for 2005–2009 based on NFI 2010. A linear extrapolation of this historical trend is applied for the period 2010–2020, thus a constant value equal to zero is applied for dead wood pool in the FMRL. As dead wood does not accumulate endlessly and technical adjustments applied contain large uncertainties in particular for dead wood and soil, the calculations will be validated as well as updated with more sophisticated methods when the data from new forest measurements (NFI-2 in 2011) becomes available. It may necessitate recalculation of data contained in annual submissions in the future

Reported historical emissions and removals were analyzed, first of all, for identification and selection of main drivers affecting changes in GHG balances. In process of FMRL estimation based on historical data, the inventory team identified main drivers, which are: harvesting rate and annual increment in growing stock. Annual harvesting rates for a period of 2010–2019 were derived by applying linear interpolation between an actual value for 2009 and a projected rate for 2020. For the years from 2010 to 2019 values were approximated using linear interpolation. Assumed harvesting rate in mentioned forecast (Głaz 2010) in 2020 is equal to 42.57 million m³.

Methodology used for estimation of projected carbon stock changes is consistent with the GHG inventory methodology as described in Chapter 7 in the Polish NIR 2011 for subcategory *Forest land remaining forest land* with regard to the analysis aiming at assessment of future drivers values [2011 National...].

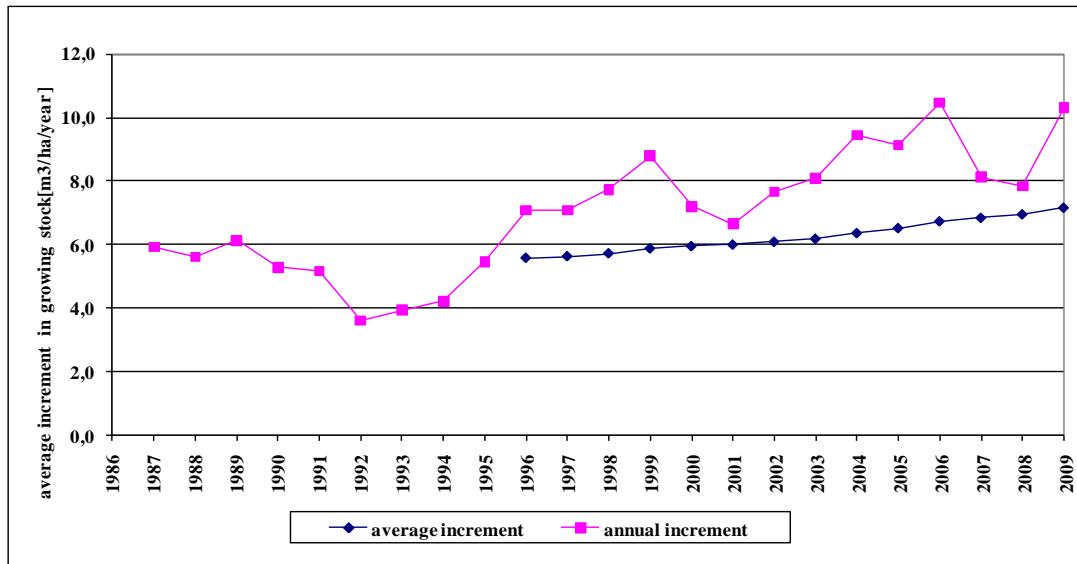


Figure 1. Comparison of annual increment in light of 20-year average increment volumes in 1988–2009 period.

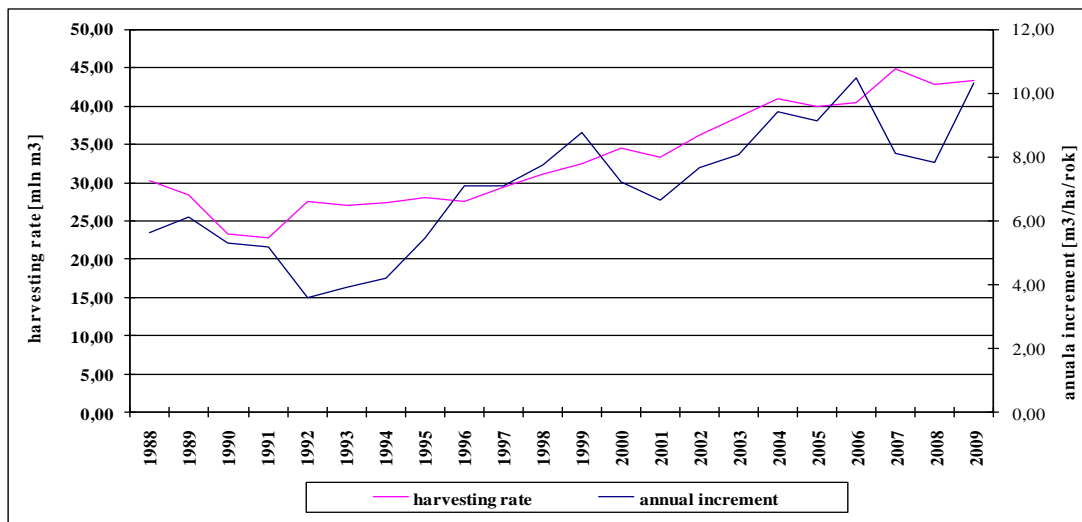


Figure 2. Comparison of annual increment with annual harvests in 1988–2009 period.

Averaging of the annual volume of increment let reduce the volatility of annual values, hence increasing consistency in reported data series and thus minimizing level of uncertainties of net CO₂ emission/removals balances. The recorded growth throughout the entire period is, to some extent, the consequence of the application of more precise inventory methods of estimation national forest resources.

The average annual increment in gross merchantable timber amounted for 7.16 m³/ha and was calculated for the last 20 years (1988–2008) from the difference in growing stock volume at the end and beginning of the inventoried period on an annual basis, including harvest rate on forest land. The observed changes in volume of standing timber resources in the past several decades are the result of existing policies of utilization level.

The impact of increasing harvesting rate on forest environment is complex, frequently synergic. Moreover, the reaction from the moment of occurrence of a logging factor can be delayed. This creates a big difficulty in interpreting the observed phenomena, particularly the direct cause relationships. Recent studies and observations demonstrate that periodically intensified occurrence of increasing harvesting rate is rather not visible in the trend of steady increase of annual increment.

5. Description of construction of reference level

5.1. Description of how each of the following elements were considered or treated in the construction of the forest management reference level, taking into account the principles in decision 16/CMP.1

5.1.1. Area under forest management with the time series since 1990

The area reported under forest management has been constantly decreasing since 1990 due to deforestation. Deforestation is strictly controlled by existing national regulations and pertains to relatively small areas.

Table 3. Historical area under forest management (according to the date of publication on 1 January) [thousand ha]

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
FM area	8884.00	8883.39	8883.03	8882.50	8881.93	8881.25	8880.85	8880.43	8879.85	8879.37
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
FM area	8878.97	8878.25	8877.73	8877.31	8876.62	8875.97	8875.50	8874.91	8874.31	8873.69

Table 4. Projected area of Forest Management in Poland [thousand ha]

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
FM area	8873.05	8872.50	8871.95	8871.41	8870.86	8870.31	8869.76	8869.21	8868.67	8868.12	8867.57

Area of forests under Forest Management has been constantly decreasing since 1990 due to deforestation. An average area of deforestation for the period 1990–2008 has been used for accounting the projected area of Forests Management. Described area of deforestation for that period is equal to 547.60 ha annually.

5.1.2. Emissions and removals from forest management

5.1.2.1. Historical emissions and removals from forest management as well as forest land remaining forest land.

Table 5. Historical emissions and removals from forest land remaining forest land. Net CO₂ emissions/removals [Gg CO₂ eq.]

Year	1988	1989	1990	1991	1992	1993
FL_FL	-28480.63	-31214.28	-36837.17	-37045.23	-29593.44	-28230.41
Year	1994	1995	1996	1997	1998	1999
FL_FL	-25894.93	-24740.75	-26184.83	-25156.13	-24805.62	-25975.51
Year	2000	2001	2002	2003	2004	2005
FL_FL	-25179.03	-27801.65	-28027.21	-28930.16	-30899.79	-35497.69
Year	2006	2007	2008	2009		
FL_FL	-38491.59	-34531.42	-42603.62	-44604.70		

Table 6. Historical emissions and removals from forest land subject to Forest Management
Net CO₂ emissions/removals [Gg CO₂ eq.]

Year	2008	2009
FM	-42794.87	-44778.73

Table 7. Historical emissions and removals from forest land subject to Afforestation/Reforestation
Net CO₂ emissions/removals [Gg CO₂ eq.]

Year	2008	2009
AR	-6734.47	-7198.38

Table 8. Historical emissions and removals from forest land subject to Deforestation
Net CO₂ emissions/removals [Gg CO₂ eq.]

Year	2008	2009
D	255.52	263.91

5.1.2.2. The relationship between forest management and forest land remaining forest land as shown in GHG inventories and relevant historical data, including information provided under Article 3.3., and, if applicable, Article 3.4 forest management of the Kyoto Protocol and under forest land remaining forest land under the Convention

Under the Kyoto Protocol, a Party shall report the area of forest land subject to Forest Management since 1990. Poland has reported FL_FL area changes for Convention purposes since the year 1988, which has been selected by Poland as the base year. Since 1988 until 1990 there was an increase in total forest land considered as the FM area. The 1990 value has been adopted as the starting point for reporting under the Kyoto Protocol. This value exceeds the 1988 FL_FL area by 18683 ha and this difference has remained constant. The term „human induced” is related to any forest land–use in Poland, thus no difference in methodology of emission and removals balance estimation between forest management and forest land remaining forest land is to be explained. The same AR and D data was used for the reporting under the Convention and the Kyoto Protocol. Emissions and removals balance reported under the Kyoto Protocol and the Convention follows the requirements of GPG for LULUCF (IPCC 2003).

5.1.2.3. Projected emissions and removals from forest management

Table 9. Emissions and removals from FM as estimated within country projections for 2010–2020 [Gg CO₂ eq.]

Carbon stock change ⁽¹⁾					
year	biomass pools				mineral soils pool
	aboveground		below ground		
	removals	emission	removals	emission	
2010	-55863.86	47273.25	-14966.08	9927.20	-16911.69
2011	-55860.41	48238.63	-14965.15	10129.92	-16906.34
2012	-55856.97	49204.01	-14964.23	10332.65	-16901.00
2013	-55853.52	50169.39	-14963.31	10535.37	-16895.65
2014	-55850.07	51134.77	-14962.38	10738.10	-16890.30
2015	-55846.62	52100.14	-14961.46	10940.82	-16884.95
2016	-55843.18	53065.52	-14960.54	11143.55	-16879.61
2017	-55839.73	54030.90	-14959.61	11346.27	-16874.26
2018	-55836.28	54996.28	-14958.69	11549.00	-16868.91
2019	-55832.83	55961.66	-14957.76	11751.73	-16863.56
2020	-55829.39	56927.03	-14956.84	11954.45	-16858.21

⁽¹⁾ as listed in table 2

Table 10. Annual emissions from wildfires as estimated within country projections for 2010–2020 [Gg CO₂ eq.]

Year	Wildfires		
	CO ₂	CH ₄	N ₂ O
2010–2020	94.97	33.00	6.48

5.1.3. Forest characteristics and related management

As of 1 January 2010 the estimated timber resources in the forests amounted to 2304 million m³ of gross merchantable timber. The observed changes in timber volume in the analysed age classes suggest that an increase in standing volume is not only the result of expanding of the area of forests. A slight increase of this indicator is observed for older age classes of stands including KO¹ and KDO² classes. The growth of timber resources is the result of timber harvest carried out in accordance with the forest sustainability principle and persistent enlargement of the national forest area in the forests. The recorded growth is, to some extent, the consequence of the application of more precise inventory methods. The objectives of silviculture are to ensure, at the same time, the sustainability and continuity of development of forest ecosystems. These goals are attained by applying natural methods of stand regeneration and shaping their species and age structures that are based on natural processes. The renewal, tending and protective treatments are being carried out at all stages of stand development. In the Polish forests much attention is being given to the ecological bases for the development of trees and forest stands. This is reflected in a precise analysis of soils and sites conditions being essential to preserve or restore the suitability of habitats for species composition and in the protection of near-natural ecosystems (i.e. in floodplain and alder forest, mid-forest water bodies and watercourses, mires, peatlands, heather moors, sites for rare plant species and refuges for animals). Of no lesser importance are conservation of biological diversity, enrichment of forest biocoenoses, and limiting of clear-cutting.

The use of forests as a renewable resource of raw material is driven not only by market demand that supports forest management economically, but also by silvicultural needs and the ecological principles that affect the structure and species composition of forest resources is regulated. Forest utilisation is pursued at a level determined by natural conditions of timber production, in accordance with the principle of forests sustainability and their areal expansion. As a result of that the total harvest of timber in 2009 was 34.629 million m³, which was by nearly 0.40 million m³ more than in 2008. In 2008, 5.9 million m³ of merchantable timber was harvested under the clear-cut system which corresponds to 19.2 per cent of total harvest. The cutting area in 2009 totalled 25,800 hectares and was the lowest since the 1980s. In the last decade, the clear-cutting was applied on over 27,500 hectares per year. The reduced size of clear-cut area is indicative of the progress in the ecologisation of forest management and their use is often the result of large-scale damage to forests induced by wind, drought, fungal infection or insect outbreak. Moreover, the anticipated volume of timber obtained in intermediate cutting in younger stands is approximate only and undergoes changes depending on the current silvicultural and sanitary needs.

Taking into account existing policies focused on increasing biodiversity values of forest species and sites, estimated projected harvesting rates were based on domestic needs of preservation and sustainability with relation to the Forest Management measures.

¹ KO refers to Restocking class as a type of vertical stand structure in which there is simultaneous utilization of the stand and regeneration under the canopy of the parent stand, and in which the level of regeneration allows to proceed with subsequent stages of tending (cf. class for restocking).

² KDO refers to class for restocking (KDO) as a type of vertical stand structure in which there is simultaneous utilization of the stand and regeneration under the canopy of the parent stand, and in which the level of regeneration does not yet meet the assumed requirements (cf. Restocking class).

5.1.3.1. Age class structure

Stands aged 41–80, representing age classes III and IV, prevail in the age structure of forests under State Forests administration, covering 24.7 per cent and 19.2 per cent of the area, respectively. As of 1999, stands under private and commune ownership aged 21–40 occupy 35 per cent of forest area and stands in age class III – 25 per cent. Stands older than 100 years, including stands in the restocking class (KO), stands in the class for restocking (KDO) and stands with selection structure (BP) under the management to the State Forests account for 14 per cent of the area. The share of non-forested land in private and commune-owned forests accounts for nearly 5 per cent, while in the State Forests, it is 1.3 per cent (Fig.4, Table 11). The proportion of stands older than 80 years continues to increase, from c. 0.9 million hectares in 1945, to c. 1.55 million hectares (excluding the KO and KDO classes) in 2008. The average age of stands within the State Forests did not change and was 60 years compared to 2007, and 40 years in private forests in 1999.

Table 11. Age class structure in light of the ownership forms

Ownership form	Forest land [ha]	[%]	Unforested forest land	I age class	III age class	VI and older age classes	Average age [years]
			[%]				
Total	9089092	100	3.7	11.8	27.1	10.3	56
National State Forest Holding	7068372	77.8	2.9	12.6	25	11.4	57
National Parks	183891	2	7.5	2.5	18.4	29	73
State Treasury Agricultural Assets Agency	37800	0.4	3.9	8.4	23.3	22.4	63
Other State Treasury	60510	0.7	3.6	10.6	20	23.9	63
Commune Owned	83523	0.9	3.1	5.9	20.7	15.2	66
Private owned	1654996	18.2	6.7	9.9	38	2.1	46

source: Preliminary data prepared on the basis of the second cycle of the large-scale forest inventory in the country conducted in 2006–2010 by the Bureau for Forest Management and Geodesy (2011).

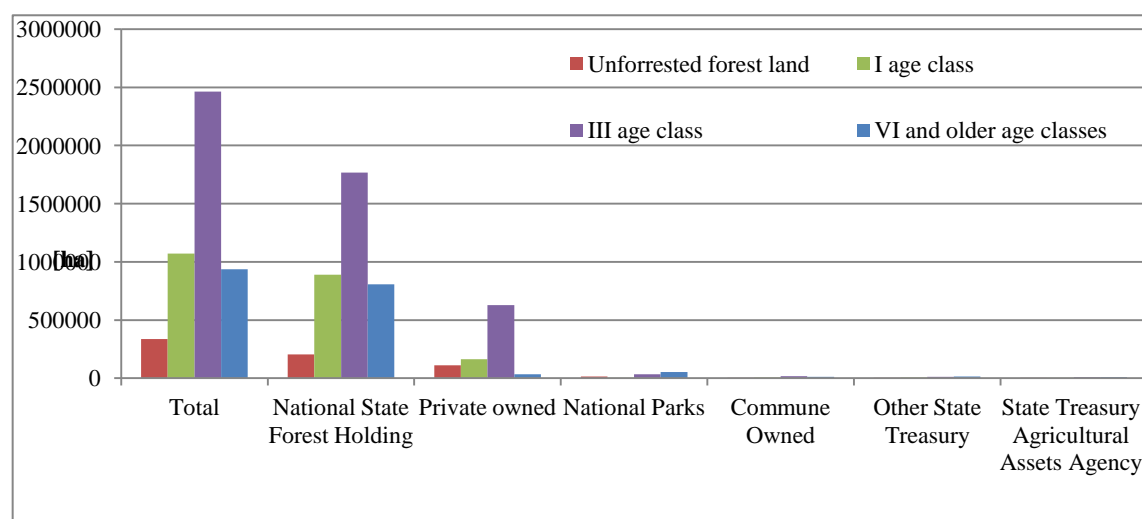


Figure 3. Age class structure in light of ownership forms (as of January 2011)

source: Preliminary data prepared on the basis of the second cycle of the large-scale forest inventory in the country conducted in 2006–2010 by the Bureau for Forest Management and Geodesy (2011).

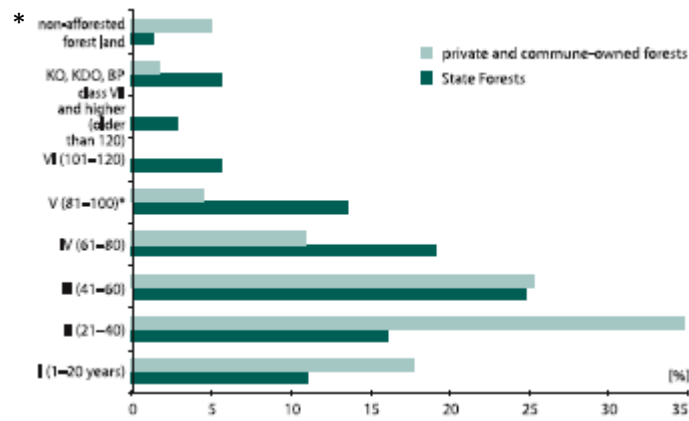


Figure 4. Area share of stands by age class in the State Forests (as of 1 January 2008), private and commune-owned forests (as of 1 January 1999) * refers to private and commune-owned forests
source: Forests in Poland 2008

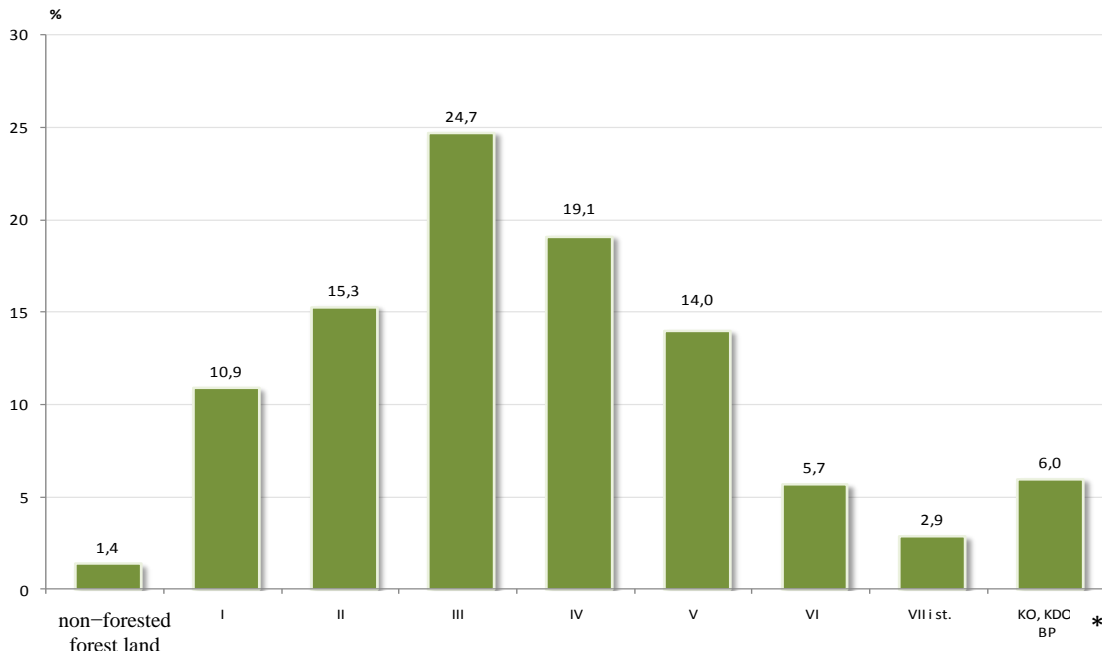


Figure 5. Area share of stands by age class in the State Forests (as of 1 January 2009)

* refers to Restocking class as a type of vertical stand structure in which there is simultaneous utilisation of the stand and regeneration under the canopy of the parent stand, and in which the level of regeneration allows to proceed with subsequent stages of tending (cf. class for restocking). KDO refers to class for restocking (KDO) as a type of vertical stand structure in which there is simultaneous utilisation of the stand and regeneration under the canopy of the parent stand, and in which the level of regeneration does not yet meet the assumed requirements (cf. Restocking class). BP Selection structure as a type of vertical structure of stands, representing groups and clumps of uneven-aged and sized trees.
source: BULiGL (2010)

Table 12. Forest area by species structure and age class of tree stands

Specification	Forest area	
	<i>in thousand ha</i>	<i>in %</i>
Spices structure of tree stands		
Total	9066	100.0
Coniferous trees	6421	70.8
<i>of which:</i>		
pine	5479	60.4
spruce	583	6.4
fir	264	2.9
Broadleaved trees	2645	29.2
<i>of which:</i>		
oak	625	6.9
beech	503	5.5
hornbeam	108	1.2
brich	667	7.4
alder	480	5.3
aspen	66	0.7
poplar	9	0.1
Age class of tree stands		
Total	9066	100.0
<i>I (1–20 years)</i>	1264	14.0
<i>I (21–40 years)</i>	1481	16.3
<i>I (41–60 years)</i>	2496	27.5
<i>I (61–80 years)</i>	1659	18.3
<i>V and higher (over 81 years)+KO</i>	1836	20.3
<i>Hold-over trees and irregularly</i>	330	3.6

source: Data prepared on the basis of the large-scale forest inventory in the country conducted in 2005–2009 by the Bureau for Forest Management and Geodesy (2010). Data are not fully comparable with data published in previous editions of Forestry Yearbook by Central Statistical Office

Table 13. Growing stock of standing wood by age class

Specification	Growing stock of standing wood	
	<i>in million m³</i>	<i>in %</i>
Spices structure of tree stands		
Total	2304	100.0
Coniferous tree	1696	73.6
<i>of witch:</i>		
pine	1434	62.2
spruce	157	6.8
fir	83	3.6
Broadleaved trees	608	26.4
<i>of witch:</i>		
oak	139	6.0
beech	156	6.8
brich	113	4.9
alder	116	5.0
Age class of tree stands		
Total	2304	100.0
<i>I (1–20 years)</i>	22	1.0
<i>I (21–40 years)</i>	246	10.7
<i>I (41–60 years)</i>	678	29.4
<i>I (61–80 years)</i>	547	23.7
<i>V and higher (over 81 years)+KO</i>	787	34.2
<i>Hold-over trees and irregularly</i>	24	1.0

source: Data prepared on the basis of the large-scale forest inventory in the country conducted in 2005–2009 by the Bureau for Forest Management and Geodesy (2010). Data are not fully comparable with data published in previous editions of Forestry Yearbook by Central Statistical Office

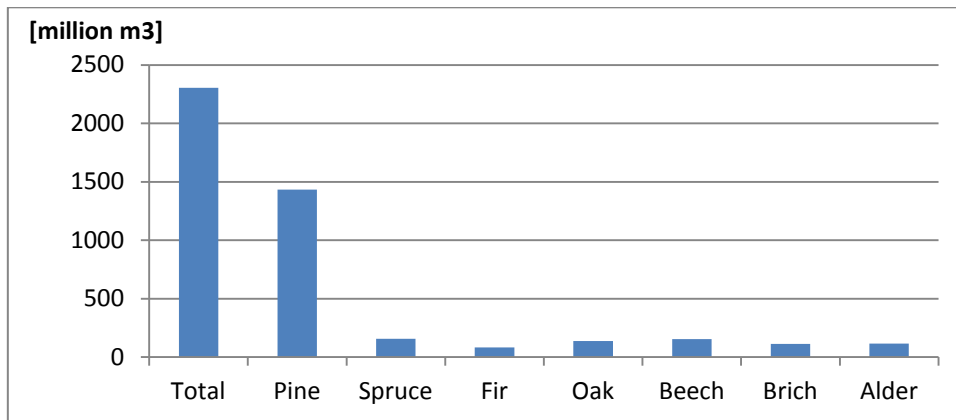


Figure 6. Growing stock of standing wood

source: Data prepared on the basis of the large-scale forest inventory in the country conducted in 2005–2009 by the Bureau for Forest Management and Geodesy 2010. Data are not fully comparable with data published in previous editions of Forestry Yearbook by Central Statistical Office

Forests in Poland mainly cover the poorest soils what is reflected in the structure of forest habitat types. Coniferous species prevail within the habitat structure, accounting for 70.8 per cent of the forest area. Broadleaved species cover 29.2 per cent of forest area. Pine (accounting for 60.4 per cent in forests) has found the optimal climatic and site conditions within its Euro-Asiatic natural range, thus being capable of developing a number of important ecotypes (e.g. the Taborska pine or the Augustowska pine). The wood processing industry's preference for softwood since the beginning of the 19th century has resulted in a high share of conifers in the species composition of forests. In the period 1945–2008, the species structure of Poland's forests underwent substantial changes. In the State Forests an increase in the share of stands with the prevalence of broadleaved species could be observed from 13.0 to 23.2 per cent. Due to lack of relevant historical data for all ownership form of forest land it was assumed that trend in species structure presented for forests administrated by the State Forest Holding in Figure 7 corresponds to forests of all ownership forms.

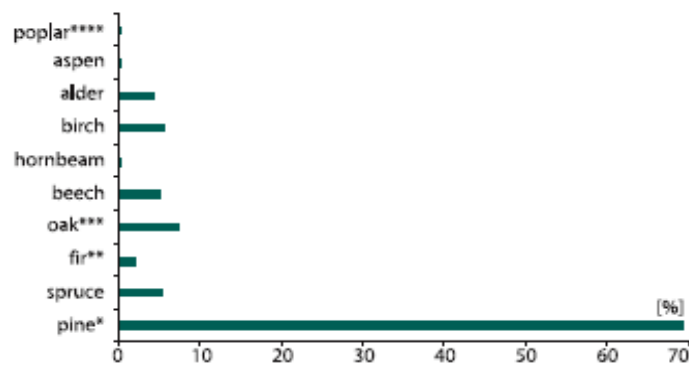


Figure 7. Area share of dominant tree species in State Forests (as of 1 January 2008)

Source: State Forests in Figures 2009

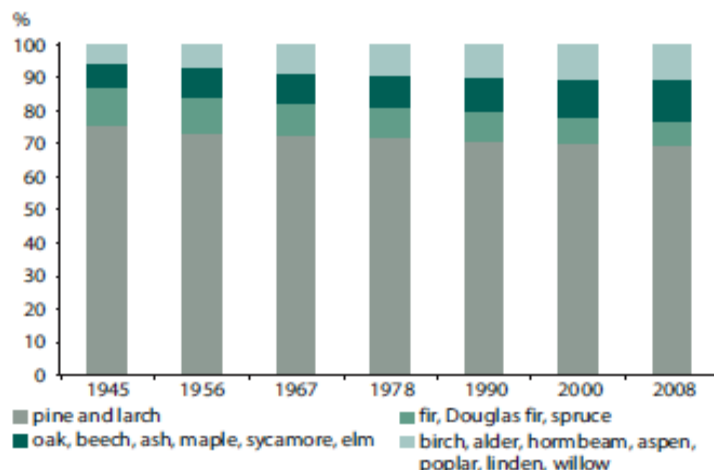


Figure 8. Area share of dominant tree species in stands administrated by State Forests Holding in the years 1945–2008

Source: State Forests in Figures 2009

5.1.3.2. Increments

From January 1988 to January 2008, increment of gross merchantable timber in the forests managed by the State Forests National Forest Holding was estimated to be equal to about 1017 million m³. During that period, 558 million m³ of merchantable timber was harvested which means that 459 million m³ of gross merchantable timber representing about 45 per cent net increase in merchantable timber volume compared to the base year. The average annual increment, in gross merchantable timber calculated for the last 20 years (1988–2008) from the difference in volume at the end (January 2008) and beginning of the period (January 1988) including harvest and per hectare of forest land, is 7.16 m³/ha. The observed changes in volume of standing timber resources in the past several decades (as shown in the diagram) is the result of a existing policies of utilization level. The volume of stands aged 41–60 years (age class III) and older has largely increased, while the contribution of young stands under 20 in the total merchantable timber volume is insignificant. The decrease in the volume of stands in age classes I and II is the result of changes in applicable area.

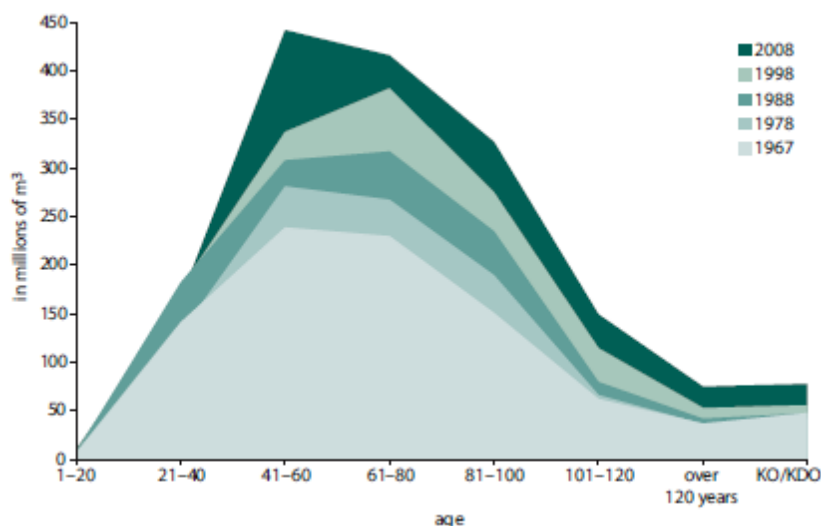


Figure 9. Changes in forests resources in the State Forests by age class

source: Forests in Poland 2008

5.1.3.3. Rotation length

The rotation length for a particular stand is determined in a relevant and approved forest management plan. Such factors as the ecosite and stand conditions, as well as the ultimate managerial objective provide the basis for the above determination. Hereafter, the rotation length ranges for the specific main species are specified.

Table 14. Rotation length ranges for the main tree species in Poland

Species	Rotation length range
Scots Pine	80–120
Norway Spruce	80–110
Fir	120–140
Oak	130–240
Beech	100–120
Alder	80–90
Birch	70–90
Aspen & Poplar	40–60
Ash	120–140
Maple	80–100
Hornbeam	80

Source: *Principles of Silviculture (2002)*

5.1.3.4. Information on forest management activities under “business as usual”

The aging forest age structure will likely have an impact on the average increment rate over the projected timeframe. Forest management planning principles generally supports practices that strengthen the biodiversity and resilience of the stands. This consequently amplifies the effect of ageing of the average age of the country forest ecosystems and impacts the GHG removal dynamics in addition to the current direction of the age structure trajectories. One more factor supporting the generally slowing rate of removal effect is the policy to remodel the stands from originally productive–function monocultures to a more diverse composition and vertically diverse structure.

5.1.4. Historical harvesting rates and assumed future harvesting rates

Historical harvesting rates are given in Table 15.

Table 15. Historical harvesting rates [thousand m³]

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
18676	18196	22037	21631	21922	22492	22058	23497	24917	26018
2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
27659	26671	28957	30836	32733	31945	32384	35935	34273	34629

Source: *Forestry (1990–2010)*

The assumed harvesting rates in 2020 are based on paper by Głaz (2010). Annual harvesting rates for a period of 2010–2019 were derived by applying linear interpolation between current values and projected rates for 2020 resulting from the above mentioned forecast (Table 16 and 17).

Table 16. Assumed harvesting rates [thousand m³]

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
35350	36070	36790	37520	38240	38960	39680	40400	41130	41850	42570

Table 17. Forecast of wood fiber availability in light of NATURA 2000 constrains

Ownership form	Assumed harvesting rate in 2020 [million m ³]
National State Forest Holding	37.33
National Parks	0.25
State Treasury Agricultural Assets Agency	0.18
Other State Treasury	0.28
Commune Owned	0.43
Private owned	4.10
Total	42.57

Source: Glaz (2010)

5.1.5. Harvested wood products

Value of net-emissions from HWP was adopted on the basis of information presented in the study by Rüter S. (2011). Taking into account the information contained in the study, in order to determine the future development of the HWP pool inflow consistent with the assumptions regarding the future harvest for each year of the projection period 2010 to 2020, the rates of change of the projected harvest as compared to the last five years average of the historic harvest, for which up-to-date data were available. In a second step, these annual change rates were applied to the same five year average of historic carbon inflow to the HWP pool in order to calculate the future inflow. As a result, the same average proportion of harvested wood has been used for the production of HWP. In the chosen historic five year period the same approach was used to calculate the future HWP product pool inflow from the projected amounts of harvested wood.

A five year average was chosen, because the proportions of harvested wood amounts to the HWP production can vary considerably from year to year. A similar approach had been proposed by Kangas and Baudin (2003). In case of substantially varying time series, they suggest to use a 'fixed constant' as the projection, that is an average over the last five years.

The contribution of HWP to the reference level of Poland amounts to **-4383 Mt CO₂**. This value was calculated using the C-HWP-Model, which estimates delayed emissions on the basis of the annual stock change of semi-finished wood products as outlined in the 2006 GL [Rüter, 2011]. The estimation uses the product categories, half lives and methodologies as suggested in para 27, page 31 of FCCC/KP/AWG/2010/CRP.4/Rev.4. The activity data for Poland (production and trade of sawnwood, wood based panels and paper and paperboard) is derived from the TIMBER database (UNECE 2011) (time series 1964–2009).

In order to achieve accurate results, the HWP numbers have been calculated applying the sub-categories of sawnwood, wood based panels and paper and paperboard as specified in Table 18. Sawnwood includes the Items 1632 and 1633, wood based panels comprising of Items 1634, 1640, 1646, 1647, 1648, 1649, 1650 and paper and paperboard corresponds to Item 1876.

The conversion factors of considered commodities are given in Table 18.

Table 18. Conversion factors of considered commodities*

Classification		Description of commodity	Air dry density [g/cm ³]	C conv. factor [Gg C/1000m ³]
FAO	UNECE			
1866	1.2.C	Industrial roundwood, coniferous	0.450	0.225
1867	1.2.NC	Industrial roundwood, non-coniferous	0.670	0.335
1632	5.C	Sawnwood, coniferous	0.450	0.225
1633	5.NC	Sawnwood, non-coniferous	0.670	0.335
1634	6.1	Veneer sheets	0.590	0.295
1640	6.2	Plywood	0.480	0.2402
1646	6.3	Particle board	0.630	0.2898
1647	6.4.1	Hardboard	0.850	0.4165
1648	6.4.2	Medium density fibreboard	0.725	0.319
1649	6.4.x	Fibreboard, compressed	0.788	0.3504
1650	6.4.3	Other board (Insulating board)	0.270	0.1148
1876	10	Paper and paperboard	0.900**	0.45**

* Items 1866 and 1867 are needed for methodological reasons only

** in [g/g] and [Gg C/1000 t]

Source: Rüter (2011)

In order to only estimate emissions from HWP removed from forests which are accounted for by Poland under Article 3, in a first step, the annual share of carbon in HWP coming from domestic forests has been calculated.

As suggested by document FCCC/KP/AWG/2010/CRP.4/Rev.4, the estimation calculates delayed emissions on the basis of the annual stock change of semi-finished wood products using the first order decay function as outlined in the 2006 IPCC Guidelines (IPCC 2006). The presented approach follows the initial assumption that all forests in Poland are managed, and in order to simplify matters, it is presumed that all harvest is allocated to forest management. This assumption is to be verified and corrected where necessary. The final allocation of carbon in HWP to forests which are accounted for under Article 3 shall be part of a technical correction as suggested in FCCC/KP/AWG/2010/CRP.4/Rev.4.

Table 19. Historic time series of amounts and share of accountable carbon inflow to the HWP pool [Gg C and %]

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
1856	2143	2181	2216	2308	2315	2394	2483	2573	2733	2819	3069
98.7%	99.3%	98.6%	98.4%	98.7%	98.8%	98.9%	99.0%	99.2%	99.6%	99.2%	99.2%
1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
3099	9123	3143	2941	2896	2649	2612	2725	2774	2777	2843	2774
99.2%	99.3%	98.9%	99.1%	98.8%	98.9%	99.1%	99.0%	99.2%	99.1%	99.2%	99.2%
1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2636	2383	2016	1847	2044	2162	2573	2278	2352	2669	2904	2950
98.9%	98.7%	99.6%	99.4%	99.5%	100%	99.8%	98.1%	98.0%	98.7%	98.5%	97.6%
2000	2001	2002	2003	2004	2005	2006	2007	2008	2009		
3160	2929	3163	3525	3840	3734	4027	4563	4351	4317		
97.3%	96.7%	97.5%	97.9%	97.2%	93.9%	94.6%	94.3%	94.9%	94.8%		

Source: Rüter (2011)

Table 20. Projected carbon inflow to the HWP pool

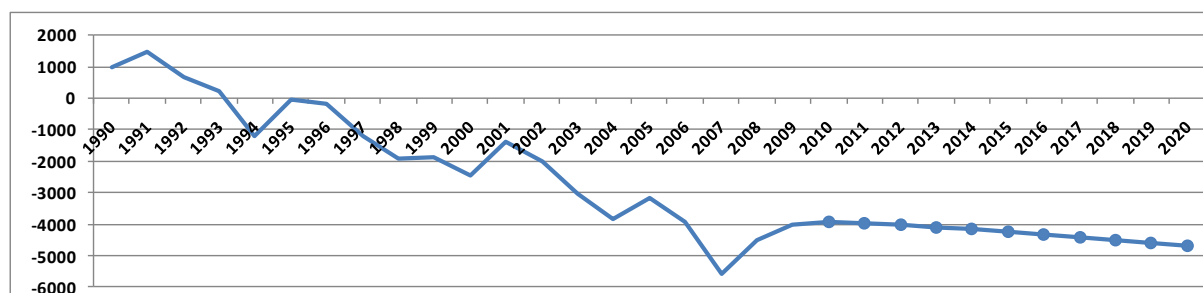
Average of historic harvest (2005-2009) [in 1000 m ³]	33 833										
Average HWP pool inflow* (2005-2009) [in 1000 t C]	4199										
Years	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Projected harvest rate [in 1000 m ³]	35350	36072	36794	37516	38238	38960	39682	40404	41126	41848	42570
Change as cp to historic harvest (2005-2009) [in %]	4.48	6.62	8.75	10.89	13.02	15.15	17.29	19.42	21.56	23.69	25.82
Projected carbon inflow to HWP pool [in 1000 t C]	4386.8	4476.4	4566.0	4655.6	4745.2	4834.8	4924.4	5014.0	5103.6	5193.2	5282.8

* a similar approach was chosen by Kangas and Baudin (2003)

The annual carbon inflow (= carbon in HWP produced from domestic harvest) to the HWP pool prior to the year 1964 has been calculated from the five year average from 1964 to 1968 and was assumed to be the constant carbon pool inflow for the time period 1900-1963.

Table 21. Historical (up to 2009) and projected net-emissions from HWP pool [in Gg CO₂]

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
998	1487	688	239	-1222	-34	-194	-1213	-1901	-1884	-2455
2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
-1398	-1999	-3021	-3851	-3156	-3945	-5588	-4493	-4033	-3948	-3975
2012	2013	2014	2015	2016	2017	2018	2019	2020		
-4024	-4089	-4165	-4247	-4334	-4423	-4513	-4603	-4693		

**Figure 10.** Historic and projected net-emissions from the HWP pool [in Gg CO₂]

5.1.6. Disturbances in the context of force majeure

The projection methodology incorporates the average rate of past disturbances into the projections. For transparency reasons, the emissions from GHG's sources presented in the tables in the current report refers to the average area of forest fires from 1990–2008. Nevertheless, only wild forest fires as a main source of emission resembling as natural disturbances have been internalized in the projections. Estimated emissions from wildfires are equal to 0.2% of summarized emissions on forest land being a subject of Forest Management.

Average value for wildfires as a part of natural disturbances was calculated based on a period 1990–2008 with the exclusion of the large scale forest fires influencing interannual trend. Such unusual wildfires covering large areas occurred in 1992 (43755 ha) and in 2003 (21 500 ha).

Table 22. Historical area of wild forest fires [ha]

year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
[ha]	7341	7341	2567	43755	8290	9171	5306	14120	6598	4019	8307	7013
year	2001	2002	2003	2004	2005	2006	2007	2008	2009			
[ha]	3429	5200	21500	3781	5826	5912	3564	3028	4400			

5.1.7. Factoring out in accordance with paragraph 1(h) (i) and 1(h) (ii) of decision 16/CMP.1

The indirect and natural GHG emissions and removals were not factored out.

5.2. Description of any other relevant elements considered or treated in the construction of the forest management reference level, including any additional information related to footnote 1 in paragraph 4 of decision 2/CMP.6

Full required information is given in Chapter 5.1.

6. Policies included

6.1. Pre–2010 domestic policies included

In Poland, for many decades, Hartig's principle of normal model forest have been incorporated into regular forestry practices. Consequently, most originally natural stands have been transformed into pine and spruce-dominated monocultures. Timber production focus led to decreasing biodiversity values across the country. These trends partially reversed two decades ago. Other goals have been equalized with the economic one, through inclusion of explicit provisions within such documents as the Forestry Act (1991) and the State Forest Policy (1997). Conservation and Protection of forest have been brought forward and raised in the rank of the daily managerial objectives in forestry sector. Furthermore, considerable total area of Natura 2000 protection sites in the country's forests moved the focus on active implementation of safeguards preserving species and sites.

The ultimate goal of the Polish forest policy, which has been formulated in the document the National Forest Policy, adopted by the Council of Ministers in April 1997, is to lay down measures targeted at sustainable multifunctionality of forests, their usefulness and protection, as well as their role in the shaping of the environment. This goal will be achieved through an increase in national forest cover to 30% in 2020 and to 33% in the min 21st century, reinstatement and rehabilitation of forest ecosystems and regeneration of the devastated and neglected tree stands in private forests. Implementation of these measures should lead to increased carbon emission and removals balance after the introduction of appropriate measures.

Measures of legal and organisational nature considered in establishing the Reference Level are described below:

- **Counteracting changes in land use** – transformation of forest land into non-forest purposes are of marginal significance in relation to the constantly growing of total forest land area.
- **Rational forest management, incentives and measures supporting Afforestation, preservation of environmental stability of forests** – forest land being a subject of Forest Management is conducted pursuant to the *Act of 28 September 1991 on forest* (Dz. U. of 2011 issue 34, item 170 as subsequently amended) and it includes both afforestation of non-forest land, reforestation, and enlargement of standing stocks with timber removal limitation to the level of 50–60% of the annual biomass growth (including biomass increase on land being a subject to afforestation/reforestation activities).
- **Forest Policy** – further implementation of measures formulated in the National Forest Policy as measures focused on increasing biodiversity values of forest species and sites has the impact on estimated projected harvesting rates as domestic needs for preservation of forest sustainability with relation to the Forest Management practices.

6.2. Confirmation of factoring out policies after 2009

There were no decisions undertaken after mid-2009 that would have a potential impact on hereby presented projected reference level for the country. In setting the reference level, the projections concerning future utilization levels were used from the expertise by Głaz (2010), which is based on pre-existing forest and economic policies.

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