Preparation of HWP estimates in line with 2/CMP.7 and 529/2013

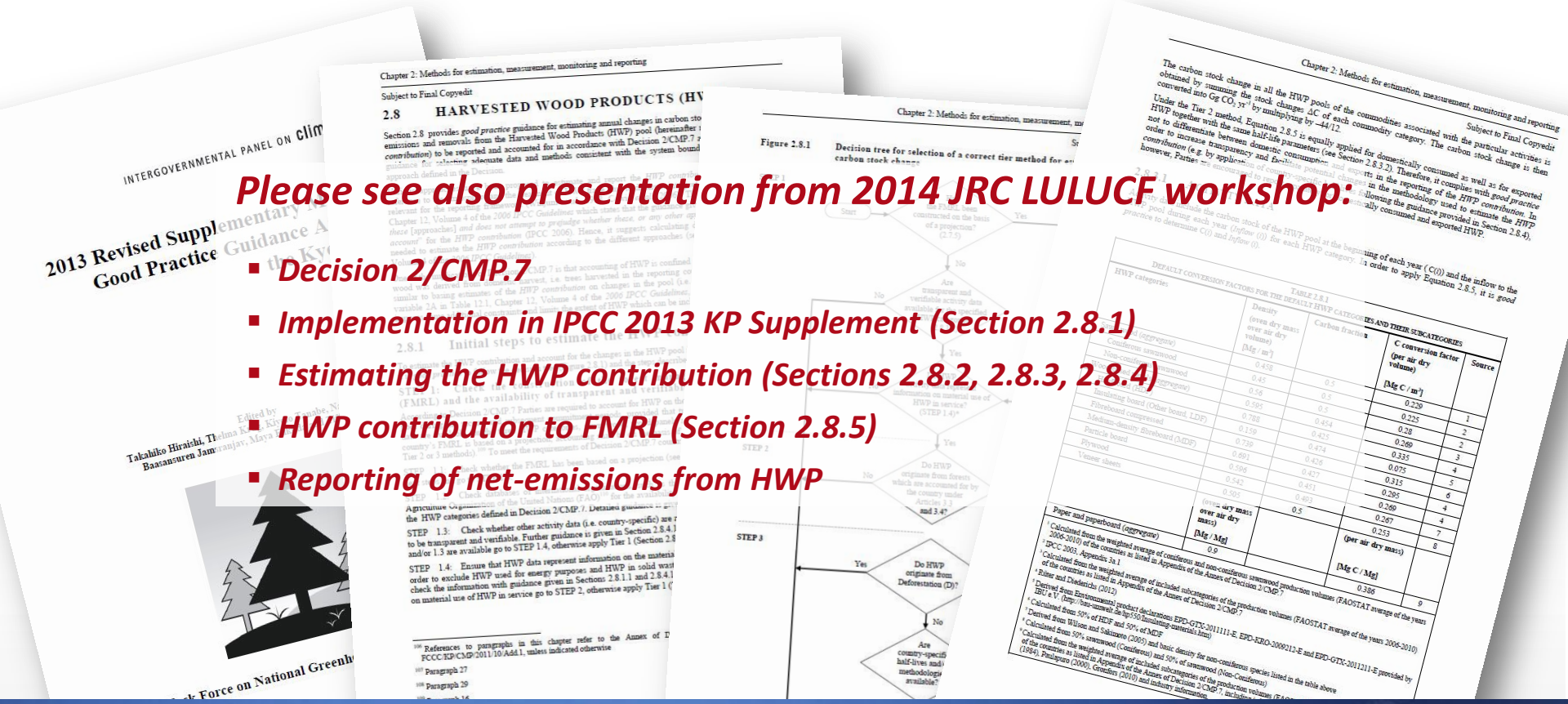
JRC technical workshop on LULUCF reporting

Sebastian Rüter
Thünen Institute of Wood Research

Arona, Italy,
26 May 2015

IPCC 2013 KP Supplement

Section 2.8 on Harvested Wood Products (pages 109-134)



Please see also presentation from 2014 JRC LULUCF workshop:

- *Decision 2/CMP.7*
- *Implementation in IPCC 2013 KP Supplement (Section 2.8.1)*
- *Estimating the HWP contribution (Sections 2.8.2, 2.8.3, 2.8.4)*
- *HWP contribution to FMRL (Section 2.8.5)*
- *Reporting of net-emissions from HWP*

Task Force on National Greenhouse Gas Inventories

ipcc INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

Sebastian Rüter

IPCC 2013 KP Supplement

Outline of Section 2.8

2.8 Harvested Wood Products

2.8.1 Initial steps to estimate the HWP contribution (2.8.1)

2.8.1.1 Availability of transparent and verifiable activity data

2.8.1.2 Allocation of HWP to domestic forest activities under Article 3, paragraphs 3 and 4

2.8.2 Tier 1: "Instantaneous oxidation"

2.8.3 Tier 2: First order decay

2.8.3.1 Activity data

2.8.3.2 Emission factors

2.8.4 Tier 3: Tier 3: Country-specific methods

2.8.4.1 Country-specific activity data

2.8.4.2 Country-specific emission factors

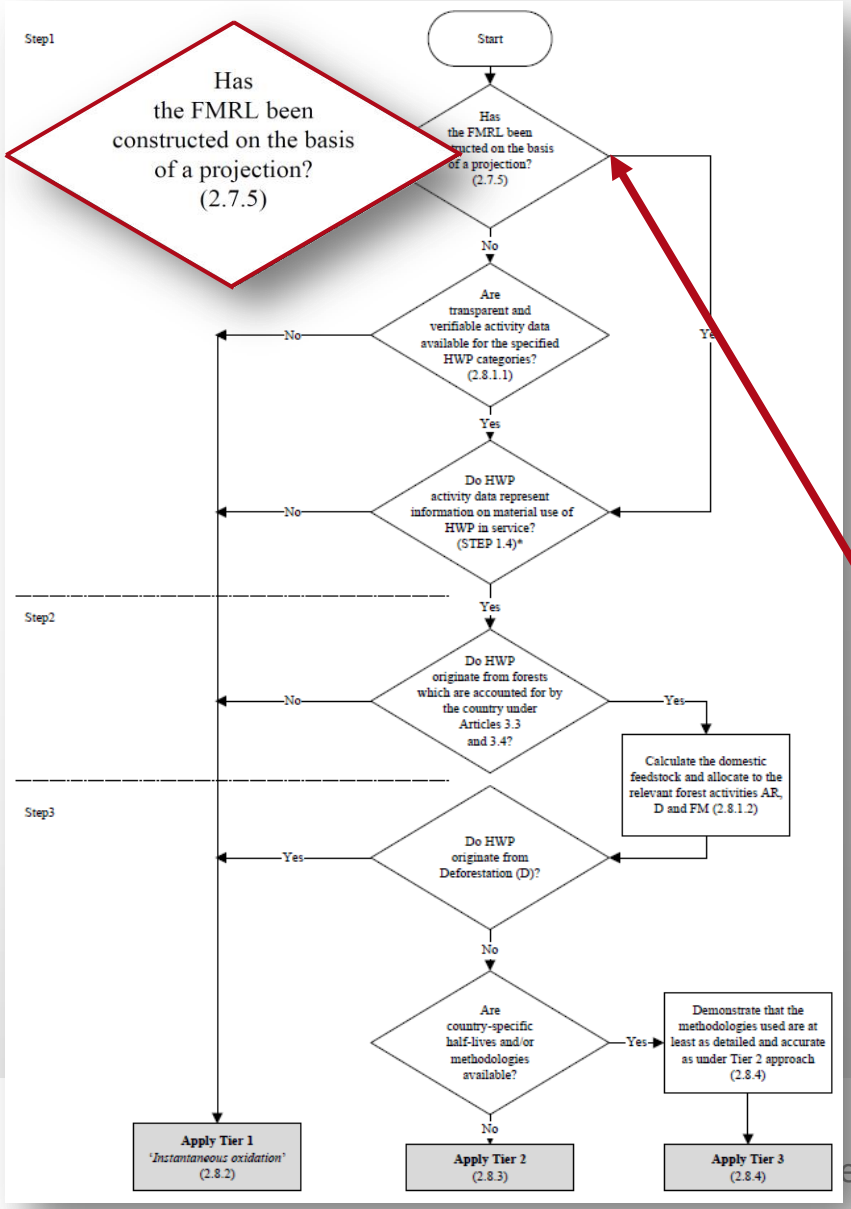
2.8.5 Consideration of the HWP pool in FMRLs

2.8.6 Uncertainty assessment

2.8.7 Quality Assurance/Quality Control

IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS



Default: Instantaneous oxidation (paragraph 28)

- No transparent and verifiable activity data (paragraphs 29 and 30)
- HWP in solid waste disposal sites and wood harvested for energy purposes (paragraph 32)
- HWP from deforestation (paragraph 31)

Accounting of HWP on the basis of change of the pool (paragraphs 29 and 30)

- Mandatory if projected FMRL has been used (paragraph 16)
- Mandatory if transparent and verifiable activity data are available (paragraphs 29 and 30)
- HWP removed from forests which are accounted for by the country (paragraph 27)

THÜNEN

DECISION 2/CMP.7

FCCC/KP/CMP/2011/10/Add.1

- **Para 16:** *Emissions that occur during the second commitment period from harvested wood products removed from forests prior to the start of the second commitment period shall also be accounted for. In the case the forest management reference level is based on a projection, a Party may choose not to account for the emissions from harvested wood products originating from forests prior to the start of the second commitment period, and shall ensure consistency in the treatment of the harvested wood products pool in the second commitment period in accordance with paragraph 14 above. Emissions from harvested wood products already accounted for during the first commitment period on the basis of instantaneous oxidation shall be excluded. The treatment of harvested wood products in the construction of a projected forest management reference level shall be on the basis of provisions outlined in paragraph 29 below and shall not be on the basis of instantaneous oxidation.*[2]

[2] *Taking in to account the provisions of paragraph 32 below.*

► ***In the case of projected FMRL, the accounting of HWP shall be on the basis of the change of the pool (no instantaneous oxidation)***

IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

Initial STEPS (Section 2.8.1)

▶ *To be applied in combination with the decision tree*

- **STEP 1: "Check the construction of the forest management reference level (FMRL) and the availability of transparent and verifiable activity data on HWP"**
  - **1.1: FMRL based on a projection?**

2.7.5 Forest Management Reference Levels

BOX 2.7.3 ▶ *See page 2.94*

APPROACHES AND METHODS USED FOR CONSTRUCTING FOREST MANAGEMENT REFERENCE LEVEL

…

1) FMRLs based on projections under a 'business-as-usual' scenario

2) Historical FMRL based on the single year 1990

3) FMRL equal to zero

▶ *All countries within EU28 (see Decision 2/CMP.7)*

▶ *Check in Decision 2/CMP.7 (Appendix in Annex) whether your country has provided a FMRL including HWP (applying first-order decay function for HWP)*

▶ *Value is missing for 4 EU countries*

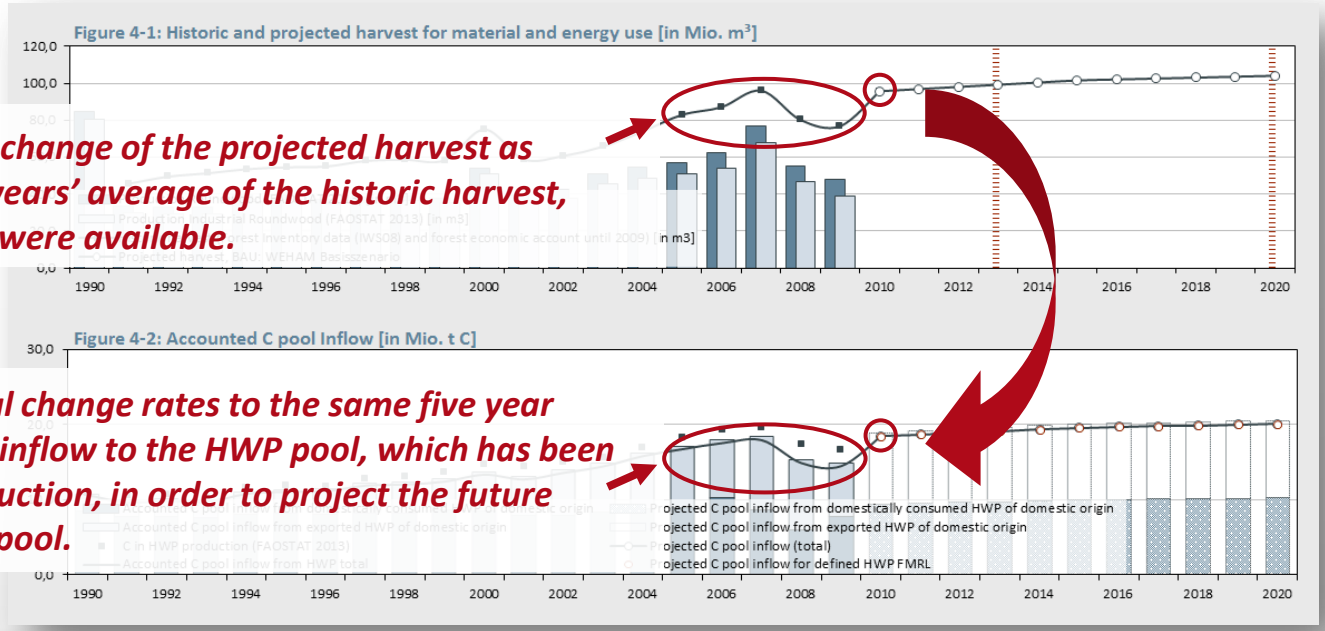
HWP contribution to FMRL

Cancun Decision 2/CMP.6

- **Based on Decision 2/CMP.6, the contribution of HWP to FMRL has been estimated**
  - **Subject to a technical assessment by LULUCF experts**
  - **See values in column '*Applying first-order decay function for HWP*' in the table of the Appendix of the Annex of Decision 2/CMP.7**

- **Example box 2.8.2**

Example Germany (Rüter 2011)



- ***STEP 1:***
  Calculation of 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.

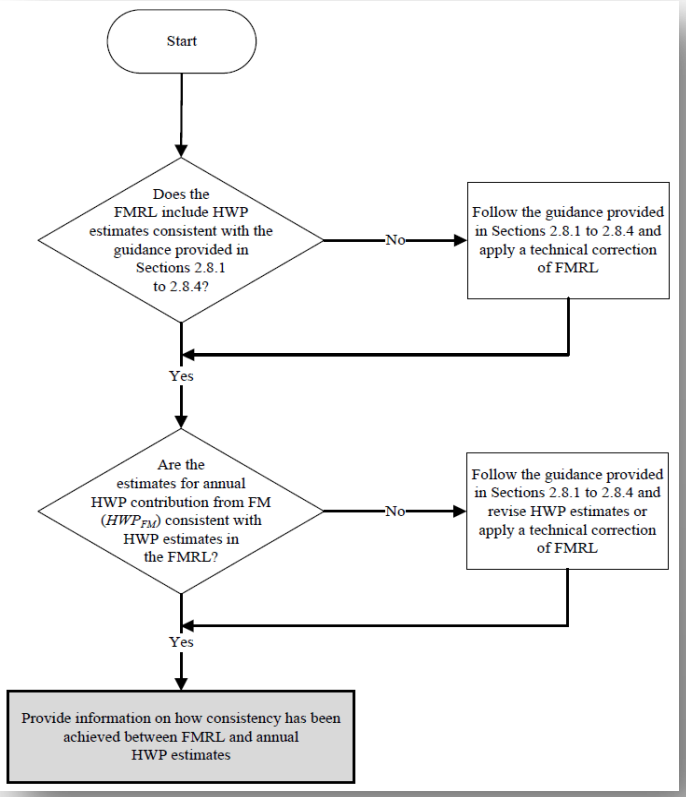
- ***STEP 2:***
  Application of these annual change rates to the same five year average of historic carbon inflow to the HWP pool, which has been calculated from HWP production, in order to project the future carbon inflow to the HWP pool.

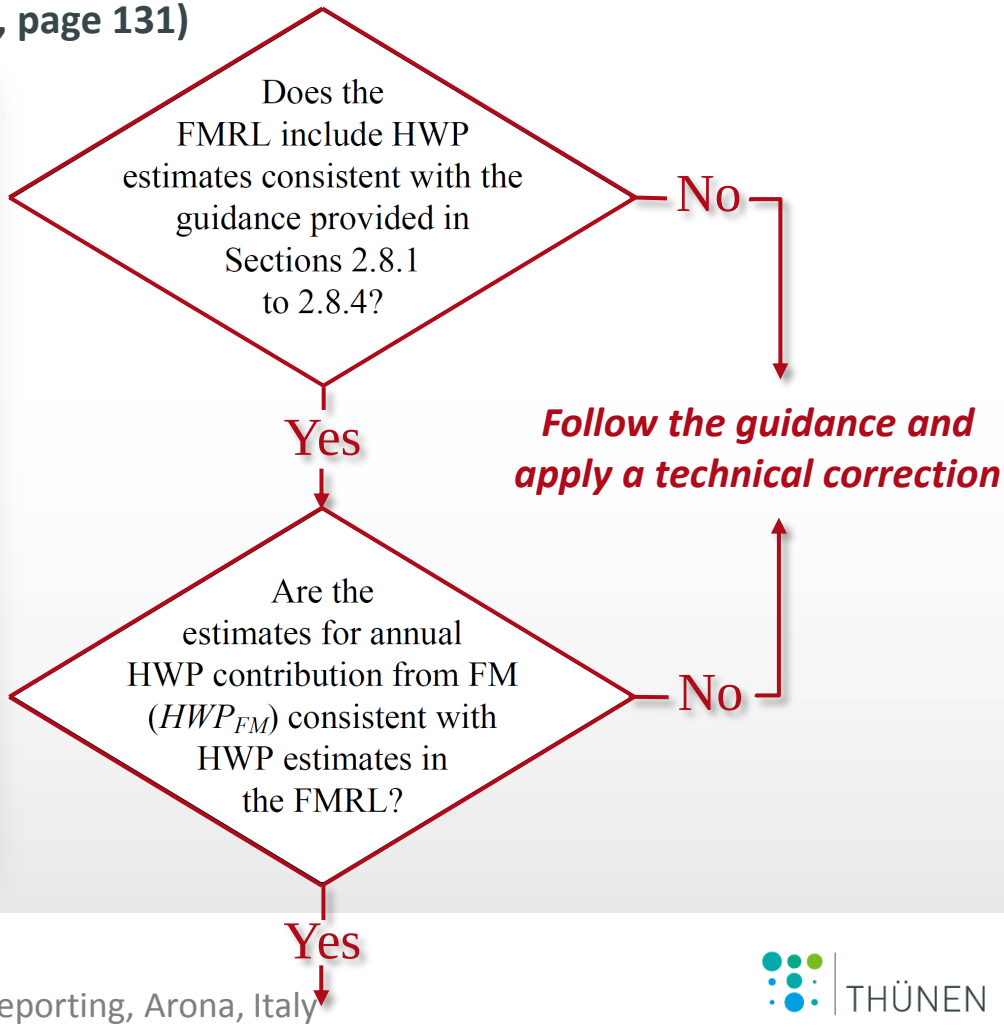
- ***As a result, it is assumed that the same average proportion of harvested timber used as feedstock for the subsequent production of HWP in the chosen historic five year period will also apply in the projection period.***

IPCC 2013 KP Supplement

Section 2.8.5: HWP in FMRL

- In line with Decision 2/CMP.7 (paragraph 14), countries need to ensure and "demonstrate methodological consistency between the reference level and reporting for FM during CP2"
- Decision tree on consistency (Figure 2.8.5, page 131)





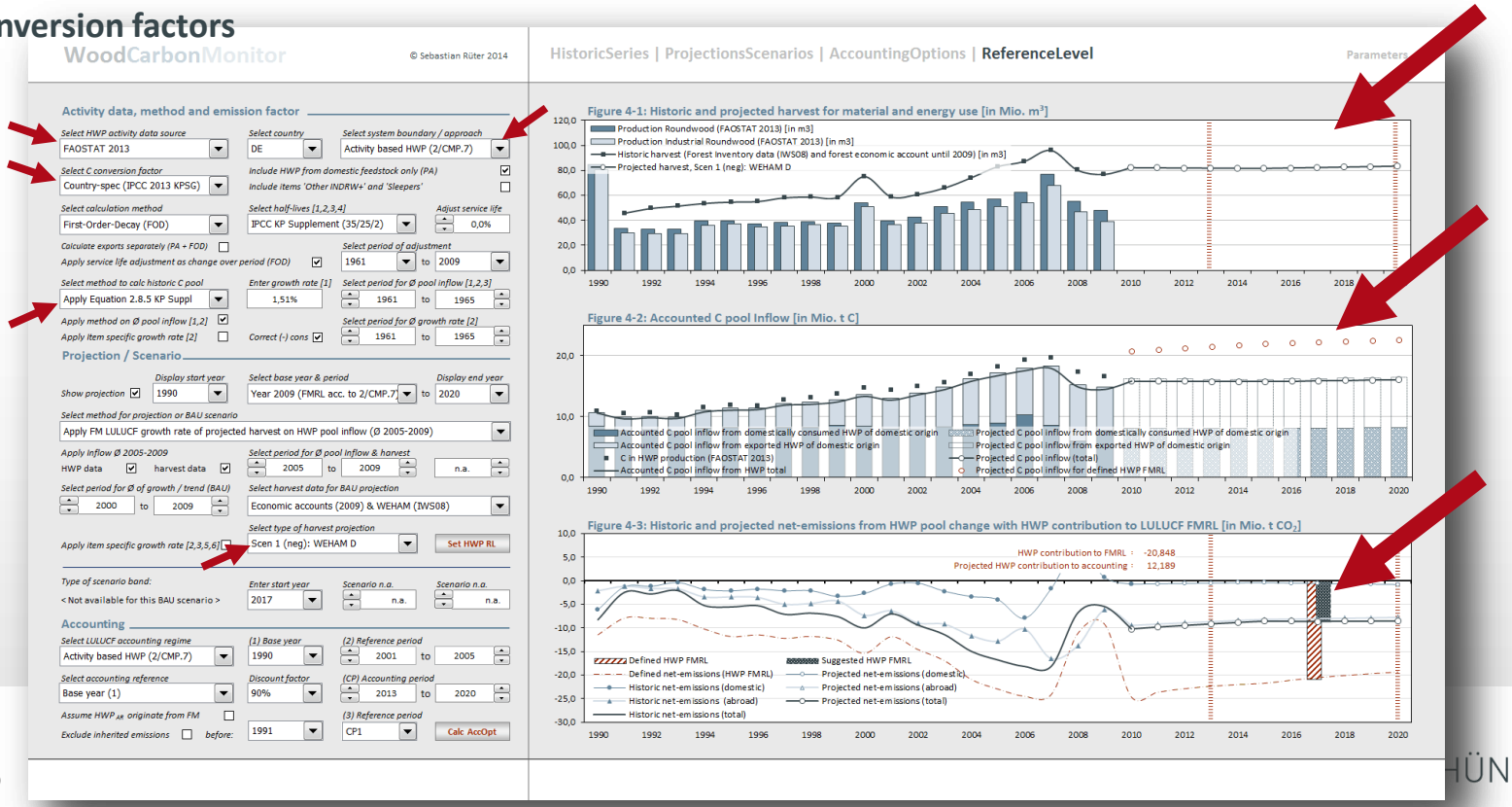
HWP contribution to FMRL

Section 2.8.5: HWP in FMRL

Requirement to apply a technical correction on HWP estimates for all countries due to:

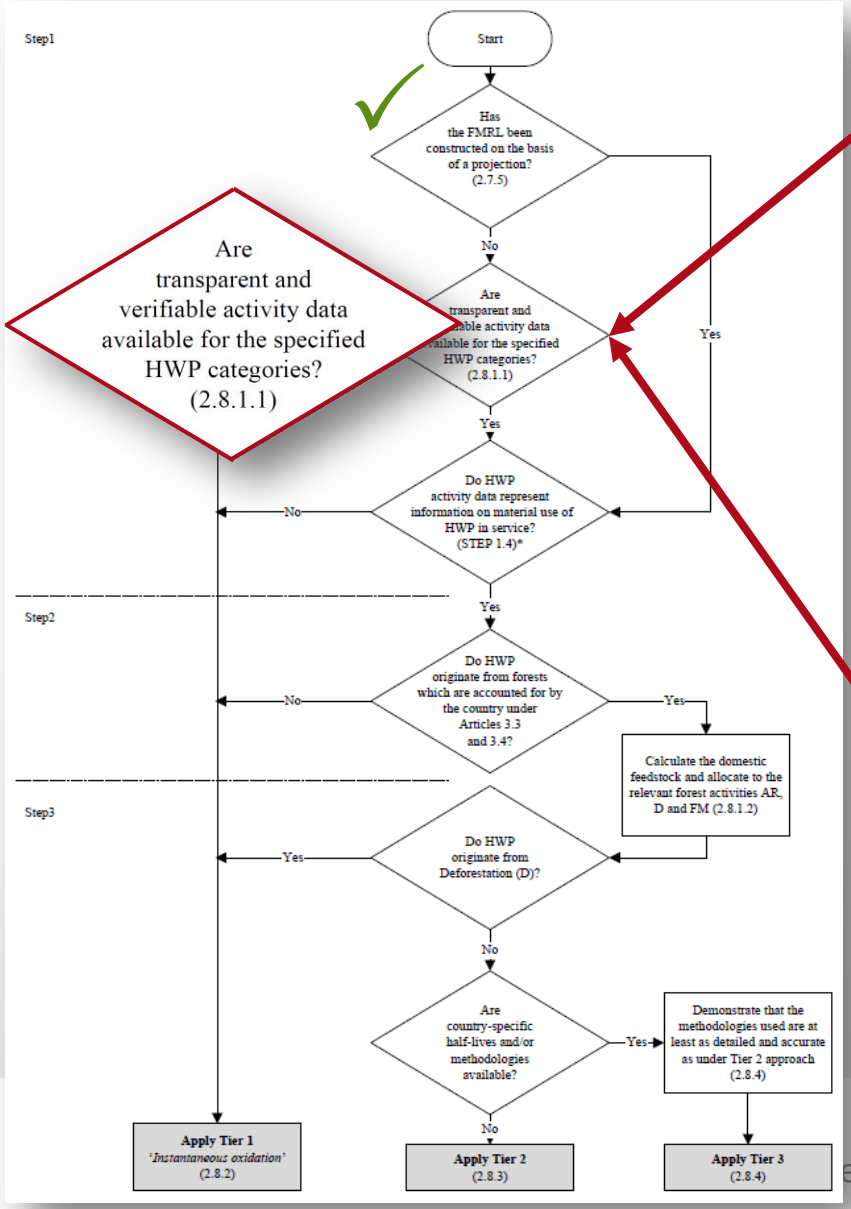
- Allocation of HWP to activities (AR/FM & D)
- Application of instantaneous oxidation for HWP originating from D
- New calculation method for inherited emissions (Equation 2.8.4)
- New harvest information based on latest forest inventories (prior to CP2)
- New conversion factors

► *Guidance available only since Decision 2/CMP.7 (12/2012) and the release of IPCC 2013 KP Supplement (04/2013)*



IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS



Are transparent and verifiable activity data available for the specified HWP categories? (2.8.1.1)

Default: Instantaneous oxidation (paragraph 28)

- **No transparent and verifiable activity data (paragraphs 29 and 30)**
- **HWP in solid waste disposal sites and wood harvested for energy purposes (paragraph 32)**
- **HWP from deforestation (paragraph 31)**

Accounting of HWP on the basis of change of the pool (paragraphs 29 and 30)

- **Mandatory if projected FMRL has been used (paragraph 16)**
- **Mandatory if transparent and verifiable activity data are available (paragraphs 29 and 30)**
- **HWP removed from forests which are accounted for by the country (paragraph 27)**

THÜNEN

DECISION 2/CMP.7

FCCC/KP/CMP/2011/10/Add.1

- **Para 28:** *Accounting shall be on the basis of instantaneous oxidation.*
- **Para 29:** *Notwithstanding paragraph 28 above, and provided that transparent and verifiable activity data for the harvested wood product categories specified below are available, accounting shall be on the basis of the change in the harvested wood products pool during the second and subsequent commitment periods, estimated using the first-order decay function[4] with default half-lives[5] of two years for paper, 25 years for wood panels and 35 years for sawn wood.*
- **Para 30:** *A Party may use country-specific[6] data to replace the default half-lives specified above, or to account for such products in accordance with the definitions and estimation methodologies in the most recently adopted IPCC guidelines and any subsequent clarifications agreed by the Conference of the Parties, provided that verifiable and transparent activity data are available and that the methodologies used are at least as detailed or accurate as those prescribed above.*

  - ***Availability of transparent and verifiable data is prerequisite for accounting on the basis of pool changes***
  - ***If transparent and verifiable data are available, HWP accounting on the basis of pool changes is mandatory***
  - ***If NO transparent and verifiable data are available, HWP accounting on the basis of instantaneous oxidation is mandatory (in the case of a projected FMRL, in line with 2/CMP.7 it is assumed that HWP data are available)***
  - ***Specification of HWP categories: sawnwood, wood panels and paper***

IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

Initial STEPS (Section 2.8.1)

- **STEP 1: "Check the construction of the forest management reference level (FMRL) and the availability of transparent and verifiable activity data on HWP"**
  - **1.1: FMRL based on a projection?**
  - **1.2: Activity data available in databases of international organizations (e.g. FAOSTAT) on defined HWP categories (sawnwood, wood-based panels, paper and paperboard)?**

    ▶ ***Section 2.8.1.1 (Availability of transparent and verifiable activity data) including:***
    – Reference and definitions of the internationally agreed system for forest products (Figure 2.8.2)
    – Examples of different processing stages of wood products along the process and value chain (Figure 2.8.3)

    ▶ ***In order to avoid double-counting and in order to check whether accounting is mandatory***

Implementation of IPCC 2013 KP Supplement

Activity data

FAOSTAT

As of 1 June 2014, this version of FAOSTAT will no longer be available.
Please click here for the new version.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
for a world without hunger
English Français Español

Home | Production | Trade | Food Supply | Food Balance Sheets | Food Security | Prices | Resources | Agri-Environmental Indicators | Emissions | Forestry | Fisheries | Other Datasets | Metadata | Support/FAQ | Release Calendar

about | ForesSTAT | Forestry Trade Flows

Final 2012 Data Now Available

country

French Southern and
Gabon
Gambia
Georgia
Germany
Ghana
Gibraltar
Greece

year

2012
2011
2010
2009
2008
2007
2006
2005

nested by: element
Y1-axis: country
Y2-axis: item
X-axis: year

item

Sawlogs and Veneer Logs > (List)
Sawnwood + (Total)
Sawnwood > (List)
Total Fibre Furnish + (Total)
Total Fibre Furnish > (List)
Wood Fuel + (Total)
Wood Fuel > (List)
Wood Pulp + (Total)

element

Production Quantity
Import Quantity
Import Value
Export Quantity
Export Value

show data

Latest News
Updated: 17 December 2013

years *country* *HWP commodities* *element*

Download of HWP commodity values:

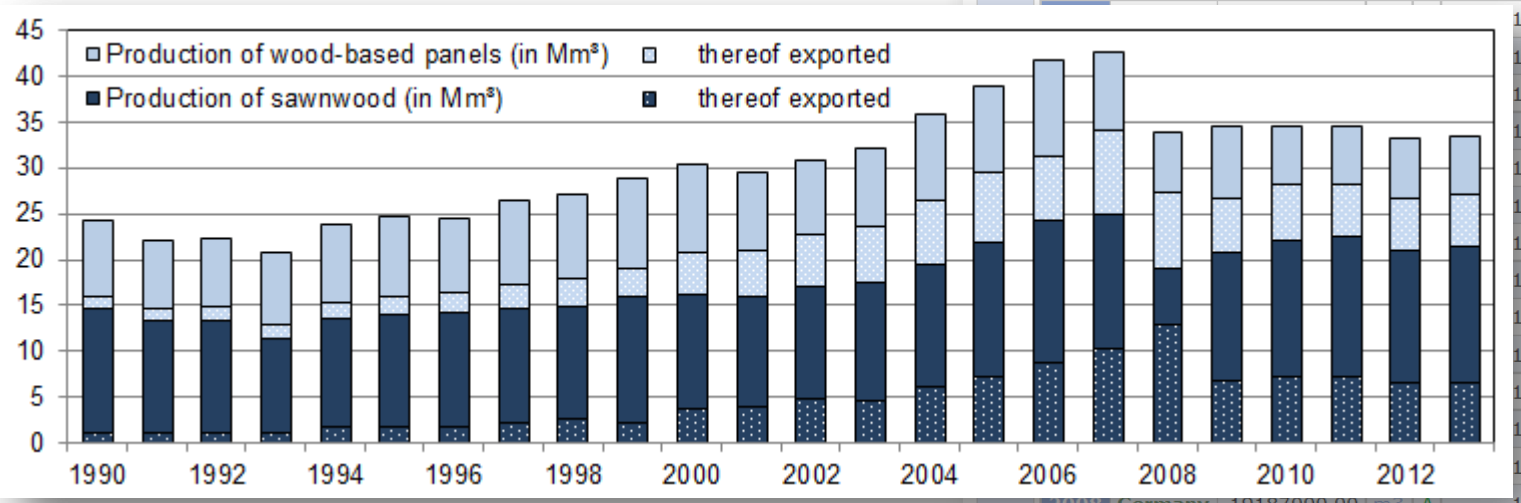
- ***Select commodities (items), i.e. sawnwood, wood-based panels, paper and paperboard or subcategories (see IPCC KP Supplement Table 2.8.1)***
- ***Select elements: production (minimum) or production and export (export is included in production)***
- ***Select years: since 1990 (minimum)***

item

Implementation of IPCC 2013 KP Supplement

Activity data

Example FAOSTAT data for Germany



Production (m3)

item

year	country	Sawnwood + (Total)			Wood-Based Panels + (Total)		
1990	Germany	14724000.00	m3	A	9635000.00	m3	A
1991	Germany	13322000.00	m3	A	8883000.00	m3	A
1992	Germany	13496000.00	m3	A	8887000.00	m3	A
1993	Germany	11522000.00	m3	A	9441000.00	m3	A
1994	Germany	13567000.00	m3	A	10282000.00	m3	A
					10646000.00	m3	A
					10388000.00	m3	A
					11887000.00	m3	A
					12180000.00	m3	A
					12752500.00	m3	A
					14063500.00	m3	A
					13532000.00	m3	A
					13693000.00	m3	A
					14650000.00	m3	A
					16350000.00	m3	A
					17092000.00	m3	A
					17400000.00	m3	A
					17708000.00	m3	A
2008	Germany	19187000.00	m3	A	14673513.00	m3	A
2009	Germany	20781166.00	m3	A	13895583.00	m3	A
2010	Germany	22059099.00	m3	A	12624554.00	m3	A
2011	Germany	22628100.00	m3	A	12091887.00	m3	A
2012	Germany	21030799.00	m3	A	12148308.00	m3	A

A = Aggregate, may include official, semi-official or estimated data

FAOSTAT | © FAO Statistics Division 2014 | 05 May 2014

IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

Initial STEPS (Section 2.8.1)

- **STEP 1: "Check the construction of the forest management reference level (FMRL) and the availability of transparent and verifiable activity data on HWP"**
  - **1.1: FMRL based on a projection?**
  - **1.2: Activity data available in databases of international organizations (e.g. FAOSTAT) on defined HWP categories (sawnwood, wood-based panels, paper and paperboard)?**
  - **1.3: Other activity data (i.e. country-specific) available which fulfil the requirement to be transparent and verifiable?**

▶ ***Section 2.8.4.1 (Country-specific activity data)***

▶ ***In order to allow for Tier 3 accounting of <u>such</u> products (i.e. sawnwood, wood-based panels, paper and paperboard) and in order to check whether accounting is mandatory***

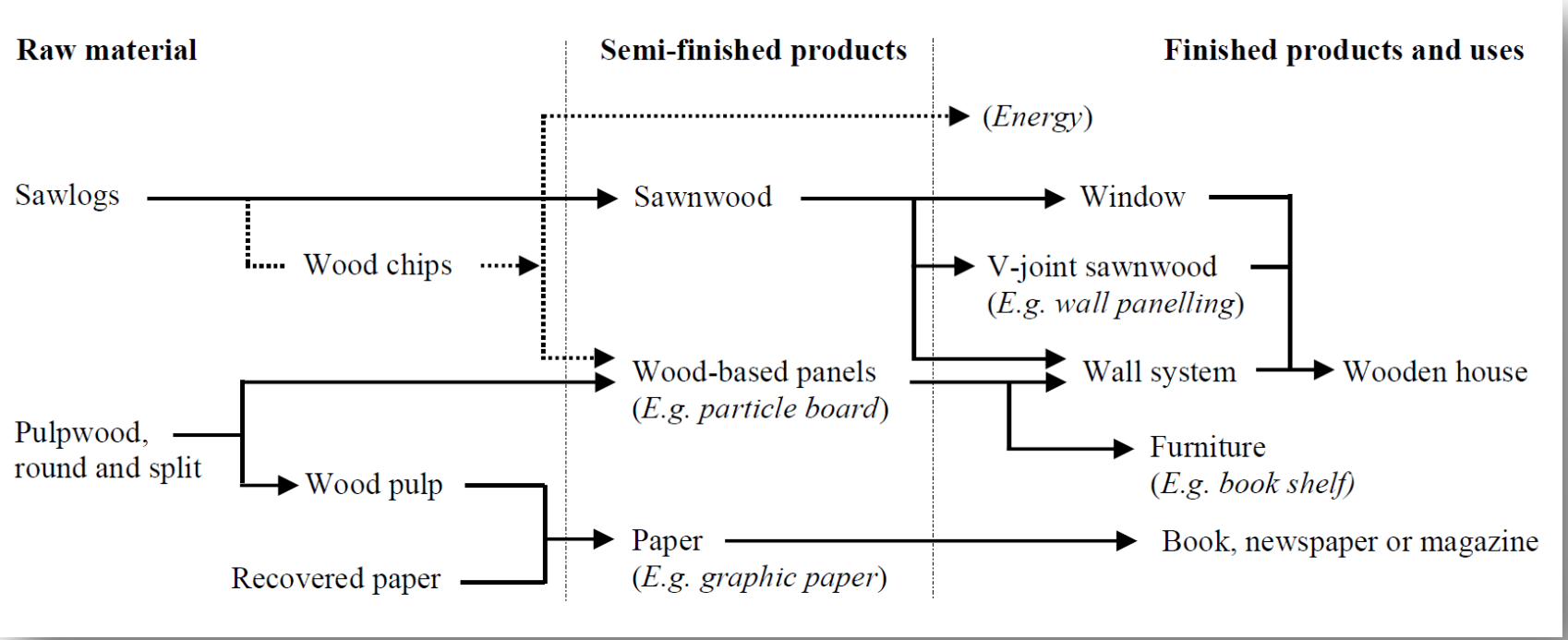
▶ ***Remember that if country-specific activity data should be used, information on how these data relate to the default categories must be available, and it also impacts the availability of country-specific decay functions and/or half-life information***

IPCC 2013 KP Supplement

Transparent and verifiable activity data

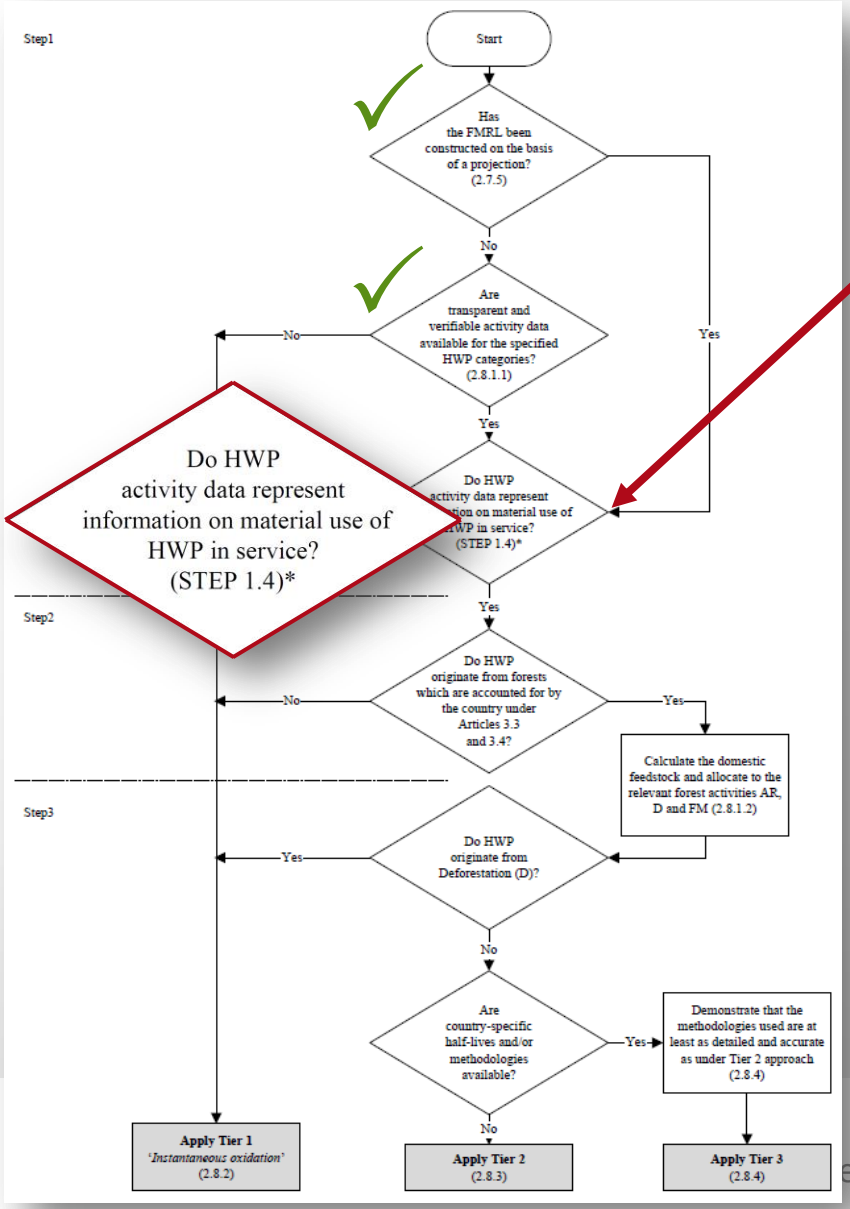
- **Section 2.8.1.1 "Availability of transparent and verifiable activity data"**

  including Figure 2.8.3 "Examples of different processing stages of wood products along the process and value chain"



IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS



Default: Instantaneous oxidation (paragraph 28)

- No transparent and verifiable activity data (paragraphs 29 and 30)
- HWP in solid waste disposal sites and wood harvested for energy purposes (paragraph 32)
- HWP from deforestation (paragraph 31)

Accounting of HWP on the basis of change of the pool (paragraphs 29 and 30)

- Mandatory if projected FMRL has been used (paragraph 16)
- Mandatory if transparent and verifiable activity data are available (paragraphs 29 and 30)
- HWP removed from forests which are accounted for by the country (paragraph 27)

THÜNEN

DECISION 2/CMP.7

FCCC/KP/CMP/2011/10/Add.1

- **Para 32:** *Where carbon dioxide emissions from harvested wood products in solid waste disposal sites are separately accounted for, this shall be on the basis of instantaneous oxidation. Carbon dioxide emissions from wood harvested for energy purposes shall be accounted for on the basis of instantaneous oxidation.*

  - ***No accounting of HWP in solid waste disposal sites (on the basis of pool changes)***
  - ***No accounting of HWP used for energy (no pool exists)***

IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

Initial STEPS (Section 2.8.1)

- **STEP 1: "Check the construction of the forest management reference level (FMRL) and the availability of transparent and verifiable activity data on HWP"**
  - **1.1: FMRL based on a projection?**
  - **1.2: Activity data available in databases of international organizations (e.g. FAOSTAT) on defined HWP categories (sawnwood, wood-based panels, paper and paperboard)?**
  - **1.3: Other activity data (i.e. country-specific) available which fulfil the requirement to be transparent and verifiable?**
  - **1.4: Ensure that HWP data represent information on the material use of wood (products in service) in order to exclude the HWP used for energy purposes and HWP in solid waste disposal sites (SWDS)**

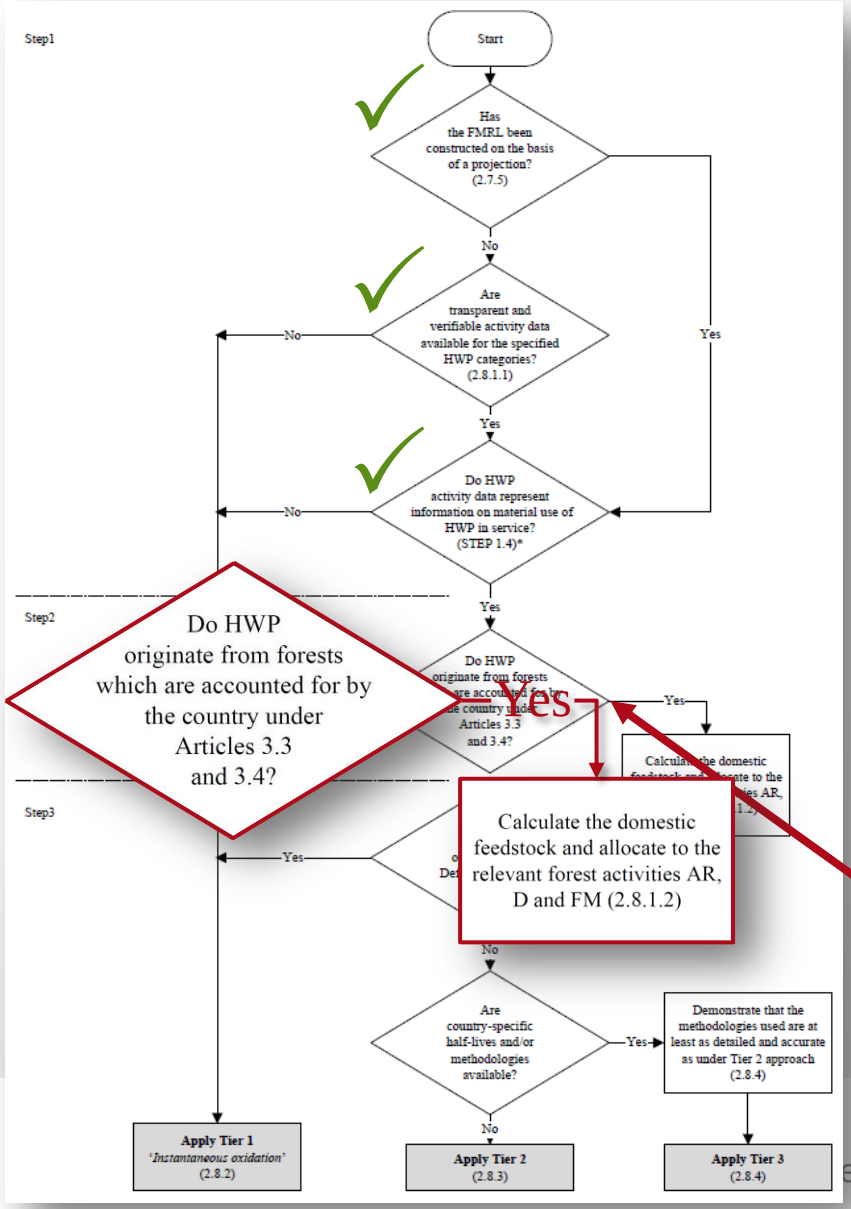
▶ ***Sections 2.8.1.1 and 2.8.4.1 in KP Supplement***

▶ ***To ensure that activity data represents HWP categories for material use***

▶ ***Using default HWP categories (sawnwood, wood-based panels, paper and paperboard) implicitly describe the material use of wood***

IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS



Default: Instantaneous oxidation (paragraph 28)

- No transparent and verifiable activity data (paragraphs 29 and 30)
- HWP in solid waste disposal sites and wood harvested for energy purposes (paragraph 32)
- HWP from deforestation (paragraph 31)

Accounting of HWP on the basis of change of the pool (paragraphs 29 and 30)

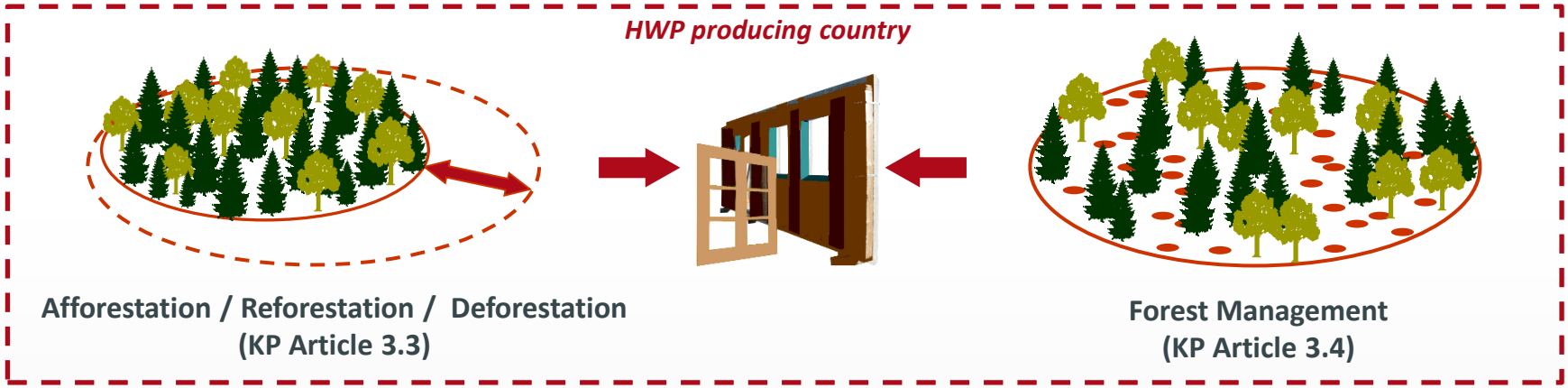
- Mandatory if projected FMRL has been used (paragraph 16)
- Mandatory if transparent and verifiable activity data are available (paragraphs 29 and 30)
- **HWP removed from forests which are accounted for by the country (paragraph 27)**

THÜNEN

DECISION 2/CMP.7

FCCC/KP/CMP/2011/10/Add.1

- **Para 27:** *Emissions from harvested wood products removed from forests which are accounted for by a Party under Article 3, paragraphs 3 and 4, shall be accounted for by that Party only. Imported harvested wood products, irrespective of their origin, shall not be accounted for by the importing Party.*



- ***This contains two elements:***
  - ***Wood from domestic forests***
  - ***Forests that are accounted for***

IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

- **STEP 2: "Check whether HWP categories originate from forests that are accounted for by the country and allocate HWP to the particular forest related activity"**
  - **2.1: Estimate the share of HWP originating from forests within the country**

    - ***Detailed guidance in Section 2.8.1.2 (Allocation of HWP to domestic forest activities under Art 3, 3 and 4)***
    - ***See "Implementation of STEP 2.1" on page 114***
    - ***The apparent consumption of e.g. industrial roundwood is assumed to equal the feedstock used to manufacture e.g. sawnwood (see slides 12, 15, 16)***
    - ***Calculation of feedstock factor for feedstock commodities (i.e. industrial roundwood (f_{IRW}) and pulp (f_{PULP}))***

EQUATION 2.8.1
ESTIMATION OF ANNUAL FRACTION OF FEEDSTOCK FOR HWP PRODUCTION ORIGINATING FROM DOMESTIC HARV

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

EQUATION 2.8.2
ESTIMATION OF ANNUAL FRACTION OF DOMESTICALLY PRODUCED WOOD PULP AS FEEDSTOCK FOR PAPER AND PAPERBOARD PRODUCTION

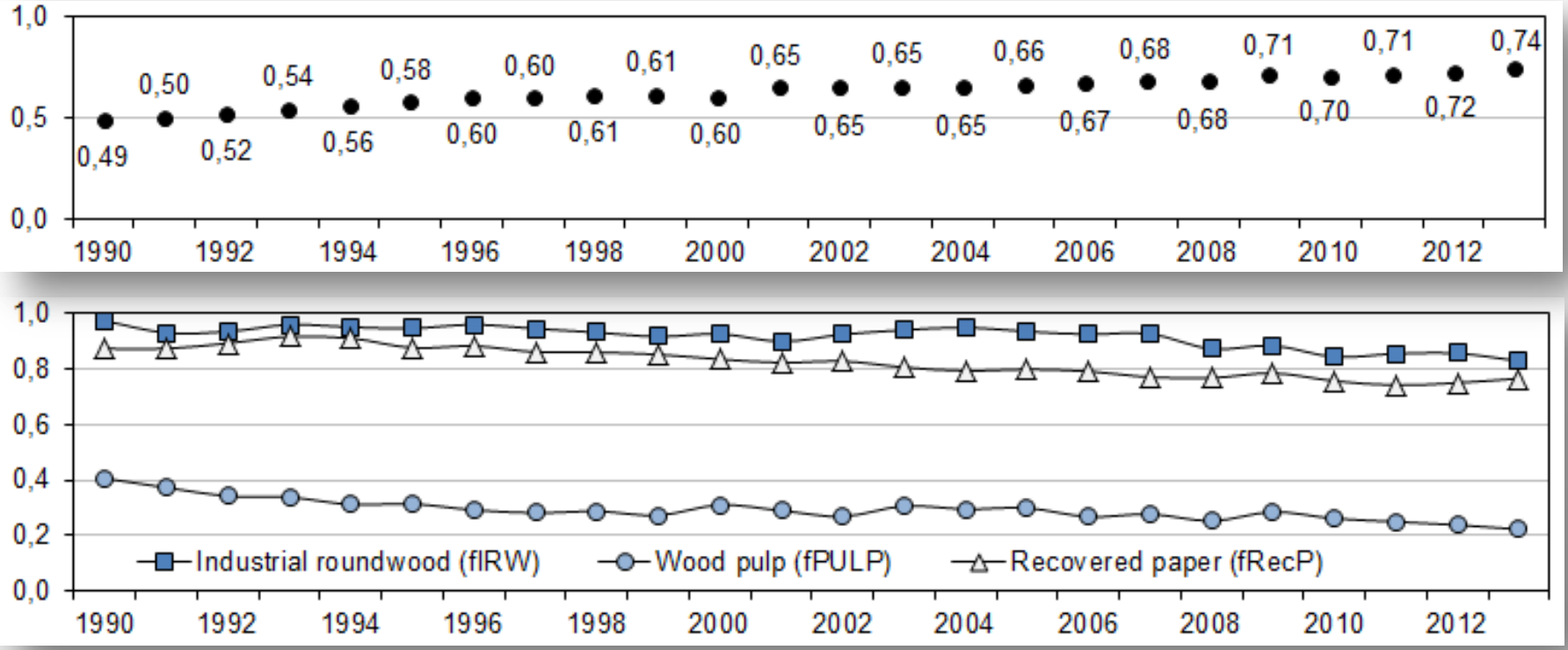
$$f_{PULP}(i) = \frac{PULP_P(i) - PULP_{EX}(i)}{PULP_P(i) + PULP_{IM}(i) - PULP_{EX}(i)}$$

IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

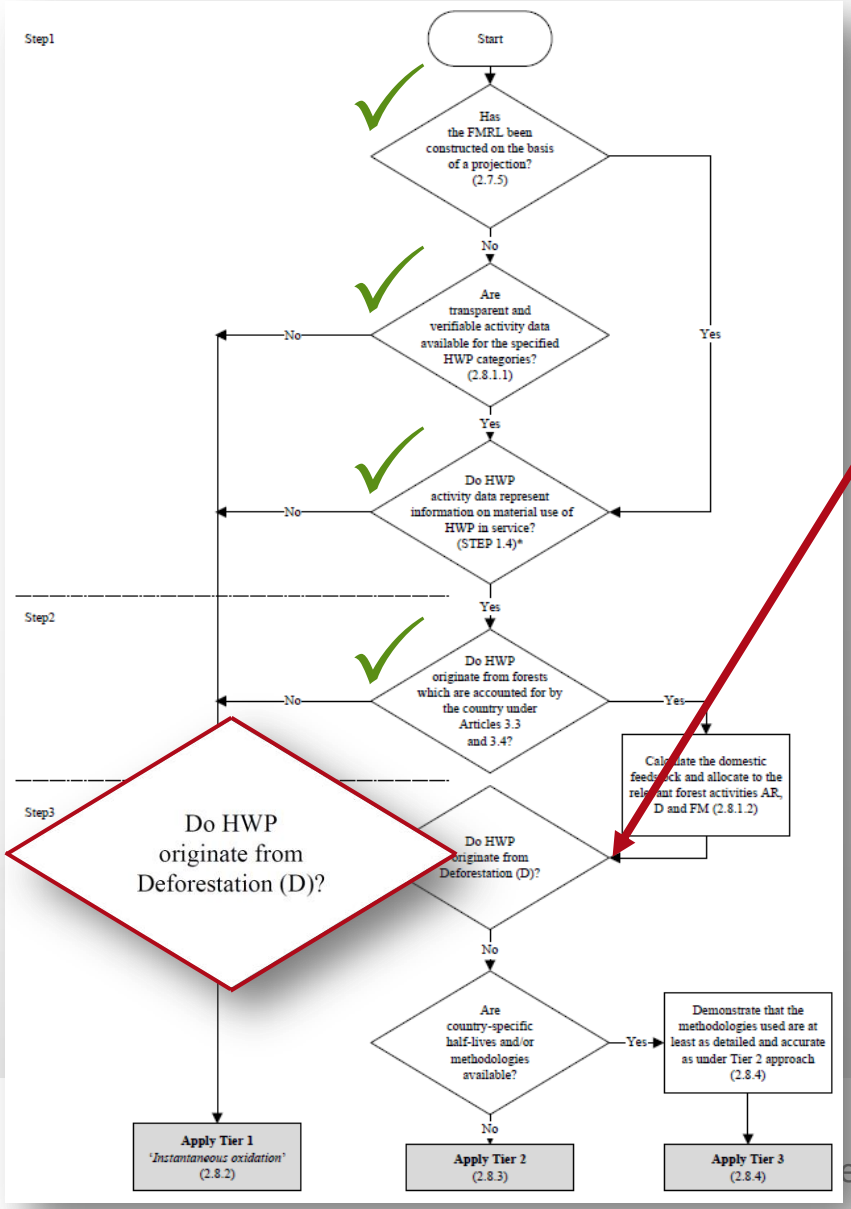
Example: Domestic feedstock factors $f_{DP}(i)$ used for Germany

- ***In order to better reflect reality and decrease uncertainty, also recovered paper as feedstock for paper production has been included (recovered paper utilization rate in paper production)***



Implementation in IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS



Default: Instantaneous oxidation (paragraph 28)

- No transparent and verifiable activity data (paragraphs 29 and 30)
- HWP in solid waste disposal sites and wood harvested for energy purposes (paragraph 31)
- HWP from deforestation (paragraph 32)

Accounting of HWP on the basis of change of the pool (paragraphs 29 and 30)

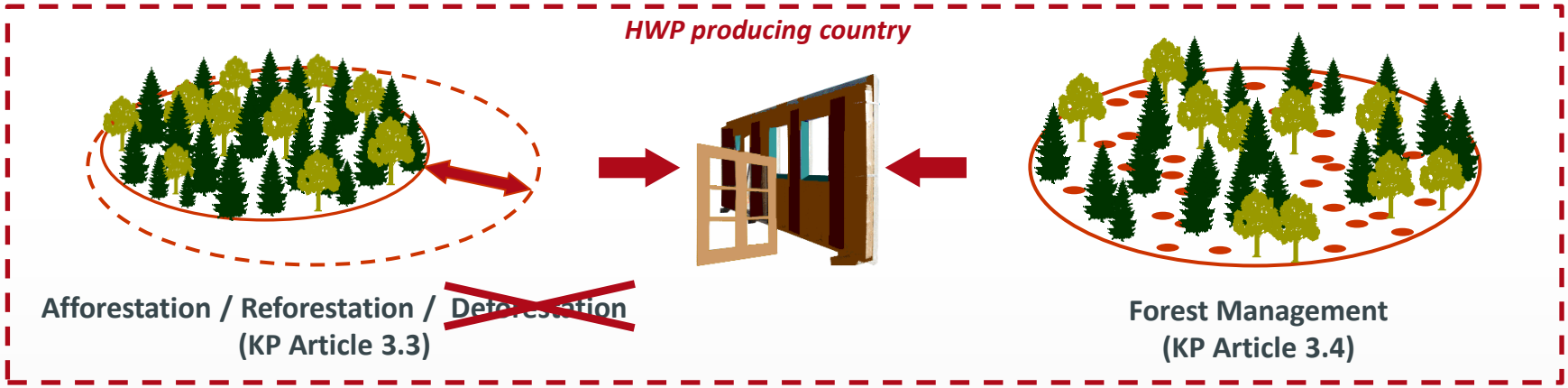
- Mandatory if projected FMRL has been used (paragraph 16)
- Mandatory if transparent and verifiable activity data are available (paragraphs 29 and 30)
- HWP removed from forests which are accounted for by the country (paragraph 27)

THÜNEN

DECISION 2/CMP.7

FCCC/KP/CMP/2011/10/Add.1

- **Para 27:** *Emissions from harvested wood products removed from forests which are accounted for by a Party under Article 3, paragraphs 3 and 4, shall be accounted for by that Party only. Imported harvested wood products, irrespective of their origin, shall not be accounted for by the importing Party.*



- **Para 31:** *Harvested wood products resulting from deforestation shall be accounted for on the basis of instantaneous oxidation.*

IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

- **STEP 2: "Check whether HWP categories originate from forests that are accounted for by the country and allocate HWP to the particular forest related activity"**
  - **2.1: Estimate the share of HWP originating from forests within the country**
  - **2.2: Estimate the share of HWP originating from ARD and FM**

▶ ***See "Implementation of STEP 2.2" on page 115***

▶ ***Calculation of activity factor (e.g. f_{FM}) for share of FM in total harvest)***

▶ ***Methods for estimating the HWP contribution will differ***

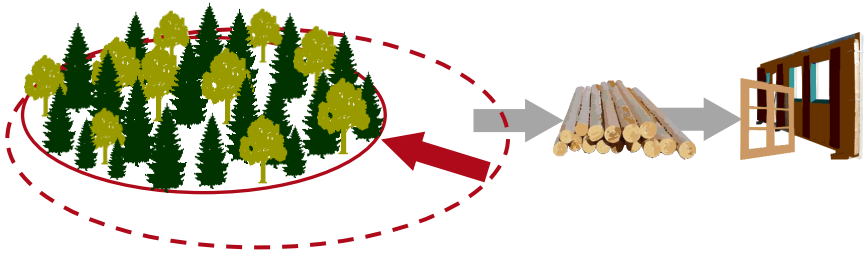
EQUATION 2.8.3
ESTIMATION OF ANNUAL FRACTION OF FEEDSTOCK FOR HWP ORIGINATING FROM FOREST ACTIVITIES UNDER ARTICLE 3, PARAGRAPHS 3 AND 4

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

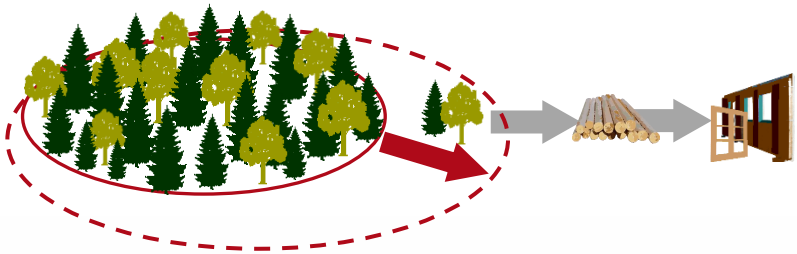
IPCC 2013 KP Supplement

Section 2.8.1: STEP 2.2 Allocation of harvest to forest activities AR, D and FM

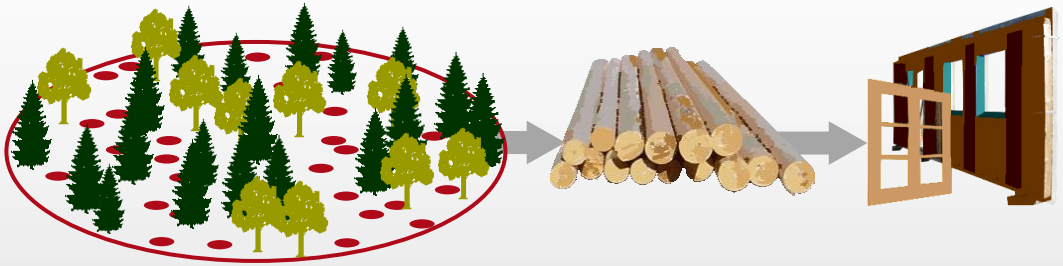
- HWP from D: f_D ▶ *Accounting on the basis of instantaneous oxidation*



- HWP from AR: f_{AR} ▶ *Accounting since 1990 (gross-net)*



- HWP from FM: f_{FM} ▶ *Contribution of HWP to FMRL (Section 2.8.5)*

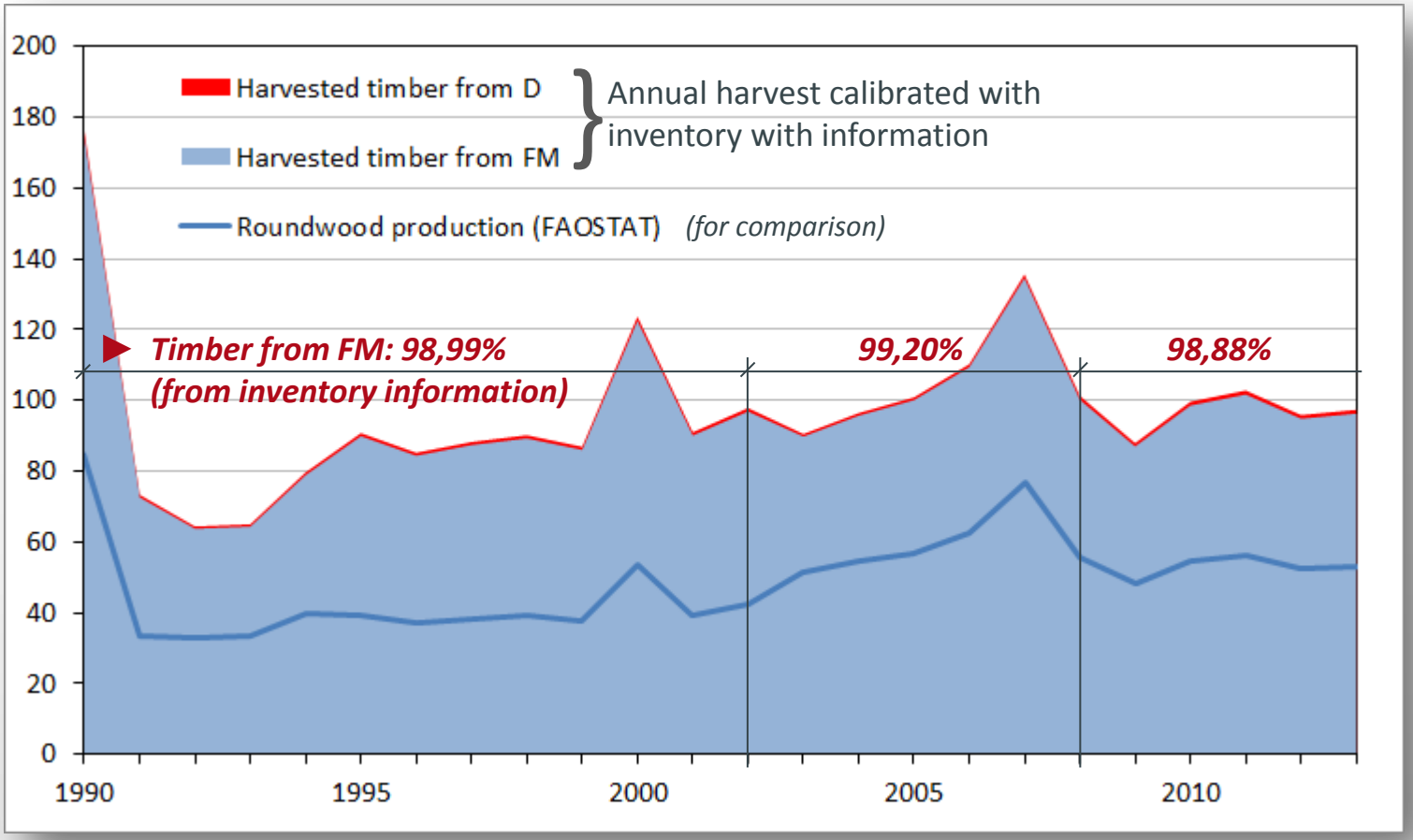


▶ *"In case it is not possible to differentiate between the harvest from AR and FM, it is conservative and in line with good practice to assume that all HWP entering the accounting framework originate from FM" (IPCC 2014, page 118)*

Implementation of IPCC 2013 KP Supplement

Section 2.8.1: STEP 2.2 Allocation of harvest to forest activities AR, D and FM

Example: Allocation of harvest to KP activities as estimated for Germany [in Mm³]



IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

- **STEP 2: "Check whether HWP categories originate from forests that are accounted for by the country and allocate HWP to the particular forest related activity"**
  - **2.1: Estimate the share of HWP originating from forests within the country**
  - **2.2: Estimate the share of HWP originating from ARD and FM**
  - **2.3: Combine the information from STEPS 2.1 and 2.2 with the annual production of the HWP commodity categories obtained from STEP 1**

▶ ***See "Implementation of STEP 2.3" on page 118***

▶ ***The amount of HWP entering the accounting framework (i.e. activity data) is obtained by combining the information from STEPS 2.1 and 2.2 with the annual production of the HWP commodity categories obtained from STEP 1.***

EQUATION 2.8.4
ESTIMATION OF ANNUAL HWP AMOUNTS PRODUCED FROM DOMESTIC HARVEST RELATED TO ACTIVITIES UNDER ARTICLE 3, PARAGRAPHS 3 AND 4

$$HWP_j(i) = HWP_P(i) \bullet f_{DP}(i) \bullet f_j(i)$$

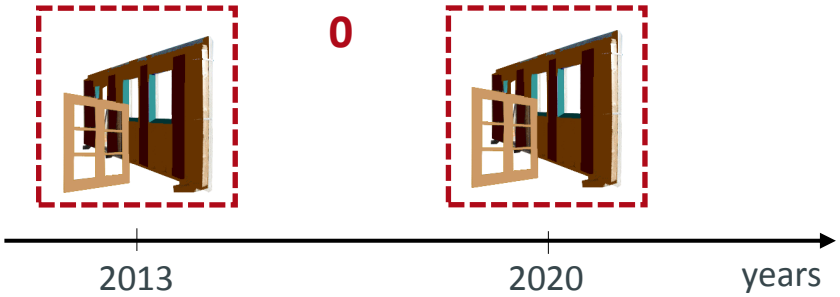
with: $f_{DP}(i) = f_{IRW}(i)$ for HWP categories 'sawnwood' and 'wood-based panels'; and
$(f_{IRW}(i) \bullet f_{PULP}(i))$ for HWP category 'paper and paperboard'
with: $f_{IRW}(i) = 0$ if $f_{IRW}(i) < 0$ and $f_{PULP}(i) = 0$ if $f_{PULP}(i) < 0$

Implementation in IPCC 2013 KP Supplement

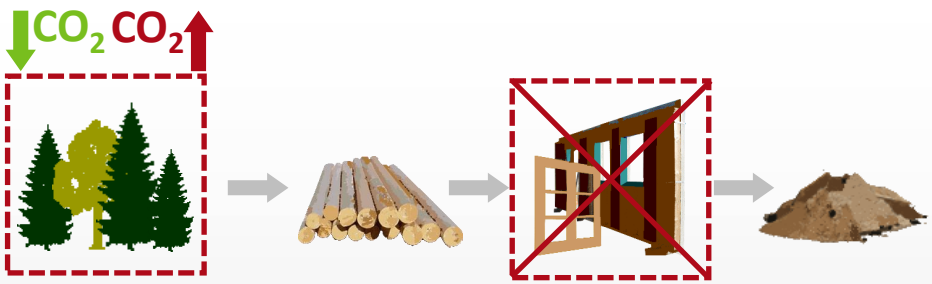
Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

- **STEP 3: "Check the availability of country-specific information and estimate carbon stock in HWP and its annual change"**
  - **3.1: Check whether HWP originate from D?**

▶ *Apply Tier 1 "Instantaneous oxidation", see Section 2.8.2*



▶ *Assumption that C HWP pool is stable over time (Inflow = outflow); this corresponds to an estimate of no change in HWP carbon stocks*



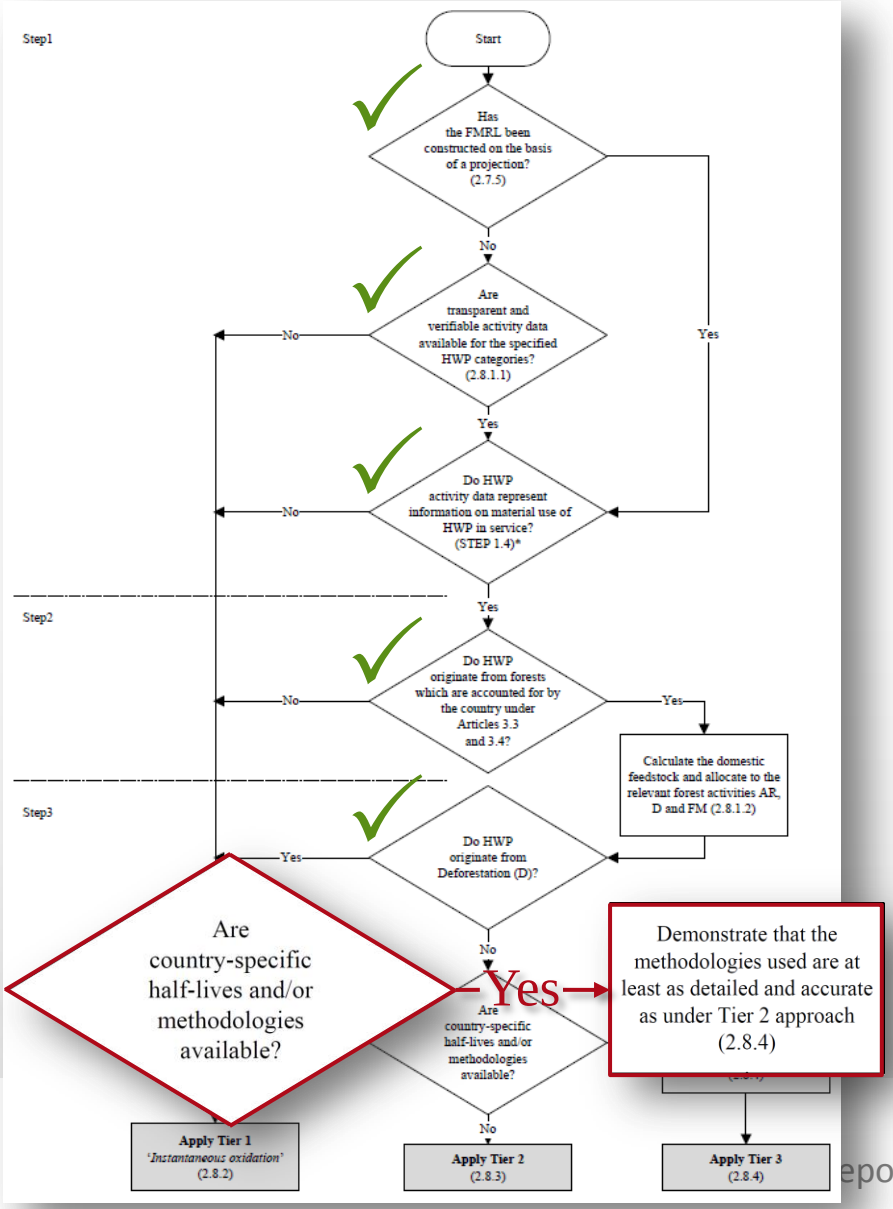
▶ *No estimation on HWP pool necessary, as by definition: net-emissions = 0*

▶ *"For the KP CP1, the storage of carbon in HWP was not included in the reporting since "the mere presence of carbon stocks be excluded from accounting" (Decision 16/CMP.1) and HWP were not listed as a pool covered by the Marrakesh Accords (IPCC 2003).*

▶ *No reporting and/or accounting of net-emissions from HWP in CP1." (IPCC 2013 KP Supplement)*

Implementation in IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS



Default: Instantaneous oxidation (paragraph 28)

- No transparent and verifiable activity data (paragraphs 29 and 30)
- HWP in solid waste disposal sites and wood harvested for energy purposes (paragraph 31)
- HWP from deforestation (paragraph 32)

Accounting of HWP on the basis of change of the pool (paragraphs 29 and 30)

- Mandatory if projected FMRL has been used (paragraph 16)
- Mandatory if transparent and verifiable activity data are available (paragraphs 29 and 30)
- HWP removed from forests which are accounted for by the country (paragraph 27)

THÜNEN

Implementation in IPCC 2013 KP Supplement

Section 2.8.1: Initial steps – Decision tree (Figure 2.8.1) and description of STEPS

- **STEP 3: "Check the availability of country-specific information and estimate carbon stock in HWP and its annual change"**
  - **3.1: Check whether HWP originate from D?**
  - **3.2 / 3.3 / 3.4: Check whether country-specific activity data / half-life values / methods are available**
    - ► ***Apply Tier 3, Section 2.8.4 (Country-specific methods), 2.8.4.1, and 2.8.4.2 (Country-specific emission factors)***
  - **3.5: Unable to apply a Tier 3 method:**
    - ► ***Apply Tier 2, see Section 2.8.3 (First Order Decay)***

Estimating the HWP contribution

Section 2.8.3: First order decay (Tier 2)

- **First order decay method: Equation 2.8.5 (page 122)**

EQUATION 2.8.5
ESTIMATION OF CARBON STOCKS AND ANNUAL CARBON STOCK CHANGES IN HWP POOL OF THE REPORTING COUNTRY

$$C(i+1) = e^{-k} \bullet C(i) + \left[\frac{(1-e^{-k})}{k}\right] \bullet Inflow(i)$$

$$\Delta C(i) = C(i+1) - C(i)$$

Sources: IPCC 2006 ; Pingoud and Wagner 2006

- **Combination of activity data with emission factor**

► ***Implementation of Equation 2.8.5: see e.g. IPCC 2006 spreadsheet model***

- **Calculation of C in activity data: Table 2.8.1 (page 123)**
  - **Default carbon conversion factors**

TABLE 2.8.1
DEFAULT CONVERSION FACTORS FOR THE DEFAULT HWP CATEGORIES AND THEIR SUBCATEGORIES

HWP categories	Density (oven dry mass over air dry volume) [Mg / m³]	Carbon fraction	C conversion factor (per air dry volume) [Mg C / m³]	Source
Sawn wood (*aggregate*)	0.458	0.5	0.229	1
Coniferous sawnwood	0.45	0.5	0.225	2
Non-coniferous sawnwood	0.56	0.5	0.28	2
Wood-based panels (*aggregate*)	0.595	0.454	0.269	3
Hardboard (HDF)	0.788	0.425	0.335	4
Insulating board (Other board, LDF)	0.159	0.474	0.075	5
Fibreboard compressed	0.739	0.426	0.315	6
Medium-density fibreboard (MDF)	0.691	0.427	0.295	4
Particle board	0.596	0.451	0.269	4
Plywood	0.542	0.493	0.267	7
Veneer sheets	0.505	0.5	0.253	8
	(oven dry mass over air dry mass) [Mg / Mg]		(per air dry mass) [Mg C / Mg]	
Paper and paperboard (*aggregate*)	0.9		0.386	9

[1] Calculated from the weighted average of coniferous and non-coniferous sawnwood production volumes (FAOSTAT average of the years 2006-2010) of the countries as listed in Appendix of the Annex of Decision 2/CMP.7
[2] IPCC 2003, Appendix 3a.1
[3] Calculated from the weighted average of included subcategories of the production volumes (FAOSTAT average of the years 2006-2010) of the countries as listed in Appendix of the Annex of Decision 2/CMP.7
[4] Rüter and Diederichs (2012)
[5] Derived from Environmental product declarations EPD-GTX-2011111-E, EPD-KRO-2009212-E and EPD-GTX-2011211-E provided by IBU e.V. (http://bau-umwelt.de/hp550/Insulating-materials.htm)

l basic density for non-coniferous species listed in the table above
nd 50% of sawnwood (Non-Coniferous)
ed subcategories of the production volumes (FAOSTAT average of the years 2006-2010)
nex of Decision 2/CMP.7, including information derived from Fengel and Wegener
l industry information.

- **Default half-live values: Table 2.8.2**
  - **Paper and paperboard**
  - **Wood-based panels**
  - **Sawnwood**

TABLE 2.8.2
TIER 2 DEFAULT HALF-LIVES[141] OF HWP CATEGORIES

HWP categories[142]	Default half-lives (years)
Paper	2
Wood panels	25
Sawn wood	35

Sebastian Rüter

Estimating the HWP contribution

Section 2.8.3: First order decay (Tier 2)

- **New element of FOD equation: Equation 2.8.6**
  - **Calculation of the C pool at initial time (t_0):**

EQUATION 2.8.6
APPROXIMATION OF THE CARBON STOCKS IN HWP POOLS AT INITIAL TIME, I.E. SINCE WHEN ACTIVITY DATA ARE AVAILABLE

$$C(t_0) = \frac{Inflow_{average}}{k}$$

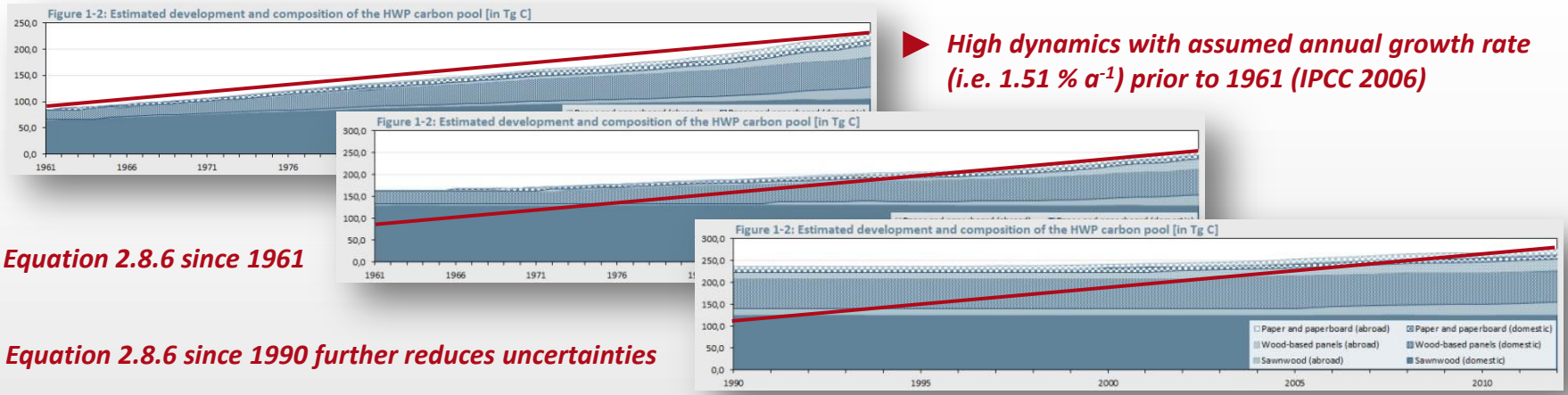
With: $Inflow_{average} = \left(\sum_{i=t_0}^{t_4} Inflow(i)\right)/5$

▶ ***Availability of data series varies, uncertainties with values could be high (e.g. FAOSTAT since 1961)***

▶ ***Assumption that HWP pools are in steady state at the initial time t_0: $\Delta C(t_0)$***

▶ ***Mandatory for countries using no projected FMRL (inherited emissions from historic pool cancel out in the case of accounting against a projected FMRL)***

Examples (development of historic HWP C pool in Germany):



▶ ***High dynamics with assumed annual growth rate (i.e. 1.51 % a^{-1}) prior to 1961 (IPCC 2006)***

▶ ***Equation 2.8.6 since 1961***

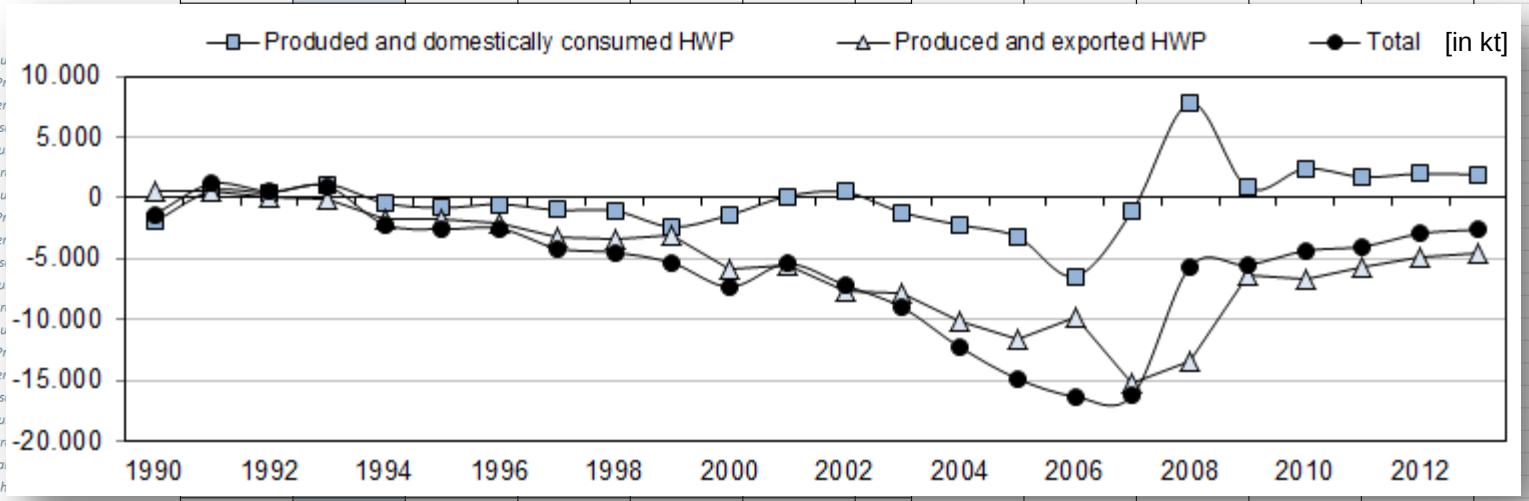
▶ ***Equation 2.8.6 since 1990 further reduces uncertainties***

Estimating the HWP contribution

Section 2.8.3: First order decay (Tier 2)

Example: Results for required data (incl. net-emissions) for HWP in Germany

	KATEGORISIERUNG UMWELTBUNDESAMT							TIMESERIES / ZEITREIHEN					
ZSE Sortierung: 1) QG:Name 2) Wertetyp:Name 3) Material:Name 4) Ts:Name	Raumbezug:Na	QG:Name	Wertetyp:Nai	Schadstoff:Na	Material:Nar	Ts:Name	Un	1990	1991	1992	1993	1994	1995
KP HWP, 3.3 Einschlag von Derbholz	Deutschland	KP C Harvested W	Aktivitätsrate		Rundholz	Einschlag von Der	m³	1.777.418	740.993	650.622	656.793	804.927	917.366
KP HWP, 3.4 Einschlag von Derbholz	Deutschland	KP C Harvested W	Aktivitätsrate		Rundholz	Einschlag von Der	m³	174.111.601	72.585.854	63.733.408	64.337.822	78.848.696	89.862.962
KP HWP, 3.4 CO2-Emissionen aus exportierten Holzwerkstoffen	Deutschland	KP C Harvested W	Emission	Kohlendioxid	Holzwerkstoffe	CO2-Emissionen a	kt	166	132	106	-17	-422	-386
KP HWP, 3.4 CO2-Emissionen aus heimischen Holzwerkstoffen	Deutschland	KP C Harvested W	Emission	Kohlendioxid	Holzwerkstoffe	CO2-Emissionen a	kt	-596	569	533	-105	-408	-694
KP HWP, 3.4 CO2-Emissionen aus exportiertem Papier und Pappe	Deutschland	KP C Harvested W	Emission	Kohlendioxid	Papier und Pappe	CO2-Emissionen a	kt	385	343	-144	-233	-949	-953
KP HWP, 3.4 CO2-Emissionen aus heimischem Papier und Pappe	Deutschland	KP C Harvested W	Emission	Kohlendioxid	Papier und Pappe	CO2-Emissionen a	kt	328	-75	-15	-158	-343	-115
KP HWP, 3.4 CO2-Emissionen aus exportiertem Schnittholz	Deutschland	KP C Harvested W	Emission	Kohlendioxid	Schnittholz	CO2-Emissionen a	kt	45	109	131	85	-386	-408
KP HWP, 3.4 CO2-Emissionen aus heimischem Schnittholz	Deutschland	KP C Harvested W	Emission	Kohlendioxid	Schnittholz	CO2-Emissionen a	kt	-1.688	109	-65	1.400	345	7
KP HWP, 3.4 Faktor für Speicherberechnung	Deutschland	KP C Harvested W	Halbwertszeit		Holzwerkstoffe	Faktor für Speiche	a	25	25	25	25	25	25
KP HWP, 3.4 Faktor für Speicherberechnung	Deutschland	KP C Harvested W	Halbwertszeit		Holzwerkstoffe	Faktor für Speiche	a	25	25	25	25	25	25
KP HWP, 3.4 Faktor für Speicherberechnung	Deutschland	KP C Harvested W	Halbwertszeit		Papier und Pappe	Faktor für Speiche	a	2	2	2	2	2	2
KP HWP, 3.4 Faktor für Speicherberechnung	Deutschland	KP C Harvested W	Halbwertszeit		Papier und Pappe	Faktor für Speiche	a	2	2	2	2	2	2
KP HWP, 3.4 Faktor für Speicherberechnung													35
KP HWP, 3.4 Faktor für Speicherberechnung													35
KP HWP, 3.4 Abnahme des Export aus heimischer Produ													-383
KP HWP, 3.4 Abnahme des Verbrauch aus heimischer Pr													-2.033
KP HWP, 3.4 Netto-Änderung des Export aus heimischer													105
KP HWP, 3.4 Netto-Änderung des Verbrauch aus heimis													189
KP HWP, 3.4 Zunahme des Export aus heimischer Produ													488
KP HWP, 3.4 Zunahme des Verbrauch aus heimischer Pr													2.222
KP HWP, 3.4 Abnahme des Export aus heimischer Produ													-1.232
KP HWP, 3.4 Abnahme des Verbrauch aus heimischer Pr													-2.071
KP HWP, 3.4 Netto-Änderung des Export aus heimischer													260
KP HWP, 3.4 Netto-Änderung des Verbrauch aus heimis													31
KP HWP, 3.4 Zunahme des Export aus heimischer Produ													1.492
KP HWP, 3.4 Zunahme des Verbrauch aus heimischer Pr													2.102
KP HWP, 3.4 Abnahme des Export aus heimischer Produ													-325
KP HWP, 3.4 Abnahme des Verbrauch aus heimischer Pr													-2.667
KP HWP, 3.4 Netto-Änderung des Export aus heimischer													111
KP HWP, 3.4 Netto-Änderung des Verbrauch aus heimis													-2
KP HWP, 3.4 Zunahme des Export aus heimischer Produ													436
KP HWP, 3.4 Zunahme des Verbrauch aus heimischer Pr													2.665
KP HWP, 3.4 Exportierter Speicher Holzwerkstoffe am Ja													13.744
KP HWP, 3.4 Heimischer Speicher Holzwerkstoffe am Jah													73.221
KP HWP, 3.4 Exportierter Speicher Papier und Pappe am Jahresanfang	Deutschland	KP C Harvested W	Kohlenstoffspeich	Kohlenstoff	Papier und Pappe	Exportierter Speic	kt	3.255	3.150	3.056	3.096	3.159	3.418
KP HWP, 3.4 Heimischer Speicher Papier und Pappe am Jahresanfang	Deutschland	KP C Harvested W	Kohlenstoffspeich	Kohlenstoff	Papier und Pappe	Heimischer Speich	kt	5.886	5.797	5.818	5.822	5.865	5.958
KP HWP, 3.4 Exportierter Speicher Schnittholz am Jahresanfang	Deutschland	KP C Harvested W	Kohlenstoffspeich	Kohlenstoff	Schnittholz	Exportierter Speic	kt	16.327	16.315	16.286	16.250	16.227	16.332
KP HWP, 3.4 Heimischer Speicher Schnittholz am Jahresanfang	Deutschland	KP C Harvested W	Kohlenstoffspeich	Kohlenstoff	Schnittholz	Heimischer Speich	kt	134.704	135.165	135.135	135.153	134.771	134.677
KP HWP Einschlag von Derbholz	Deutschland	KP C Harvested W	Aktivitätsrate		Rundholz	Einschlag von Der	m³	175.889.019	73.326.847	64.384.031	64.994.614	79.653.623	90.780.328



Sebastian Rüter

Reporting of net-emissions from HWP

Convention reporting *(Table 4.G s1)*

TABLE 4(KP-I)C. SUPPLEMENTARY BACKGROUND FOR LAND USE, LAND-USE CHANGE AND FORESTRY ACTIVITIES UNDER THE KYOTO PROTOCOL

Carbon stock changes in the harvested wood products (HWP) pool[1]

Inventory year 2013

Submission year 2015

ORIG		Harvest[2]	categories[3]	Subcategories[4]		(yrs)	(kt C)	(kt C)		Net change	Net CO_2 emissions/removals (kt CO_2eq)
TOTAL		97.362.372,19	TOTAL				282.744,92	11.973,84	-11.268,00	705,84	-2.588,08
Article 3.3 activity	From land subject to afforestation/reforestation	NA	Total for HWP_{AR}					NA	NA	NA	NA
			Total for category					NA	NA	NA	NA
			e.g. sawn wood		Drop-down list						
					Domestically consumed	NA	NA	NA	NA	NA	NA
					Exported	NA	NA	NA	NA	NA	NA
			Total for category				NA	NA	NA	NA	NA
			...		Drop-down list						
					Domestically cons						
					Exported						
			Total for category				NA	NA	NA	NA	NA
					Drop-down list						
					Domestically consumed	NA	NA	NA	NA	NA	NA
					ed	NA	NA	NA	NA	NA	NA
							NA	NA	NA	NA	NA
			Total for category				NA	NA	NA	NA	NA
	From land subject to Deforestation (8)	NA	e.g. sawn wood		Drop-down list						
					Domestically consumed						
					Exported						
			Total for category				NA	NA	NA	NA	NA
			...		Drop-down list						
					Domestically consumed	NA	NA	NA	NA	NA	NA
					Exported	NA	NA	NA	NA	NA	NA
			Total for category				NA	NA	NA	NA	NA
					Drop-down list						
					Domestically consumed	NA	NA	NA	NA	NA	NA
									A	NA	NA
							68,00			705,84	-2.588,08
Article 3.4 activity		96.272.841,10	Total for category				165.922,97	4.058,44	-3.293,57	764,87	-2.804,51
			sawn wood		Drop-down list						
					Domestically consumed	35,00	135.462,10	2.760,80	-2.683,49	77,32	-283,49
					Exported					5	-2.521,01
			Total for category							5	648,46
			wood-based panels		Drop-down list						
					Domestically consumed	25,00	73.[illegible]31,30	1.36[illegible],67	-2.037,72	-669,05	2.453,18
					Exported	25,00	28.198,94	1.280,89	-788,70	492,19	-1.804,71
			Total for category				14.791,72	5.265,84	-5.148,02	117,83	-432,04

Harvest (TOTAL, from land subject to AR, land subject to FM, land subject to D

Applied half-life value

Net change and net CO2 (= emissions/removals)

HWP subcategories (e.g. particle board)

Initial stock (beginning of the reporting year)

HWP categories (i.e. sawnwood, wood-based panels, paper and paperboard)

Gains (= inflow) and losses (= emissions)

Reporting of net-emissions from HWP

KP reporting *(Table 4(KP-I)C)*: deforestation lands – deforestation event

Article 3.3 activity	aff		Total for category					NA	NA	NA
					Drop-down list					
										NA
										NA
	From land subject to Deforestation (8)	NA								NA
										NA
			e.g. sawn wood		Domestically consumed	NA	NA	NA	NA
					Exported	NA	NA	NA	NA
			Total for category				NA	NA	NA
			...		Drop-down list				
					Domestically consumed	NA	NA	NA	NA
					Exported	NA	NA	NA	NA
			Total for category				NA	NA	NA
			...		Drop-down list				
					Domestically consumed	NA	NA	NA	NA
					Exported	NA	NA	NA	NA
Article 3.4 activity	From land subject to forest management		Total for HWP_{FM}				282.744,92	11.973,84	-11.268,00
			Total for category				165.922,97	4.058,44	-3.293,57
			sawn wood		Drop-down list				
					Domestically consumed	35,00	135.462,10	2.760,80	-2.683,49
					Exported	35,00	30.460,87	1.297,63	-610,08
								2.649,56	-2.826,42
								1.368,67	-2.037,72
								1.280,89	-788,70
								5.265,84	-5.148,02
								2.192,36	-2.126,69
			paperboard		Exported	2,00	8.690,11	3.073,49	-3.021,32
Information items									
Harvest originating from deforestation events(8)		1.089.531,09							
Harvest from remaining lands(9)		NA							

HWP from land subject to Deforestation could be included, as intention and interpretation of Decision 2/CMP.7 was to exclude HWP from deforestation events

HWP from the deforestation event are to be accounted on the basis of instantaneous oxidation (i.e. no reporting)
Inclusion of harvest amounts associated with deforestation events in the reporting year for information only

Reporting of net-emissions from HWP

Convention reporting *(Table 4.G s1)*

TABLE 4.G SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY Year

Harvested wood products (HWP)[1] Submission

(Sheet 1 of 2)

APPROACH A[2]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES[3]
TOTAL HWP consumed domestically (ΔC HWPdom IU DC)
1. Solid wood[7]
Drop down list
Sawnwood
Wood panels
Other solid wood products
2. Paper and paperboard
3. Other *(please specify)*

APPROACH B[12]

Footnote 12

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	HWP in use from domestic harvest				Net emissions/ removals from HWP in use [6]
	Gains[4]	Losses[4]	Half-life[5]	Annual Change in stock (ΔC HWP IU DH)	
	(t C)		(yr)	(kt C)	(kt CO_2)
TOTAL HWP from domestic harvest (ΔC HWP IU DH)					
1. Solid wood[7]					
Drop down list					
Sawn wood					
Wood panels					
Other solid wood products					
2. Paper and paperboard					
3. Other *(please specify)*					
HWP produced and consumed domestically (ΔC HWPdom IU DH)[13]					
Total					
1. Solid wood[7]					
Drop down list					
Sawnwood					
Wood panels					
HWP produced and exported					
Drop down list					
Sawnwood					
Wood panels					
Other solid wood products					
2. Paper and paperboard					
3. Other *(please specify)*					

[12] Production approach. Refer to equations 12.1, 12.3 and 12.A.6 of volume 4 of the 2006 IPCC Guidelines **or any other IPCC methodological guidance reflecting this approach**.

- ***Allows for the application of IPCC 2013 KP Supplement guidance in Section 2.8 to consistently estimate and report the HWP contribution, both under KP and under the convention***

Thank you for your attention

Contact:

Sebastian Rüter
Thünen Institute of Wood Research

+49 40 73962-619
sebastian.rueter@ti.bund.de
www.holzundklima.de / www.ti.bund.de