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Harvested wood products (HWP) in the National Inventory Document 2024 (GHG inventory 1990-2022)

Description of time series, modelling methodology and results.

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History

Date	Major changes	By
up to NIR 2018	FOEN 2018h documentation established	Paolo Camin and Nele Rogiers
NIR 2019	FOEN 2019e:Corrections of Figures (units)	Dominik Eggli and Beat Rihm
NIR 2020	FOEN 2020e: Recalculations wood density, recycling paper	Dominik Eggli and Beat Rihm
NIR 2021	FOEN 2021e Updates. New sections about FMRL	Beat Rihm
NIR 2022	FOEN 2022e Updates	Beat Rihm, Dominik Eggli
NID 2023	FOEN 2023e Updates (post KP)	Beat Rihm
NID 2024	FOEN 2024e National production data 2021-2022	Beat Rihm, Fabio Fasel

1. Executive summary

CO_2 emissions and removals from Harvested wood products (HWP) must be reported under the UNFCCC. This report explains the data sets and methods applied by Switzerland to calculate yearly carbon stock changes in HWP and shows detailed results used in the Swiss Greenhouse Gas Inventory (FOEN 2024).

Carbon stock changes in the HWP pool were calculated by applying the so-called production approach for three semi-finished wood product categories: i) sawnwood, ii) wood-based panels and iii) paper and paperboard. Activity data were collected from international database (FAOSTAT) as well as from surveying the Swiss wood industry (Tier 2 and 3 methodologies).

For calculating carbon stock changes in HWP, Switzerland applied the default first order decay model using the corresponding default half-lives (35 years for sawnwood, 25 years for wood panels and 2 years for paper and paperboard; Tier 2 methodology). HWP originating from imported wood were excluded from the accounting and HWP originating from deforestation activities were accounted for on the basis of instantaneous oxidation.

The total inflow of carbon to the HWP pool in 2022 amounted to 408 kt C (60 % from sawnwood, 35 % from wood panels, 5 % paper and paperboard). The outflow from the pool was reported to amount to 399 kt C in 2022 (57 % from sawnwood, 34 % from wood panels, 9 % paper and paperboard). Thus, there was a net carbon gain in HWP of around 10 kt C or -36 kt CO_2 in 2022.

2. Introduction

Forests have a significant impact on the global carbon cycle and therefore on the climate. They absorb atmospheric carbon (CO_2) through photosynthesis, forest growth and forest expansion and store it on the long term (sequestration). When wood is used in furniture or construction, for example, the sequestered carbon remains stored in the wood product.

Wood materials may store carbon over a long-time frame. Depending on the balance between carbon inflow and outflow and the corresponding carbon stock change, the HWP pool may indeed act as a sink or as a source of CO_2. For this reason, the role of HWP in mitigating greenhouse gas (GHG) emissions is considered in sector 4 of the GHG inventory (FOEN 2024).

The following accounting rules described in IPCC (2014) were implemented for the calculation of HWP in the Swiss GHG inventory:

- Imported HWP and exported round wood shall not be accounted for.
- Default half-lives for the HWP categories: sawnwood, wood panels and paper were defined. Exported HWPs should be accounted for using default half-lives.
- HWP originating from deforestation shall be accounted for on the basis of instantaneous oxidation.
- Rejected HWP in solid waste disposals and HWP used for energy production shall be accounted for on the basis of instantaneous oxidation.

In climate reporting, the effects of substitution are recorded as CO_2 reductions within the industry and energy sectors and are, therefore, not recognized as a contribution of the forestry and wood products industries. To fully assess the forestry and wood products industries' impact to climate, an integrated study of the forestry and wood products industries which accounts for all storage and substitution effects would be needed.

3. Definition of HWP pool

HWP are defined as wood materials that, following harvest, are transformed into commodities such as sawnwood, wood panels (e.g. plywood), paper and paperboard. After a period (lifetime of the product), which can vary considerably depending on the product itself, the wood product might be recycled (especially in the case of paper) or used as fuel. In Switzerland, the disposal in landfills is banned since the year 2000.

For the climate reporting, Switzerland does account the amount of recovered wood pulp for paper production. Products disposed of in landfills were not included in the HWP pool.

In order to estimate the changes in the HWP pool the inflow and outflow from the pool must be quantified. The inflow can be estimated directly from data on the production of HWP.

However, a direct quantification of the outflow from the pool can only be based on successive inventories of products in use – this is quite resource-demanding and requires extensive data. In Switzerland, no such inventories were made. An alternative way for the quantification of the outflow is the calculation with a model using a "First Order Decay", as described in IPCC (2014). This model estimates the outflow from the pool based on the size of the pool and the product life expectancies (half-lives). It is assumed that the outflow is instantly oxidised.

Only semi-finished wood products (SFWP), i.e. sawnwood, wood panels and paper and paperboard, can be accounted for (see Figure 2.8.2 in IPCC 2014). Finished products (e.g. furniture, floors, beams, books etc.) do not enter the estimations.

4. Reporting HWP

Presently, three sets of guidelines for estimating the carbon stock in the HWP pool exist:

- The 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 IPCC Guidelines; IPCC 2006)
- The 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (2013 KP Supplement; IPCC 2014)
- The 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2019)

Switzerland decided to continue the HWP reporting according to the production approach that had been used under the Kyoto Protocol, including minor modifications. For the estimation of carbon stocks and carbon stock changes, the equations described in IPCC (2014: chp. 2.8) were applied. Some information related to uncertainties has been taken from IPCC 2006.

4.1. Choice of the approach

The 2013 KP Supplement (IPCC 2014) provides three tiers to calculate the carbon stock changes in the HWP pool from domestic harvest (i.e., the trees harvested in the reporting countries):

- Instantaneous oxidation (Tier 1): This approach does not quantify the changes in HWP stock under the assumption that harvested wood is instantaneously oxidized.
- Default method (Tier 2): This method applies a first order decay function based on default half-lives differentiated between the main semi-finished wood products (i.e. sawnwood, wood panels, paper and paperboard) as defined by the international classification system of forestry products.
- Country-specific methods (Tier 3): If more detailed data and methodologies are available, a country-specific method can be used.

Switzerland applied a combination of a Tier 2 and Tier 3 approach for the product categories sawnwood and wood panels. The IPCC default method for estimating the HWP carbon stock was used in combination with country-specific activity data as well as data from FAOSTAT.

For the product category paper and paperboard, Switzerland applied the Tier 2 approach.

It is assumed that wood disposed of in solid waste disposal sites until 1999 (banned since 2000) was instantly oxidised. I.e. the wood in solid waste disposal sites is not a part of the HWP pool.

The 2013 KP Supplement Tier 2 method is basically a production approach: Estimates of net emissions are derived from a stock change calculation applied to products derived from domestic harvest, excluding imported HWP. To implement this method, it is necessary to estimate:

1) the annual fraction of the industrial roundwood (sawn wood and wood panels) and wood pulp commodities (paper and paperboard) from domestic harvest;
2) the share of HWP originating from forest land (by excluding HWP originating from deforestation);
3) the share of recovered fibre pulp.

In accordance with the IPCC guidelines, the carbon stock of fuelwood is immediately released into the atmosphere.

4.2. Method for calculating carbon stocks in HWP

Changes in carbon stocks in year i were estimated on the basis of information on the inflow of wood products into the stock and of assumed lifetimes and decay factors of these products. In accordance with the 2013 KP Supplement a first order decay (i.e. exponential decay) function (equation 2.8.5 in IPCC 2014) was used to estimate the carbon stock and the annual changes for each of the SFWP categories.

$$C_{i+1} = e^{-k} \cdot C_i + \left[\frac{(1 - e^{-k})}{k}\right] \cdot Inflow_i$$

$$\Delta C_i = C_{i+1} - C_i$$

Where:

C_i is the carbon stock for the given HWP category at the beginning of year i (variables are written with index i, as the equation is used in the discrete form); in Gg C

k is the decay constant of first-order decay depending on the HWP category ($k = \ln(2)/HL$ where HL is the half-life of the HWP pool in years.)

$Inflow_i$ is the inflow to the given HWP category during year i; in Gg C yr^{-1}

ΔC_i is the carbon stock change during year i; in Gg C yr^{-1}

The starting year used to estimate the delayed emissions from the existing pools (inherit emissions) was 1900. In accordance with the 2013 KP Supplement and IPCC 2014, the calculations started in 1900 with a carbon stock $C_{(1900)}$ equal to 0.

The choice of expected lifetimes and thus of the half-lives for the HWP influences the size of the stock and thus the stock changes. However, the influence on the stock changes may be relatively small (depending on the pool characteristics), as the applied lifetimes influence both the size of the stock and the size of the outflow. Since these two are opposing effects, they partially cancel each other out.

4.3. Allocation of HWP to activities

The calculation and accounting of HWP depends on its activity of origin.

- HWP originating from deforestation (loss of forest land) are accounted for on the basis of instantaneous oxidation.
- HWP originating from forest land shall be included in the HWP pool.

In Switzerland, HWP originating from deforestation was excluded from the pool by determining the fraction of the feedstock (roundwood for production of HWP) originating from deforestation following equation 2.8.3 in IPCC (2014):

$$f_j(i) = \frac{harvest_j(i)}{harvest_{total}(i)}$$

Where:

$f_j(i)$ is the share of the harvest originating from activity j in year i

$harvest_j(i)$ is the harvest originating from activity j in year i

$harvest_{total}(i)$ is the total harvest from all activities in year i

However, there are no specific harvesting data for deforestation areas. Therefore, $f_j(i)$ was calculated as ratio of "losses of living biomass from deforestation" to "losses of living biomass from forest land" as presented in the CRT Tables 1990–2022 of the GHG inventory (FOEN 2024). Losses of living biomass correspond to cut and mortality. The resulting shares are between 0.023 and 0.042. The split between HWP from deforestations and from Forest land was calculated considering only the biomass

loss on deforested areas in categories 4B2.1, 4C2.1 and 4E2.1 because it is very unlikely that wood from Forest land converted to wetlands (4D2.1) or Forest land converted to other land (4F2.1) can be used for HWP.

4.4. Estimation of annual fraction of HWP from domestic harvest

Following the production approach, only HWP produced domestically may be included in the HWP pool of the reporting country, i.e. the HWP must originate from trees harvested and processed in the reporting country. This means that the domestic production must be split in one part produced from domestically harvested wood, and another part produced from imported roundwood.

4.4.1. Categories sawnwood and wood panels

In order to estimate the annual fraction of HWP originating from domestic harvest equation 2.8.1 in IPCC (2014) was used for the categories sawnwood and wood panels:

$$f_{IRW}(i) = \frac{IRW_p(i) - IRW_{EX}(i)}{IRW_p(i) + IRW_{IM}(i) - IRW_{EX}(i)}$$

Where:

$f_{IRW}(i)$	is the share of domestically harvested and consumed industrial roundwood (feedstock) to the total domestic consumption of industrial roundwood in year i
$IRW_p(i)$	is the production of roundwood in year i; in Gg C yr^{-1}
$IRW_{IM}(i)$	is the import of roundwood in year i; in Gg C yr^{-1}
$IRW_{EX}(i)$	is the export of roundwood in year i; in Gg C yr^{-1}

$f_{IRW}(i)$ was estimated separately for sawnwood coniferous and non-coniferous. For wood panels an average share of domestic feedstock based on the determined roundwood consumption was used. The share was calculated for the period after 1961; for previous years (1900-1960) an average of the first 10 years (1961-1970) was applied.

Using equation 2.8.4 in IPCC (2014), the produced amount of HWP of each category ($HWP_p(i)$) was multiplied with this ratio in order to obtain the part of HWP produced from domestic harvest ($HWP_j(i)$).

$$HWP_j(i) = HWP_p(i)\ x\ f_{DP}(i)\ x\ f_j(i)$$

Where:

$HWP_j(i)$	is the HWP amount produced from domestic harvest associated with activity j in year i; in kt C yr^{-1}
$f_{DP}(i)$	is the share of domestic feedstock for the production of the particular HWP category originating from domestic forests in year i. For sawnwood and panels, $f_{DP}(i)$ is equal to $f_{IRW}(i)$
$HWP_p(i)$	is the production of the particular HWP commodities (i.e. sawnwood, wood panels, and paper and paperboard) in year i; in kt C yr^{-1}

4.4.2. Category paper and paperboard

In order to estimate the annual fraction of paper and paperboard originating from domestic harvest equation 2.8.2 in IPCC (2014) was used:

$$f_{PULP}(i) = \frac{PULP_p(i) - PULP_{EX}(i)}{PULP_p(i) + PULP_{IM}(i) - PULP_{EX}(i)}$$

Where:

$f_{PULP}(i)$ is the share of domestically produced pulp for the domestic production of paper and paperboard in year i

$PULP_p(i)$ is the production of wood pulp in year i; in Gg C yr^{-1}

$PULP_{IM}(i)$ is the import of wood pulp in year i; in Gg C yr^{-1}

$PULP_{EX}(i)$ is the export of wood pulp in year i; in Gg C yr^{-1}

The share of wood pulp produced from recovered paper is not explicitly mentioned in equation 2.8.4 in IPCC (2014). Therefore, equation 2.8.4 was extended for paper and paperboard as follows:

$$HWP_j(i) = HWP_p(i)\ x\ f_{DP}(i)\ x\ f_j(i)\ x\ (1 - f_{RECPULP}(i))$$

Where:

$f_{DP}(i)$ is equal to $f_{IRW}(i)\ x\ f_{PULP}(i)$ for paper and paperboards

$f_{RECPULP}(i)$ is the share of recovered fibre pulp used for the production of paper and paperboard.

The share of recovered fibre pulp is calculated based on FAO-data on production, import and export of wood pulp and recovered fibre pulp. It was defined as the ratio of net consumption of recovered pulp to net consumption of total pulp:

$$f_{RECPULP}(i) = \frac{RECPULP_p(i) + RECPULP_{IM}(i) - RECPULP_{EX}(i)}{PULP_p(i) + PULP_{IM}(i) - PULP_{EX}(i)}$$

Where:

$RECPULP_p(i)$ is the production of recovered fibre pulp in year i; in Gg C yr^{-1}

$RECPULP_{IM}(i)$ is the import of recovered fibre pulp in year i; in Gg C yr^{-1}

$RECPULP_{EX}(i)$ is the export of recovered fibre pulp in year i; in Gg C yr^{-1}

5. Data

5.1. Model parameters

5.1.1. Emissions factors – half-life

In accordance with the Tier 2 approach default values on half-lives are used (Table 2.8.2 in IPCC 2014):

- Sawnwood 35 years
- Wood panels 25 years
- Paper and Paperboard 2 years

5.1.2. Carbon conversion factors

For converting product volume of panels or weight of paper/paperboard into carbon, the following default conversion factors (Table 2.8.1 in IPCC 2014) are used:

- Fibreboard compressed 0.315 t C/m^3
- Hardboard 0.335 t C/m^3
- Insulating Board 0.075 t C/m^3
- Medium density fibreboard MDF 0.295 t C/m^3
- Particle Board 0.269 t C/m^3
- Plywood 0.267 t C/m^3

- Veneer Sheets 0.253 t C/m^3
- Paper and paperboard 0.386 t C/t

For sawnwood, country-specific values measured by the wood industry and checked with the values in the National Forest Inventory (NFI) are used (Werner 2019a):

- Sawnwood coniferous 0.205 t C/m^3
- Sawnwood non-coniferous 0.295 t C/m^3

5.2. Activity data

5.2.1. Overview

Historical data on production, import and export of roundwood and semi-finished wood products (SFWP) were available from two sources:

- FAO forest product statistics (FAOSTAT) for the period 1961-2020, that cover data on production, import and export of roundwood, sawnwood, wood panels and paper/paperboard as well as recovered fiber pulp; recovered fiber pulp is not recorded any more after 2018.
- FAO Foreign trade statistics (share of industrial roundwood and wood products) for the years 2021-2022.
- National statistics 2021-2022: sawmill statistics (production of sawnwood including the share of imported roundwood), surveys of the wood processing industries (production of wood panels including the share of imported wood biomass).

Data from the CRT Tables 1990–2022 of the GHG inventory (LULUCF) were used to determine and to exclude the share of harvested wood originating from deforestation (see chapter 4.3).

To estimate the HWP contribution for the period 1900 to 1960, historical production data and data from national statistics were used. For recovered fiber pulp, there are no reliable data in FAOSTAT until 2000; for this period, the 10-year average 2001-2010 was used instead.

5.2.2. FAOSTAT

FAOSTAT is the statistical office of the FAO. Its database includes statistical data on production, import and export of roundwood and SFWP as reported by member states. Swiss data in the FAOSTAT database is based on primary statistical data as well as national historical research data. The Swiss Federal Statistical Office (FSO) manages the database (FAOSTAT 2023).

5.2.3. National statistics

The Federal Statistical Office produces primary statistics both in monetary value and physical units. Relevant for HWP estimates were the statistics on the sawnwood production, and statistics on international trade of roundwood and SFWP. The statistics on the production of wood panels are collected and managed by the Federal Office for the Environment and fed into FAOSTAT.

5.2.3.1. Wood processing statistics – production of sawnwood

The wood processing survey covers all production data of sawmills over the marketing year (FSO 2023a). Annual sawnwood production is reported in m^3. Also, the utilization of the residual wood as energy wood (in own enterprise or by third parties), as paper, pulp and panels is calculated on the basis of these statistics and fed into FAOSTAT. A full survey of sawmill production data was carried out every 5 years with random samples in the years between. The data quality is considered as good, and data are available since 1951. Since 2018 partial surveys are made annually covering over 95 % of total production.

5.2.3.2. The production of wood panels

In Switzerland, there are only a few enterprises producing wood panels. A complete survey of the production and shares of domestic wood is made annually by the Federal Office for the Environment. The results of the surveys 2021 and 2022 were used for calculating the inflow to HWP (FOEN 2023d). The surveys include also small amounts of wood wool (packaging material) which were reported under the category paper and paperboard with a mean half-live of 2 years.

Most panel types are produced by only one enterprise. Thus, the data are confidential. Since 2010, export figures are no longer published for data protection reasons and must be estimated.

6. Results

6.1. Carbon stock, inflow and outflow

6.1.1. Production and share of roundwood from domestic harvest

Figure 1 shows the production and share of roundwood for Switzerland, 1990-2022. In 1990 (storm Vivian) and in 2000 (storm Lothar), storms ravaged Swiss forest. In 2000, the winter storm Lothar doubled total harvesting amount due to salvage logging. Since 2007, wood harvest is generally decreasing. The quantities of exported roundwood were closely correlated with those of production, as on average 30 % of roundwood produced was exported. The import of roundwood in Switzerland played a marginal role, contributing approximately 8 % of total roundwood production.

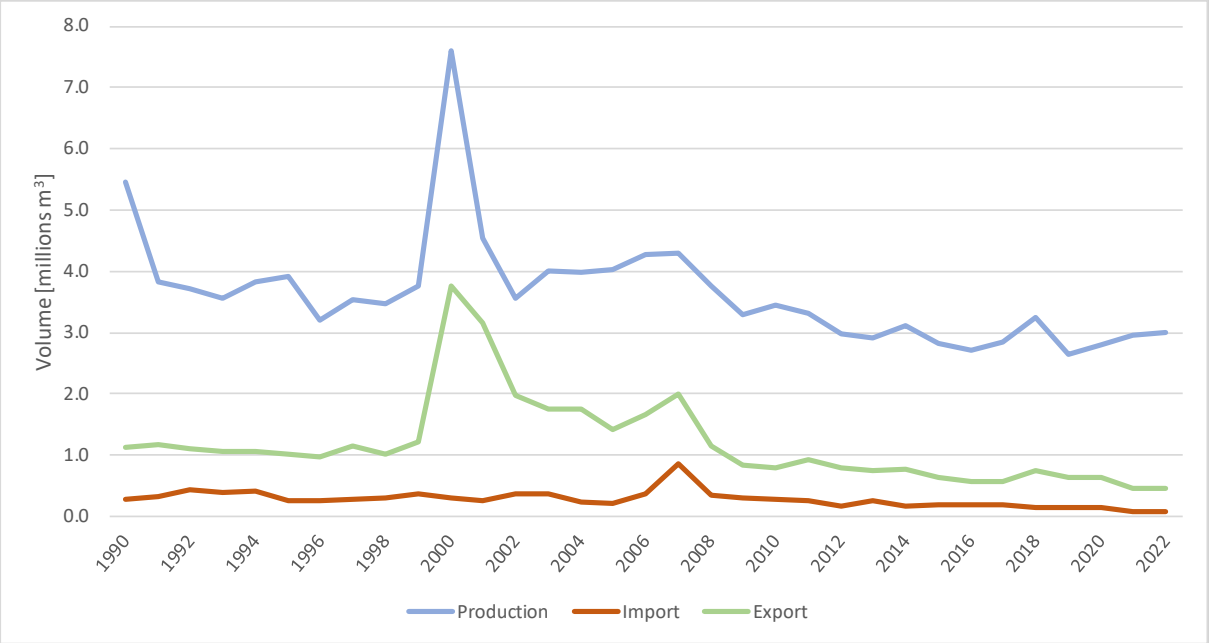

Figure 1: Production, export and import of roundwood; 1990-2022.

The development of the fraction of the roundwood feedstock originating from domestic harvest for producing HWP from 1990 to 2022 is given in Figure 2. For coniferous roundwood the fraction was steady between 90 % and 95 %. For non-coniferous roundwood it was lower.

Figure 2: Fraction of the feedstock for production of HWP coming from domestic harvest; 1990-2022, specified for coniferous (industrial roundwood coniferous) and non-coniferous (industrial roundwood non coniferous). The outlier in 2007 is due to exceptionally high values for import and export in the FAOSTAT database.

6.1.2. Inflow and outflow

Figure 3 shows the production of sawnwood, panels and paper and paperboard from Swiss wood industries for the years 1900 to 2022. The production of sawnwood increased until 1990. Since then, a trend of decreasing production started and remained until 2013. Since 2014, the production of sawnwood has stabilised. Panel production slightly increased until 2010 and is declining since then. The production of paper and paperboard decreased between 1990 and 2022. The average total production modelled since 1990 is about 1'253'000 m^3 yr^{-1} for sawnwood, about 756'000 m^3 yr^{-1} for panels, and respectively for paper and paperboard about 144'000 tonnes yr^{-1}.

Figure 3: Production of HWP from domestic harvesting (sawnwood and panels in millions of m^3, paper and paperboard in millions of tonnes); 1990-2022. The share of recovered fibre pulp in paper production is excluded.

The inflow to and the outflow from the HWP pool for the categories sawnwood, panels and paper and paperboard are shown in Figure 4. The inflows are similar to the trends in production. Also, the effects of the storms Vivian (1990) and Lothar (2000) can be distinguished. In 2012, the sawnwood inflow dropped below the outflow and remained lower until 2020.

The inflow rate for panels was slightly fluctuating from 1990 to 2010; afterward there was a gradually decreasing trend but the inflow remained higher than outflow, except in 2019.

For paper and paperboard there was a slightly decreasing trend for both inflow and outflow from 1990 to 2022. Inflow and outflow are almost the same over the whole period which can be explained by the short lifetime of only two years.

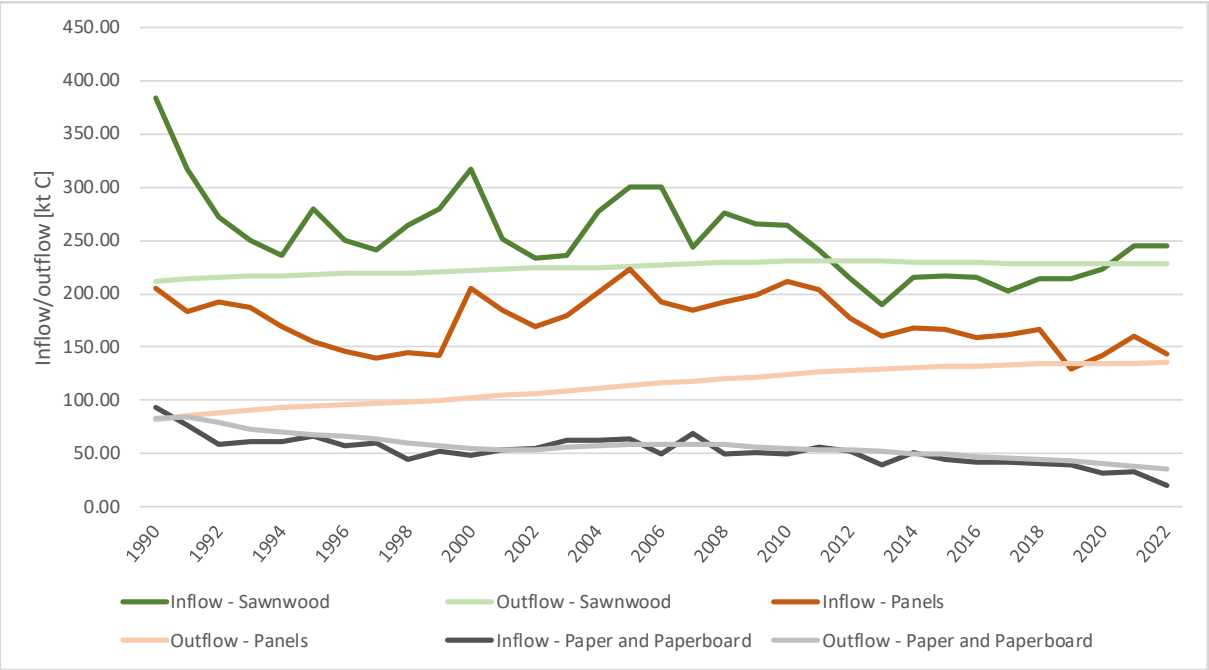

Figure 4: Inflow and outflow from the HWP pool for the categories sawnwood, panels and paper/paperboard; 1990-2022.

Figure 5 and Table 1 show the development of the carbon stock changes for the categories sawnwood, panels and paper and paperboard between 1990 and 2022. Until 1991, sawnwood was the dominant category for the HWP pool. However, wood panels gained in importance. Since 2001 the contribution by panels is higher than that from sawnwood in most years. From 2012 to 2020, sawnwood became a source. In 2019, also the panels switched from a sink to a (small) source. The value for paper and paperboard fluctuates and represents about 5 % of the total HWP emissions/removals.

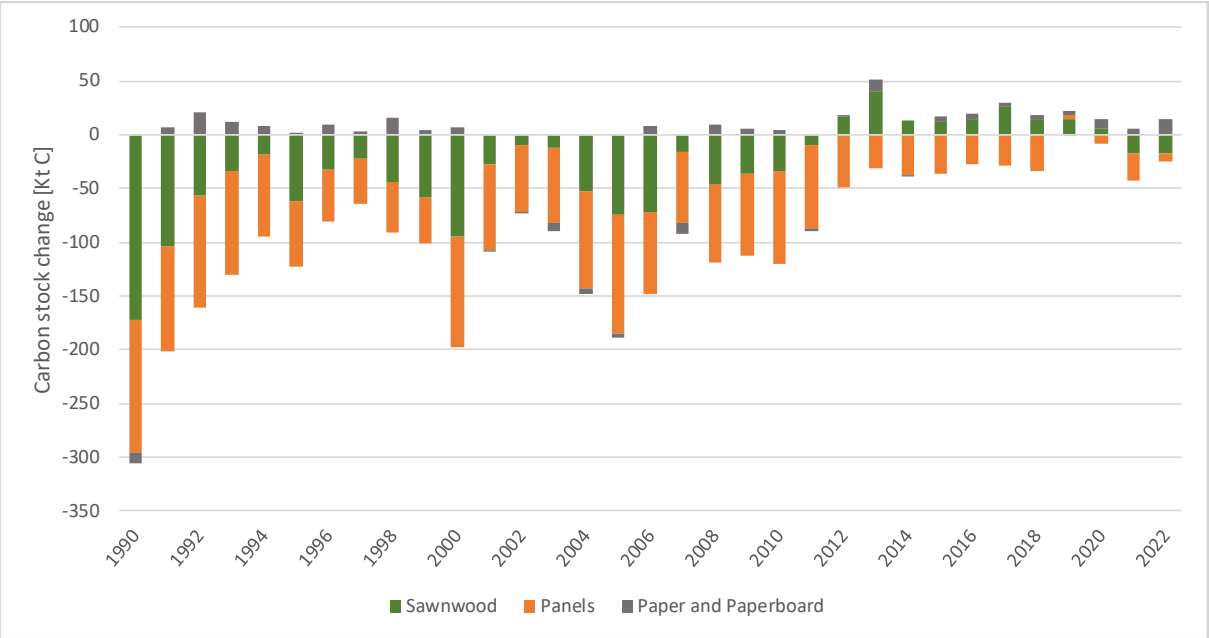

Figure 5: Carbon stock changes from HWP (positive values refer to emissions, negative values refer to removals) between 1990 and 2022.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	kt C									
Total	-305.1	-194.2	-139.6	-118.5	-87.0	-120.7	-72.1	-60.7	-74.9	-95.5
Sawnwood	-172.7	-103.5	-55.9	-34.2	-19.0	-62.2	-31.9	-22.4	-44.3	-58.3
Panels	-122.8	-97.9	-104.4	-96.3	-76.0	-60.6	-49.3	-42.0	-46.2	-42.1
Paper and Paperboard	-9.5	7.2	20.8	12.0	8.0	2.1	9.1	3.7	15.6	5.0

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	kt C									
Total	-191.0	-107.9	-72.7	-89.2	-148.6	-188.2	-139.7	-92.2	-109.7	-106.4
Sawnwood	-95.0	-27.9	-9.4	-11.4	-52.6	-74.7	-72.2	-15.4	-46.8	-36.2
Panels	-103.1	-79.9	-61.9	-70.6	-90.7	-109.6	-76.1	-66.2	-72.0	-76.3
Paper and Paperboard	7.1	-0.1	-1.3	-7.2	-5.4	-4.0	8.6	-10.6	9.1	6.1

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	kt C									
Total	-116.1	-89.1	-29.7	20.9	-24.5	-19.0	-7.5	1.9	-14.8	22.6
Sawnwood	-33.7	-10.1	17.2	40.3	13.9	12.5	14.1	26.6	14.2	14.5
Panels	-86.8	-77.6	-48.3	-31.3	-37.2	-35.9	-27.1	-28.3	-33.2	4.4
Paper and Paperboard	4.4	-1.5	1.3	11.8	-1.2	4.3	5.5	3.6	4.1	3.7

	2020	2021	2022
	kt C	kt C	kt C
Total	6.5	-36.1	-9.7
Sawnwood	5.4	-16.9	-16.9
Panels	-7.9	-25.2	-7.6
Paper and Paperboard	9.0	6.1	14.9

Table 1: Carbon stock changes in HWP (positive values refer to emissions, negative values refer to removals) between 1990 and 2022 originating from forest land.

The total inflow in 2022 was 408 kt C, with shares of 246 kt C from the production of sawnwood, 143 kt C from the production of wood panels, and 20 kt C from the production of paper and paperboard. The outflow from the pool was 399 kt C with shares of 229 kt C from sawnwood, 135 kt C from wood panels, and 35 kt C from paper and paperboard. This means that the net carbon stock changes in HWP represented a net sink of about -10 kt C. The HWP-Pool acted as a net sink of C in all years, except for the years 2013, 2017, 2019 and 2020.

6.2. Uncertainty

This section provides an overview of the uncertainties related to the results of this reporting. The uncertainty related to the choice of SFWP to account for the HWP contribution to the overall carbon stock will not be discussed.

6.2.1. Uncertainty in methods

Uncertainty in methods relates to the choice of model to describe the development of the HWP pool over time. The Tier 2 method “first order decay” used is “assumed to be a good proxy for the decay of semi-finished wood products” (IPCC 2014 – page 2.132). However, the behaviour of the HWP pool may also possibly follow a different decay function.

6.2.2. Uncertainty of conversion factors (emission factors)

The 2006 IPCC Guidelines indicate an uncertainty of about 50 % on the default half-life parameter (IPCC 2006, Vol. 4, Table 12.6).

Regarding the default conversion factors, the 2006 IPCC Guidelines (IPCC 2006, Vol. 4, Table 12.4) indicate an uncertainty of about +/- 25 % on the conversion from volume to biomass. For Switzerland, a somewhat lower value of 20 % is used considering the county-specific measured wood densities for sawnwood.

The 2006 IPCC Guidelines propose a default uncertainty of +/- 10 % on the conversion from biomass to carbon (carbon content).

The resulting uncertainty of the conversion factors is 54.8 %.

6.2.3. Uncertainty of activity data

According to IPCC (2014, chp. 2.8.6) uncertainty on activity data is caused by: a lack of time series, definitional uncertainties, limited resources for data collection, reporting errors and missing subcategories. These points in general refer to different kinds of measurement uncertainty. In addition, statistical uncertainty may also be included if data acquisition is based on statistical sampling. According to the expert judgment of authors of the 2013 KP Supplement, uncertainty on the reported values on inflow may lie between -25 % and + 5 %. In other words, underreporting is likely.

Regarding data from national Statistics (FSO 2023a) and FAOSTAT, the relevant uncertainty refers to the reporting of roundwood and the following conversion to sawnwood. Errors on reporting and limitations on data collection are probably the most important factors, as well as statistical uncertainty on the estimation of the annual harvest. Regarding the “Survey by the Wood Panels Industry” (FOEN 2023d), uncertainty is related to the companies’ ability to report correct volumes and the overall coverage of the wood industry. This uncertainty can be limited by cross-validation on roundwood consumption and the results of the production.

On this basis, the mean uncertainty for the production data was estimated to 5 % (expert judgement). The uncertainty of the share of domestic harvest in the wood products is higher as it is calculated with proxy data (import and export of industrial roundwood). It was set to 10 % (expert judgement). The resulting total uncertainty of activity data is 11.2 % for all product categories (see calculation in chapter 6.10.3, FOEN 2024).

7. References

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