

Harvested wood products - Spain

The contribution of HWP to the reference level of Spain amounts to **-2,283 Mt CO₂**.

It 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 (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 1. Sawnwood includes the Items 1632 and 1633, wood based panels comprising of Items 1634, 1640, 1646, 1647, 1648, 1649 and 1650, and paper and paperboard corresponds to Item 1876.

Following conversion factors have been used:

Table 1: Conversion factors of considered commodities*

Classification		Description of commodity	Air dry density	C conv. factor	Source
FAO	UNECE		[g/cm ³]	[Gg C/1000m ³]	
1866	1.2.C	Industrial roundwood, coniferous	0.450	2.250E-01	Kollmann (1982), (oak, beech)
1867	1.2.NC	Industrial roundwood, non-coniferous	0.670	3.350E-01	Kollmann (1982), (oak, beech)
1632	5.C	Sawnwood, coniferous	0.450	2.250E-01	Kollmann (1982), (oak, beech)
1633	5.NC	Sawnwood, non-coniferous	0.670	3.350E-01	Kollmann (1982), (oak, beech)
1634	6.1	Veneer sheets	0.590	2.950E-01	IPCC (2003)
1640	6.2	Plywood	0.480	2.402E-01	IPCC (2003)
1646	6.3	Particle board	0.630	2.898E-01	Hasch (2002), Barbu (2011)
1647	6.4.1	Hardboard	0.850	4.165E-01	Kollmann (1982), Barbu (2011)
1648	6.4.2	Medium density fibreboard	0.725	3.190E-01	Hasch (2002), Barbu (2011)
1649	6.4.x	Fibreboard, compressed	0.788	3.504E-01	(50 % hardboard / 50 % medium density fibreboard)
1650	6.4.3	Other board (Insulating board)	0.270	1.148E-01	Kollmann (1982), Barbu (2011)
1876	10	Paper and paperboard	0,900**	4,500E-01**	IPCC (2006)

* Items 1866 and 1867 are needed for methodological reasons only (see following section), ** in [g/g] and [Gg C/1000t]

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

Following equations were used as industrial roundwood is assumed to serve as raw material for the production of HWP.

$$(1) \text{Ratio}_{\text{INDRW consumption from dom harvest}} = \frac{(\text{Production}_{\text{INDRW}} - \text{Expott}_{\text{INDRW}})}{(\text{Production}_{\text{INDRW}} + \text{Impott}_{\text{INDRW}} - \text{Expott}_{\text{INDRW}})}$$

$$(2) \text{Production}_{\text{HWP from dom harvest}} = \text{Production}_{\text{HWP}} \cdot \text{Ratio}_{\text{INDRW consumption from domestic harvest}}$$

The ratio (Equation 1) was calculated both for coniferous and non-coniferous industrial roundwood (*INDRW*, Items 1866 and 1867). For coniferous sawnwood and paper and paperboard, the ratio for coniferous industrial roundwood was applied. For non-coniferous sawnwood the ratio for non-coniferous industrial roundwood was applied. For the other HWP, the ratio of the annual mass weighted average of coniferous and non-coniferous industrial roundwood was applied.

As a result, this share of HWP produced from domestically harvested timber is presented as a percentage in Table 2.

The presented approach follows the initial assumption that all forests in Spain 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 para 15 quater, page 27 of FCCC/KP/AWG/2010/CRP.4/Rev.4.

Table 2: Historic time series of amounts and share of accountable carbon Inflow to the HWP pool [in 1000t C and %]

1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
598	820	864	997	1083	1093	1232	1411	1630	1702	1762	1723	1911	1984	2037	2266	2134
95.5%	94.4%	93.0%	92.0%	91.8%	90.0%	91.9%	92.7%	92.6%	89.2%	88.3%	94.9%	93.5%	94.4%	92.3%	89.0%	90.5%

1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
2353	2460	2351	2415	2455	2651	2698	2661	2865	2981	3025	2802	2881	3056	3008	3064	3013
97.2%	97.2%	97.2%	96.6%	96.0%	96.0%	96.1%	94.6%	94.8%	93.1%	93.1%	92.5%	92.6%	92.9%	91.1%	93.1%	91.8%

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
2827	3365	3608	3844	3967	4033	4124	4059	4485	4164	4099	4114
82.9%	85.6%	80.6%	79.9%	83.1%	84.5%	84.4%	81.8%	80.6%	76.8%	86.1%	85.9%

The annual carbon Inflow (= carbon in produced HWP) to the HWP pool prior to the year 1964 (first year for which activity data from TIMBER database (UNECE 2011) is available for Spain) has been calculated from the 5 years average from 1964 to 1968 and was assumed to be the constant carbon pool Inflow for the time period 1900-1963.

In order to provide a projection for the development of the HWP pool consistent with the assumptions on the future harvest, the rates of change of the Projected harvest (EC JRC, 2011) as compared to the last 5 years average of historic harvest, for which up-to-date data is available, was calculated (cf Table 3).

These projected growth rates as cp. to the average of the years 2003-2007 for Spain were applied to the same 5 years average of historic carbon Inflow to the HWP pool in order to receive the future Inflow to the HWP pool.

Table 3: Projection of carbon Inflow to the HWP pool

Average of historic harvest (2003-2007) [in 1000m3]	17,755											
Average HWP pool Inflow* (2003-2007) [in 1000t C]	4173											
years	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Projected harvest rate [in 1000m3]	18246.3	18344.6	18442.8	18541.1	18639.4	18737.7	18836	18934	19032	19131	19229	
Change as cp to historic harvest (2003-2007) [in %]	2.77%	3.32%	3.87%	4.43%	4.98%	5.53%	6.09%	6.64%	7.20%	7.75%	8.30%	
Projected carbon Inflow to HWP pool [in 1000t C]	4288.48	4311.57	4334.67	4357.77	4380.87	4403.96	4427.06	4450.16	4473.26	4496.35	4519.45	

*a similar approach was chosen by Kangas and Baudin (2003): ECE/TIM/DP/30

For calculating the pool of HWP in use, three half-lives for application in the first order decay function have been used as suggested by para 7, page 31 of FCCC/KP/AWG/2010/CRP.4/Rev.4.

- Sawntwood: 35 years
- Wood based panels: 25 years
- Paper and paperboard: 2 years

The projected net-emissions are calculated from the annual stock change estimates following the calculation method provided in IPCC 2006, Vol.4, Ch. 12 (Equation 12.1).

Table 4: Historic (up to 2009) and projected net-emissions from HWP pool [in 1000t CO2]

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
-3061	-3033	-2076	-2328	-2922	-2614	-2638	-2310	-1642	-3483	-4044	-4563	-4600	-4414	-4383	-3840	-4939

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
-3333	-2778	-5059	-2896	-2709	-2570	-2467	-2389	-2329	-2281	-2242	-2210	-2183	-2159