Estimating and reporting of emissions/removals from living biomass/DOM and HWP associated with windthrow

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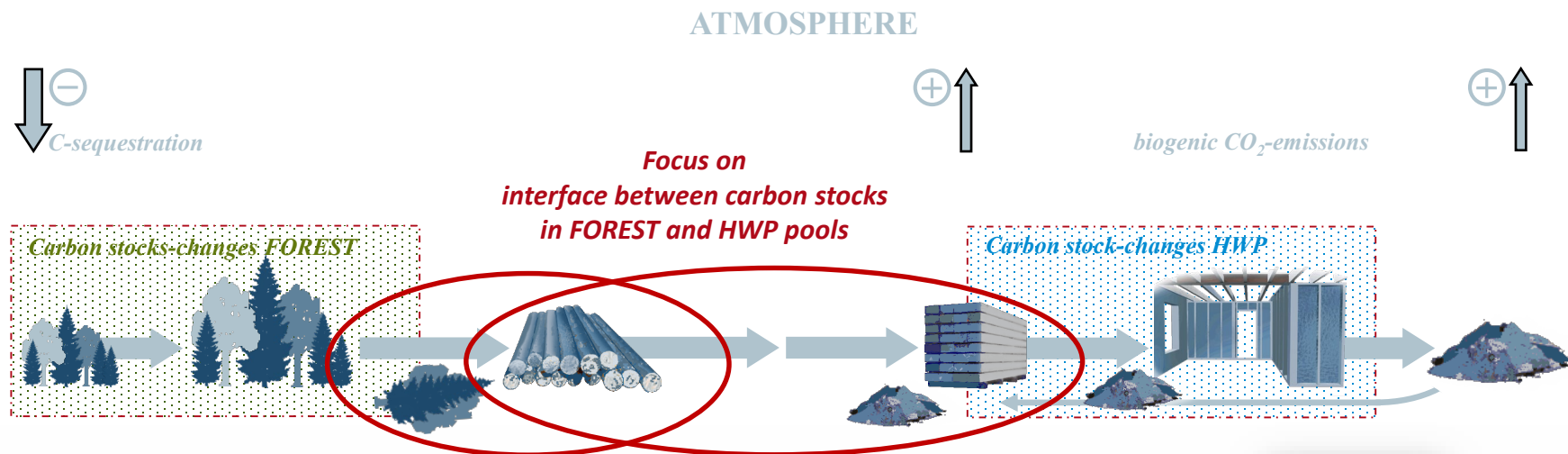
Hamburg/ Ispra
08 June 2021

*In order to approach the topic and address relevant aspects associated with the issue of **[consistently]** estimate and report emissions/removals from living biomass/DOM and HWP associated with windthrow, I would like to address…*

- **Methods** for estimating CO_2 emissions/removals along the forest-based value chain

- **Conceptual frameworks** of **approaches** for HWP

- **Reporting of windthrow in living biomass/DOM and HWP**: example of Germany

…as follow-up exercise of discussions we had just lately with COM, JRC and members of the review team in the context of the German trial review.
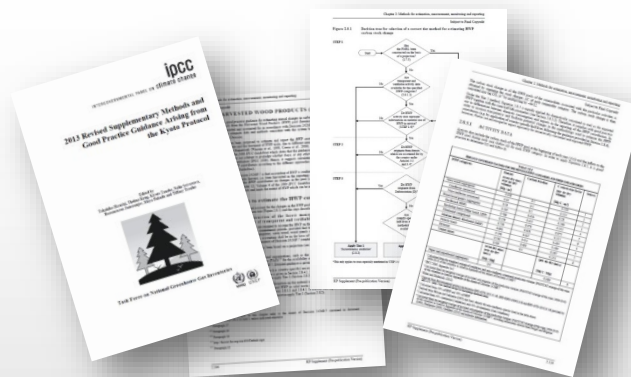
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Conceptual and methodological background
...for estimating emissions/removals from FORESTS and HWP along the value chain

ATMOSPHERE

C-sequestration

Focus on
interface between carbon stocks
in FOREST and HWP pools

biogenic CO_2-emissions

Carbon stocks-changes FOREST

Carbon stock-changes HWP

- Estimating annual 'CO₂ emissions by sources and their removals by sinks' from **FORESTS** (incl. living biomass & DOM) and **HARVESTED WOOD PRODUCTS** in line with the IPCC methodological guidelines
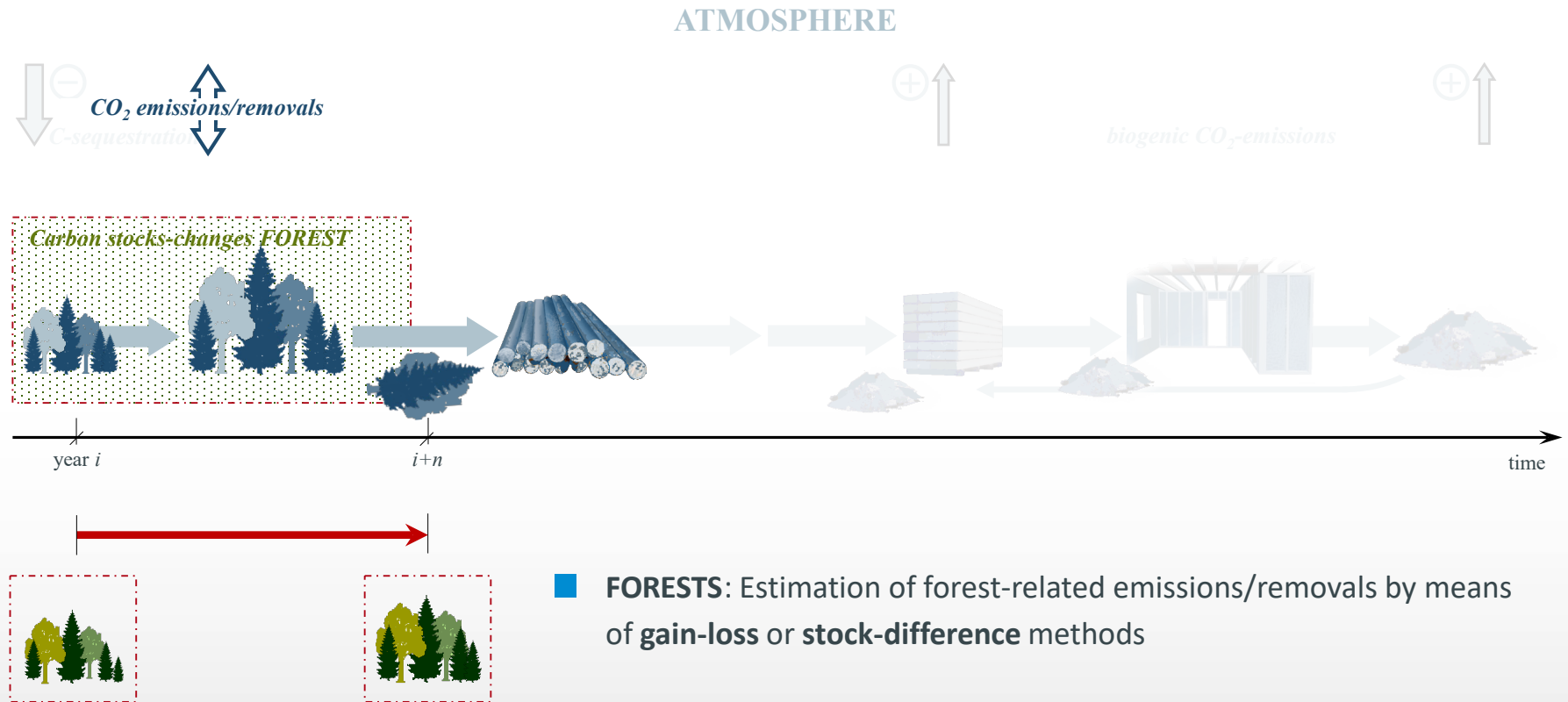
- IPCC 2006 GL (and 2019 Refinement), Volumes 4:
  - Chapter 2 GENERIC METHODOLOGIES APPLICABLE TO MULTIPLE LAND-USE CATEGORIES
  - Chapter 4 FOREST LAND
 - Chapter 12 HARVESTED WOOD PRODUCTS

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ATMOSPHERE

CO_2 *emissions/removals*

C-sequestration

biogenic CO_2-emissions

Carbon stocks-changes FOREST

year i $i+n$ time

FORESTS: Estimation of forest-related emissions/removals by means of **gain-loss** or **stock-difference** methods

■ The **stock-difference method** for estimating carbon stock-changes of living biomass & DOM is based on **National Forest Inventory (NFI) information**…

Inventory year i Inventory year $i+n$ Inventory year $i+2n$ time
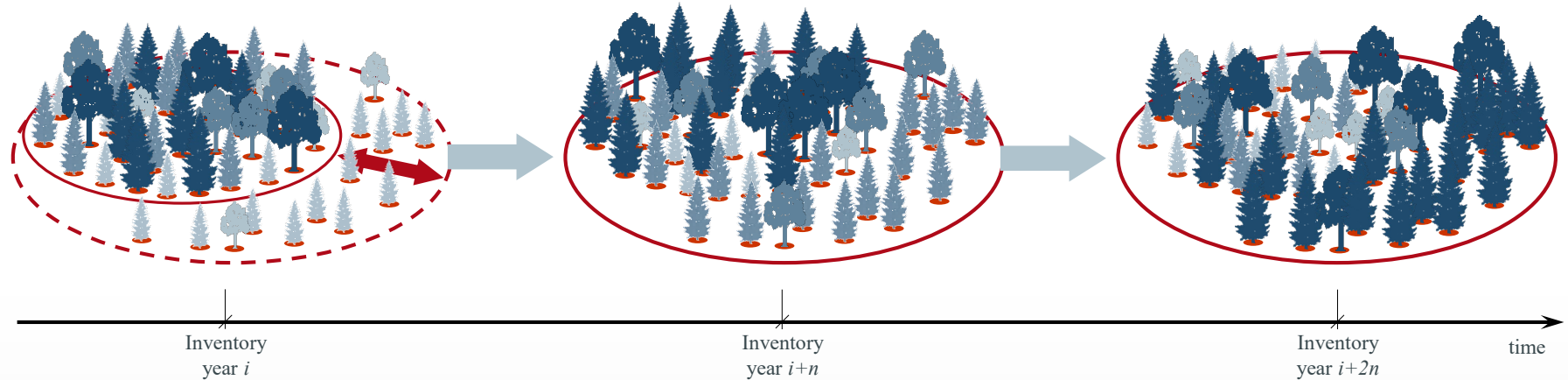
…covering:

▪ remaining forest areas (FLrFL) & forest management (KP Art. 3.4)
   (Land Use, Land Use-Change and **Forestry**)

▪ forest-associated land use-changes (Land Use, **Land Use-Change** and Forestry)
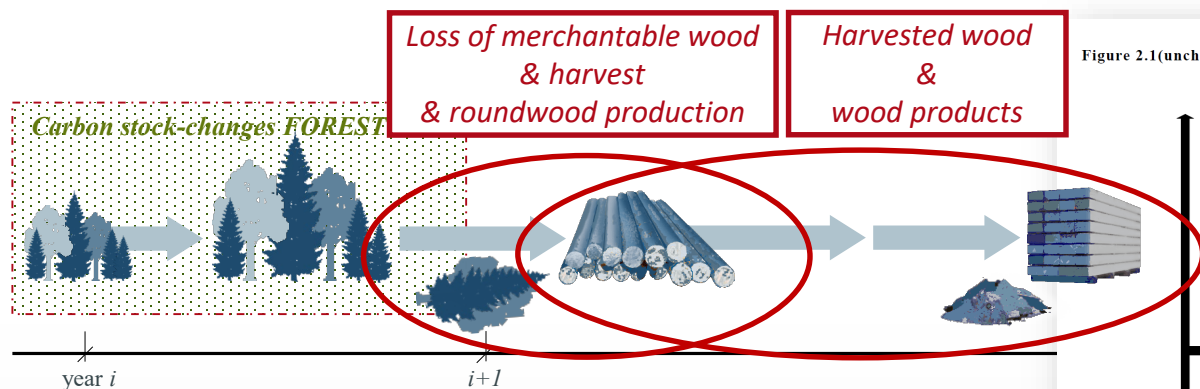
Age classes

Biomass growth:

■ **Reductions of living biomass** (i.e. standing trees) are recorded as **losses of merchantable wood** (volume of the stem with a diameter > 7cm diameter)

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- The **gain-loss method** for estimating carbon stock-changes of living biomass & DOM **is to be based on activity data** such as harvest, land-use change, and natural disturbances **that are available annually**

Loss of merchantable wood & harvest & roundwood production

Harvested wood & wood products
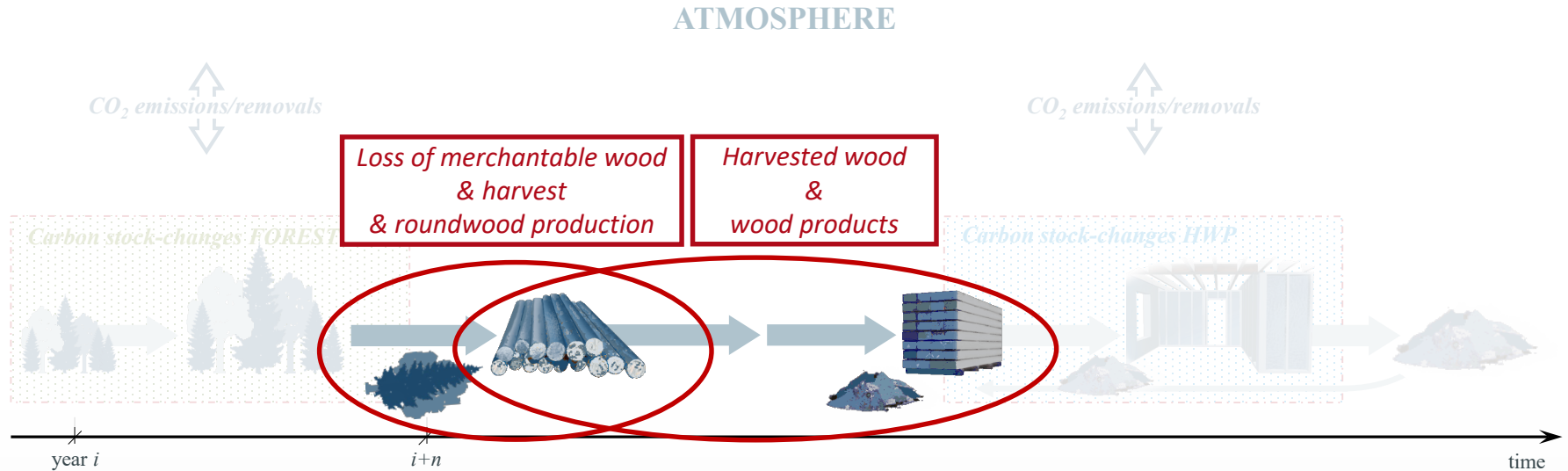
Carbon stock-changes FOREST

year *i*

i+1

Figure 2.1(unchanged) Generalized carbon cycle of terrestrial AFOLU ecosystems showing the flows of carbon into and out of the system as well as between the five C pools within the system.

Challenge ▶ very **different sources** of data with **heterogenous quality**, varying **temporal representativeness** and **validity**
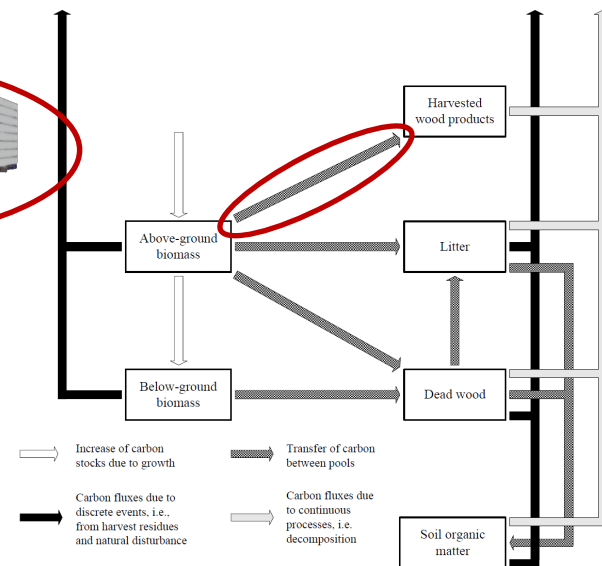
Source: IPCC (2019) R Vol 2 Ch2, p. 9

Conceptual and methodological background

Biomass loss & harvest data: carbon loss from FOREST and feedstock for wood products

ATMOSPHERE

CO_2 emissions/removals

CO_2 emissions/removals

Loss of merchantable wood & harvest & roundwood production

Harvested wood & wood products

Carbon stock-changes FOREST

Carbon stock-changes HWP

year i

$i+n$

time

- **Loss of merchantable wood** (in reserve solid cubic metres, RSCM): information **derived from National Forest Inventories** every few years, including woody biomass losses along the subsequent process and value chain (bark, un-removed log piles, firewood for private households etc.)

- **(Industrial) roundwood production**: information could be derived from forest management units (on sold timber) or from **annual industry statistics** on the consumption of timber feedstock for manufacturing purposes (> country-specific)

- Manufacturing of **semi-finished wood products** (representing the material use of wood): production statistics of manufacturing (forest-based) industries (sawn mills, wood-based panel & paper mills) from national statistical offices
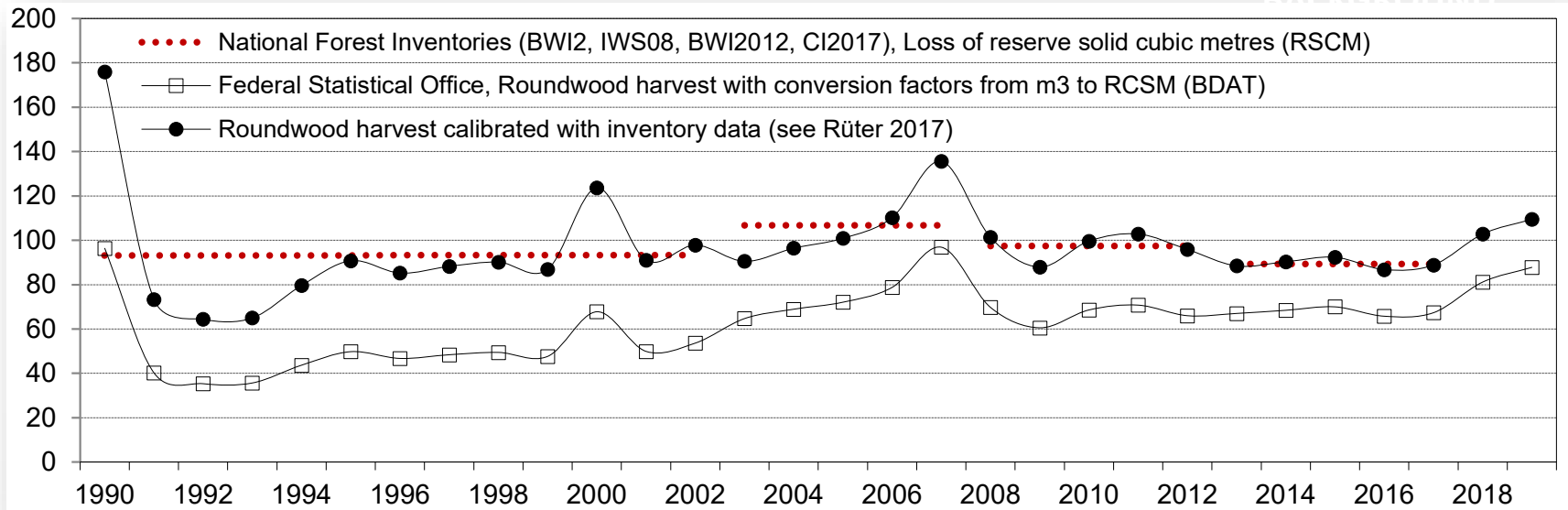
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Conceptual and methodological background

Example of woody material flow from harvest to wood products (Germany)
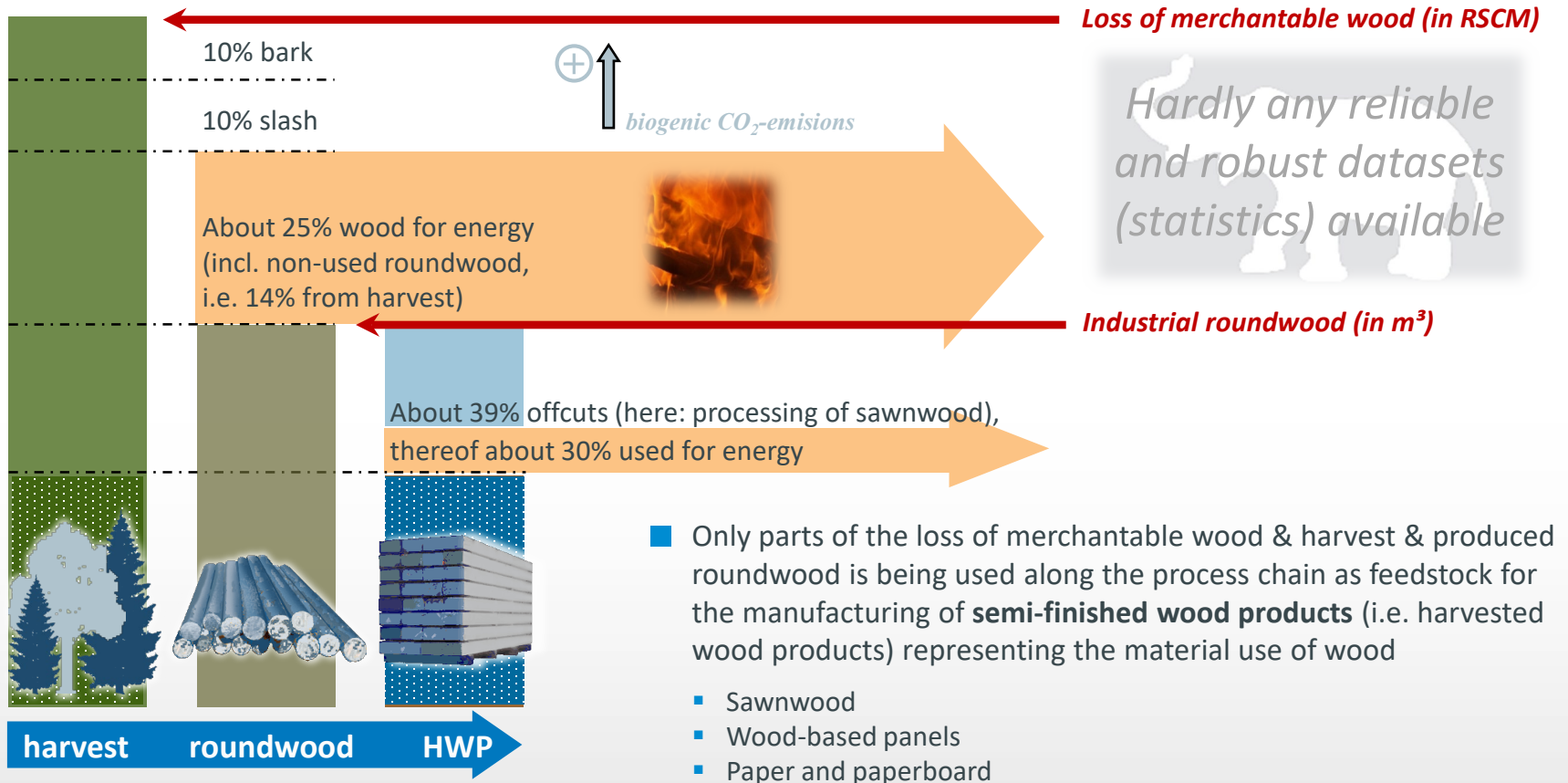
Loss of merchantable wood (in RSCM)

10% bark

10% slash

$+$ biogenic CO_2-emisions

Hardly any reliable and robust datasets (statistics) available

About 25% wood for energy (incl. non-used roundwood, i.e. 14% from harvest)

Industrial roundwood (in m³)

About 39% offcuts (here: processing of sawnwood), thereof about 30% used for energy

■ Only parts of the loss of merchantable wood & harvest & produced roundwood is being used along the process chain as feedstock for the manufacturing of **semi-finished wood products** (i.e. harvested wood products) representing the material use of wood

- Sawnwood
- Wood-based panels
- Paper and paperboard

harvest   roundwood   HWP

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Time series on harvest as part of HWP reporting requirements
Implementing the production approach based domestic feedstock (industrial roundwood) information

Source: German NIR, Umweltbundesamt (2021)

■ Since NIR 2015, Germany applies this calibrated harvest time series for HWP estimates and reports it as part of KP reporting (*Table 4(KP-I)C*)

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■ Statistical data on industrial roundwood is applied for estimating the annual fraction of the feedstock coming from domestic harvest calculate the domestic feedstock factor (f_{DP}) for estimating the domestically produced fraction of HWP commodities in line with KP Supplement (IPCC 2014) using the production approach (Equation 2.8.1 for the HWP categories sawnwood and wood-based panels)

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

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

Where:

$f_{IRW}(i)$ = share of industrial roundwood for the domestic production of HWP originating from domestic forests in year i.

$IRW_P(i)$ = production of industrial roundwood in year i, Gg C yr^{-1}

$IRW_{IM}(i)$ = import of industrial roundwood in year i, Gg C yr^{-1}

$IRW_{EX}(i)$ = export of industrial roundwood in year i, Gg C yr^{-1}

Source: IPCC (2014), p. 115

HWP: Estimation (tier 1 & tier 2) by means of **flux data method**

...applying:

- Statistical data of manufacturing (forest-based) industries

- Annual **production** data (production approach) for the commodities:
  - **sawnwood**
  - **wood-based panels**
  - **paper and paperboard**
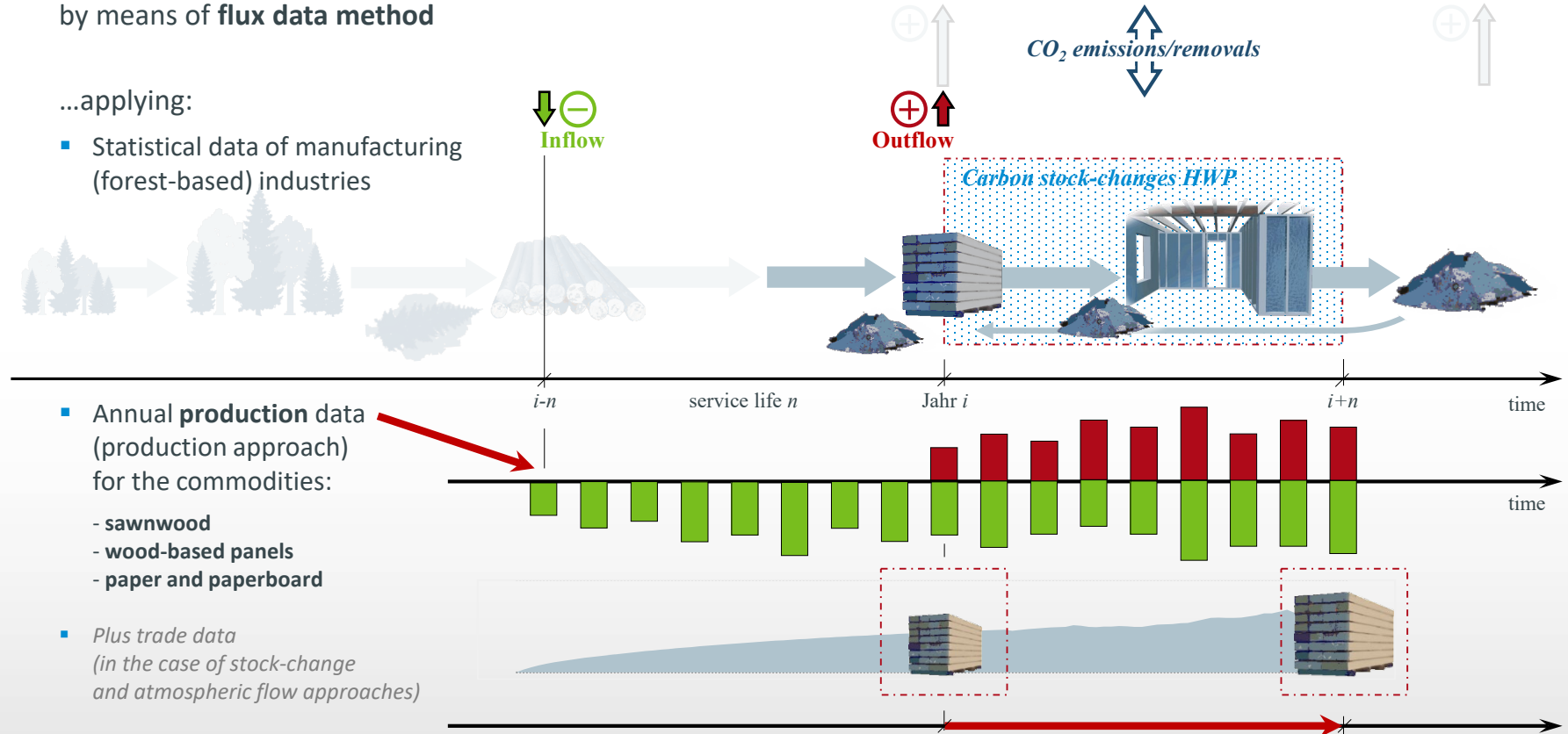
- *Plus trade data (in the case of stock-change and atmospheric flow approaches)*

ATMOSPHERE

CO_2 emissions/removals

Inflow

Outflow

Carbon stock-changes HWP

$i-n$ service life n Jahr i $i+n$ time

time

ATMOSPHERE

CO_2 emissions/removals

Gains — Losses

Carbon stock-changes FOREST

First conceptual framework:
Carbon losses along the
process chain

Gains — Carbon fluxes to and from the pool — Losses

Carbon stock-changes HWP

year i — i+n — time
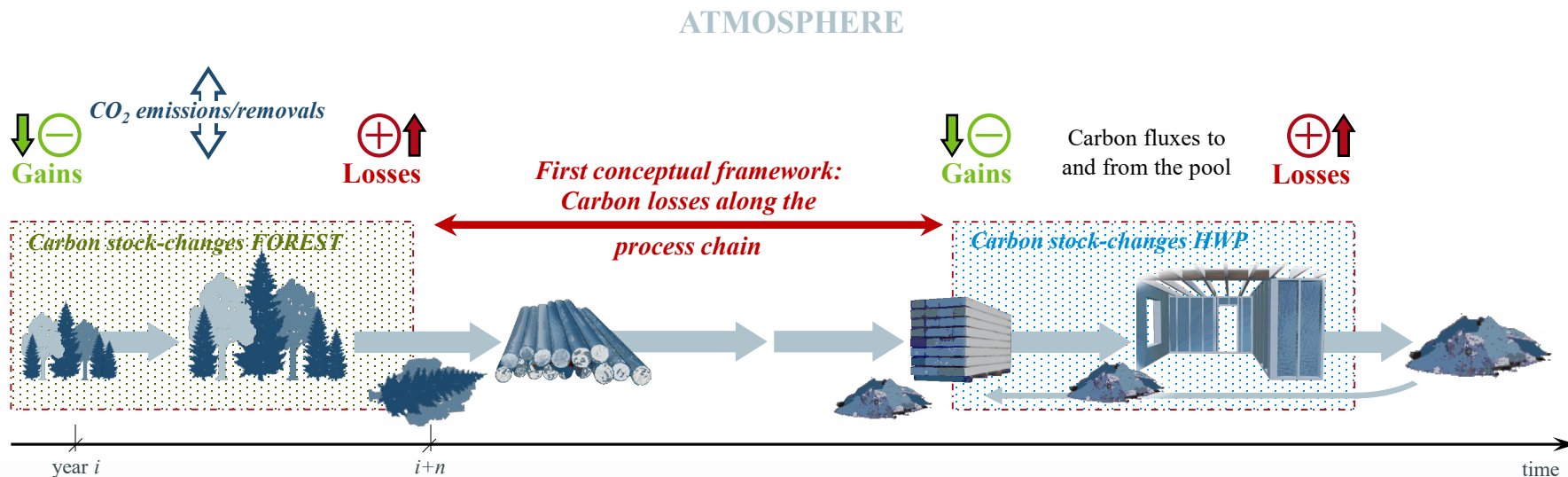
- "*The **first conceptual framework** focusses on the estimation of CO_2 emissions and removals arising from HWP on the basis of **changes in carbon stocks within defined HWP pools**. […]*

- *The **second conceptual framework** focusses on identifying and **quantifying actual CO_2 fluxes from and to the atmosphere** from HWP.* **[In theory, starting with forest growth (increase of living biomass) as part of the gain-loss method]**

- *The 'stock-change' and **'production' approach**[es are] **[is]** based on the first conceptual framework and the 'atmospheric-flow' […][approach is] based on the second conceptual framework.*"

- According to Decision 24/CP.19 (on the Revision of UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention), Parties can select between **three approaches**:

TABLE 4.G   SECTORAL BACKGROUND DATA FOR LAND USE, LAND-USE CHANGE AND FORESTRY
Harvested wood products (HWP)[1]
(Sheet 1 of 2)

Footnote 12

[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**.

► Intended to allow for the application of IPCC KP Supplement, Section 2.8 to consistently estimate and report the HWP contribution, both under KP and under the convention

► Possibility for an update to properly reflect the methodological elements associated with the 'production' approach as provided by latest IPCC guidance
  - IPCC 2019 Refinement (e. g. link to harvest and/or land use category)
  - (EU Regulation 2018/841)

Time series on harvest as part of HWP reporting requirements

Implementing the production approach based domestic feedstock (industrial roundwood) information
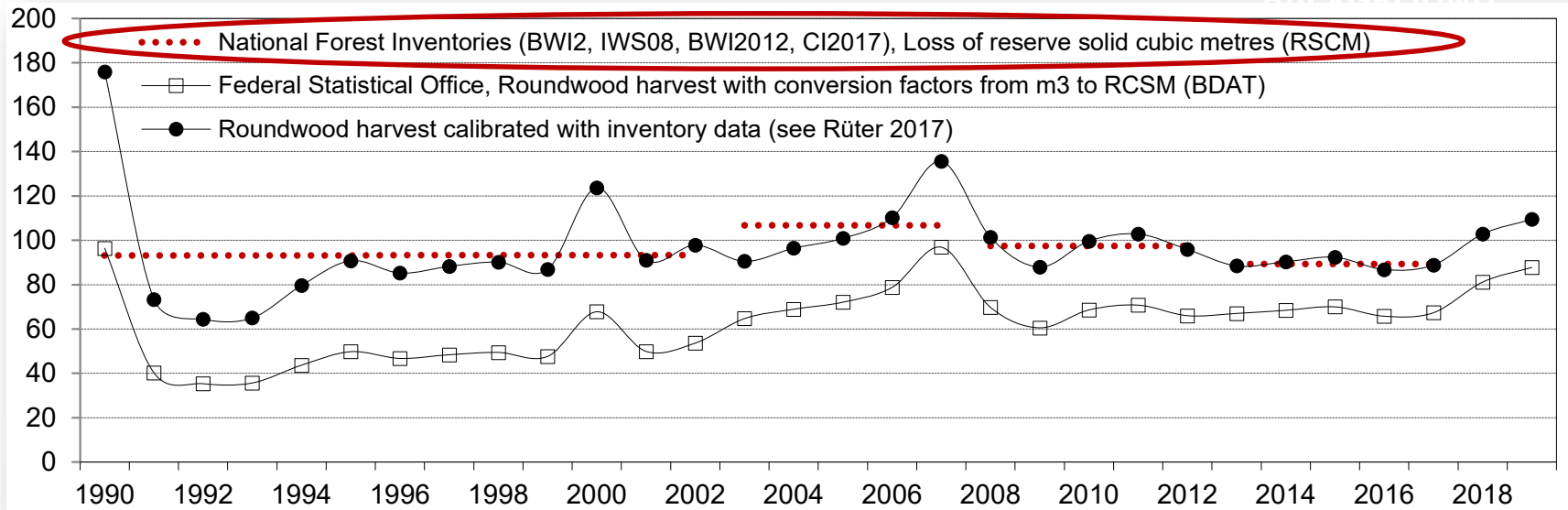
Source: German NIR, Umweltbundesamt (2021)

- Since NIR 2015, Germany applies this calibrated harvest time series for HWP estimates and reports it as part of KP reporting (*Table 4(KP-I)C*)

- Since NIR 2020, we also include further information on this calibration of the national harvest statistics provided by the National Statistical Office (on roundwood production, in m³) by means of National Forest Inventory information on losses of merchantable wood (in reserve solid cubic metres, RSCM), considering specific expansion factors for the main tree species (oak, beech, other nc, fir, pine)

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Reported emissions/removals from forests and HWP
German NIR 2020

BWI1987   **BWI2002**   **IS2008**   **BWI2012**   **CI2017**

1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018

Mt CO_2

10
-10
-30
-50
-70
-90

► *Since the first German FRL proposal being based on inventory data (2002-2007 period) got criticized for not being representative for the full reference period (2000-2009), it was decided to calibrate the time series with the harvest data*

- Deforestion
- FLrFL (NIR 2020)
- Afforestation
- HWP

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Reported emissions/removals from forests and HWP

German NIR 2021 – including time series recalculation based on calibrated harvest data

BWI1987

BWI2002

IS2008

BWI2012

CI2017

1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018

Mt CO_2

10

-10

-30

-50

-70

-90

► In result, also the emissions/removals for the year 1990 drop from -69,4 to -21,4 Mt CO_2e

□ Deforestion
⊞ FLrFL (NIR 2021, calibrated)
■ Afforestation
⊠ HWP

► Why is the year 1990 so specific (for Central Europe/Germany) and how do these harvest numbers relate to the HWP production?

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Conceptual and methodological background
Comparison of calculated harvest consumption with feedstock demand for relevant HWP production
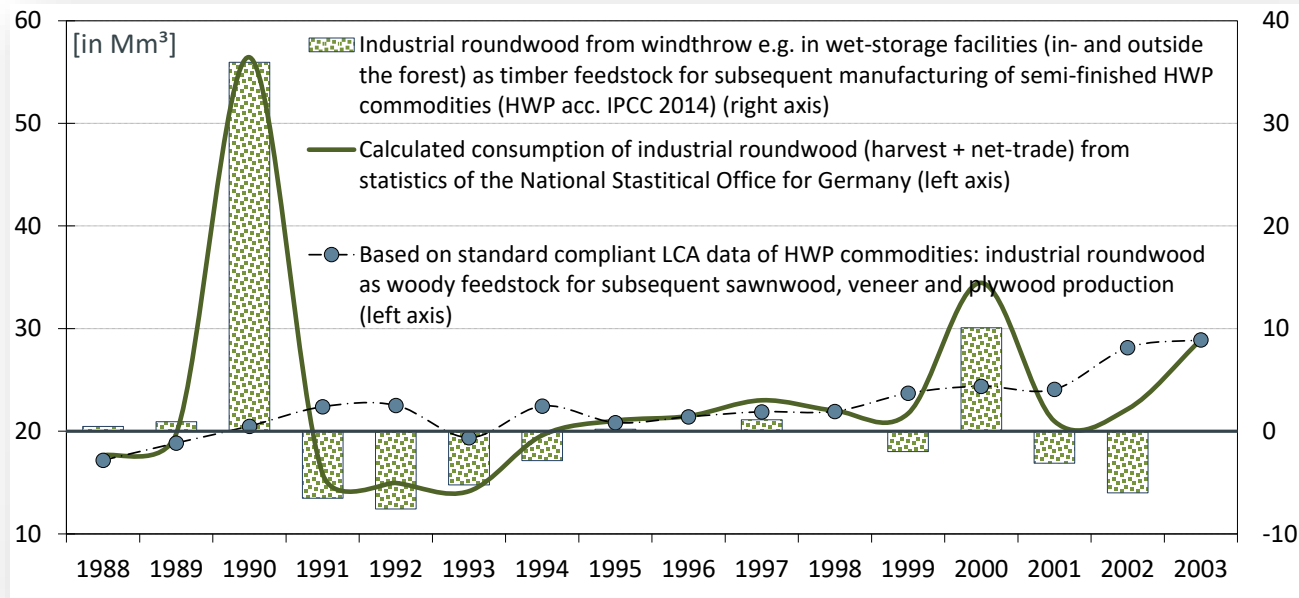
Source: Rüter (2017)

▶ **Due to windthrow** (in 1990 "Wiebke" and 2000 "Lothar"), there was a tremendous **surplus of industrial roundwood** as feedstock for subsequent HWP production: the **timber was salvage logged**, stored and **in subsequent years further processed**, whilst the **overharvest got compensated by reduced fellings** in the years after these disturbances

▶ In line with IPCC KP Supplement and 2019 Refinement, industrial roundwood enters HWP estimates as **feedstock commodity** only (production approach), *inter alia* to **avoid double counting**

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Thank you for your time and interest!

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