

# Alternative approaches for accounting for HWP

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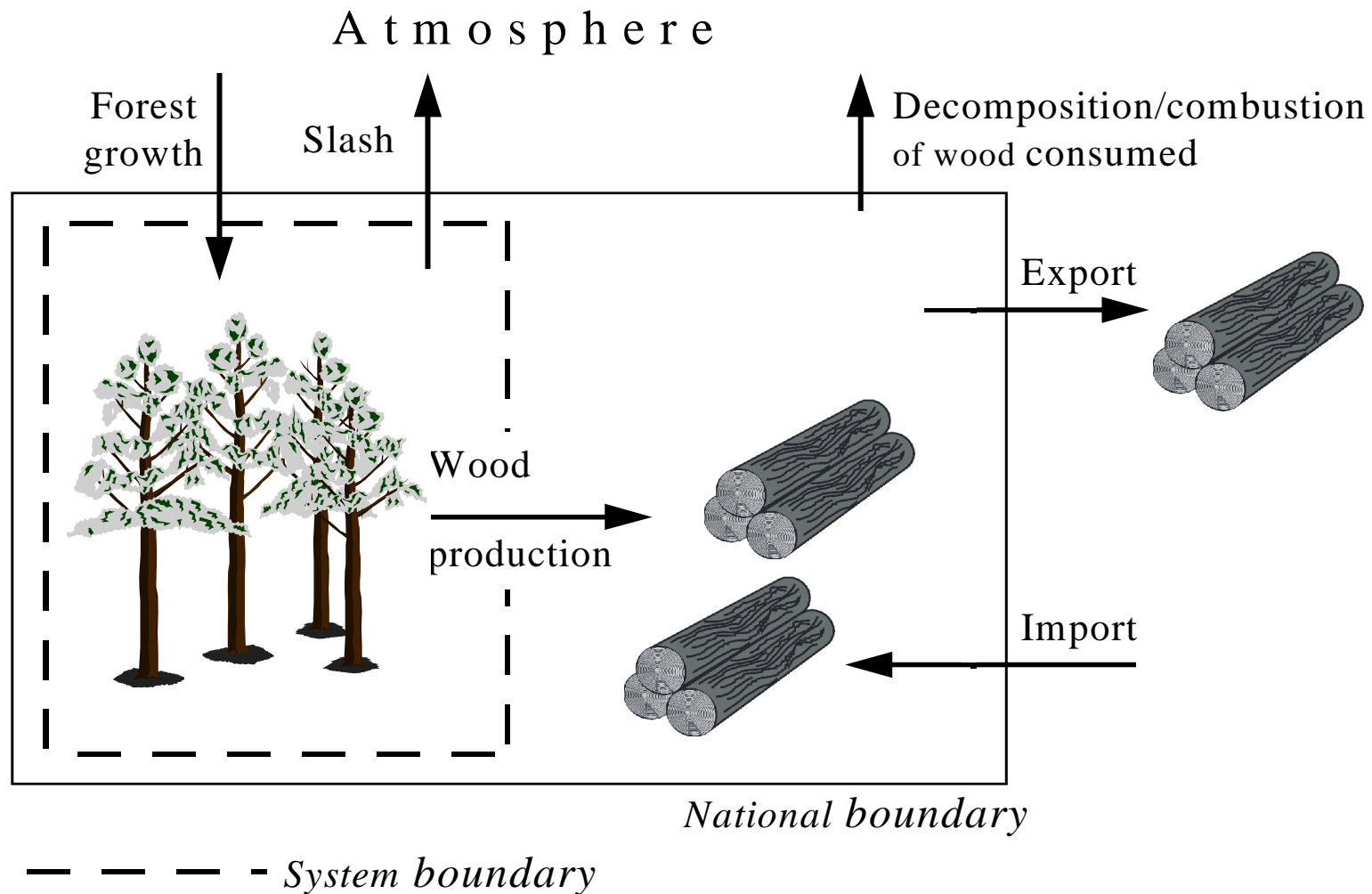
## Outline

- Basic alternative approaches for HWP accounting
- Inclusion of HWP to the accounting system of the LULUCF sector
- Pros and cons of the approaches with regard to the data
- Incentives/disincentives of the different approaches
- Some numerical estimates

# The basic accounting approaches for HWP and forests

# IPCC default approach

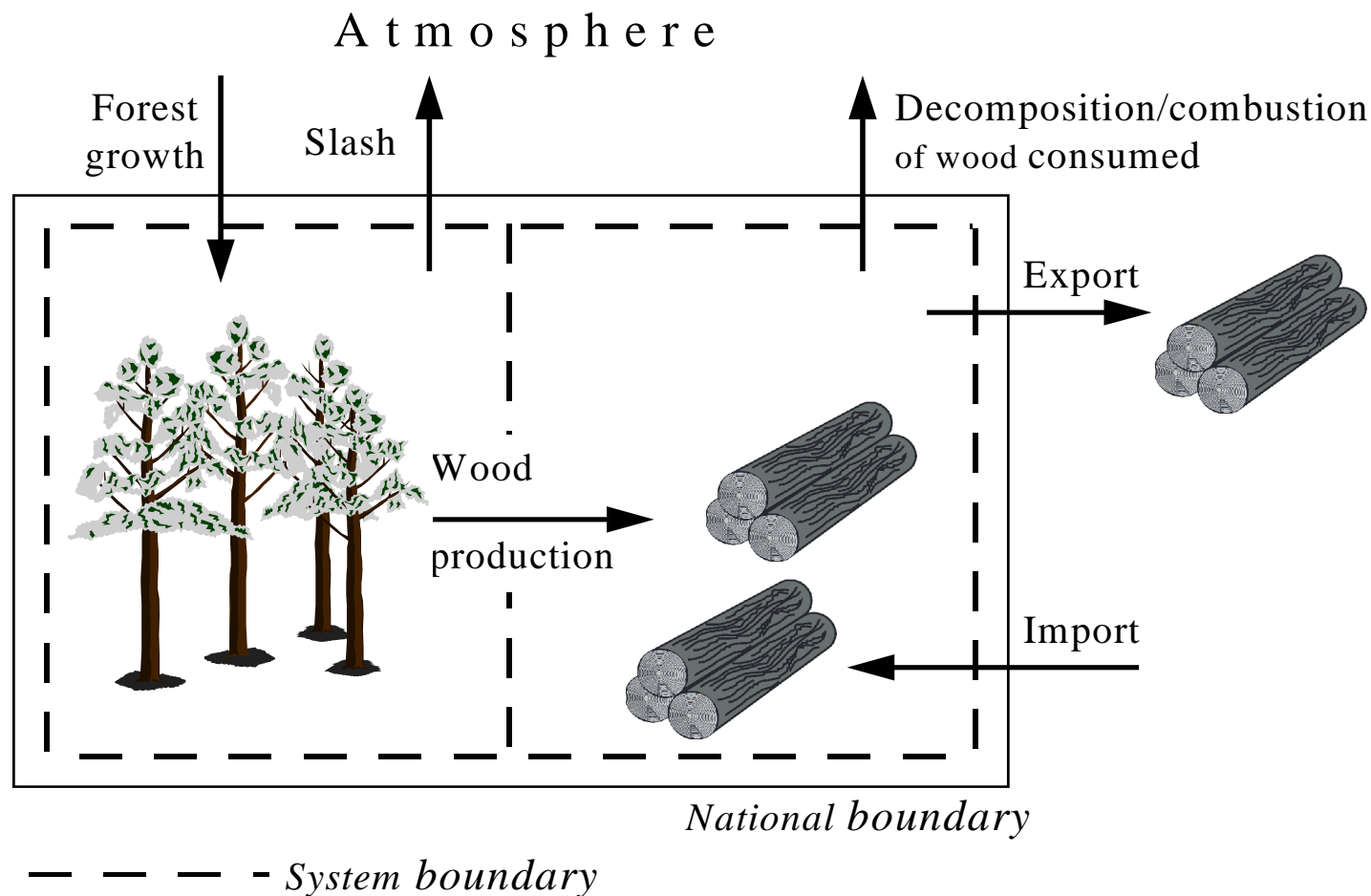
(considers only stock changes in forests: proposes, that stock changes in HWP = 0)



$$\begin{aligned}
 \text{Removal} &= \text{Stock change} = (\text{stock change forest}) \\
 &= (\text{forest growth} - \text{slash} - \text{wood production})
 \end{aligned}$$

*Removal due to HWP = 0*

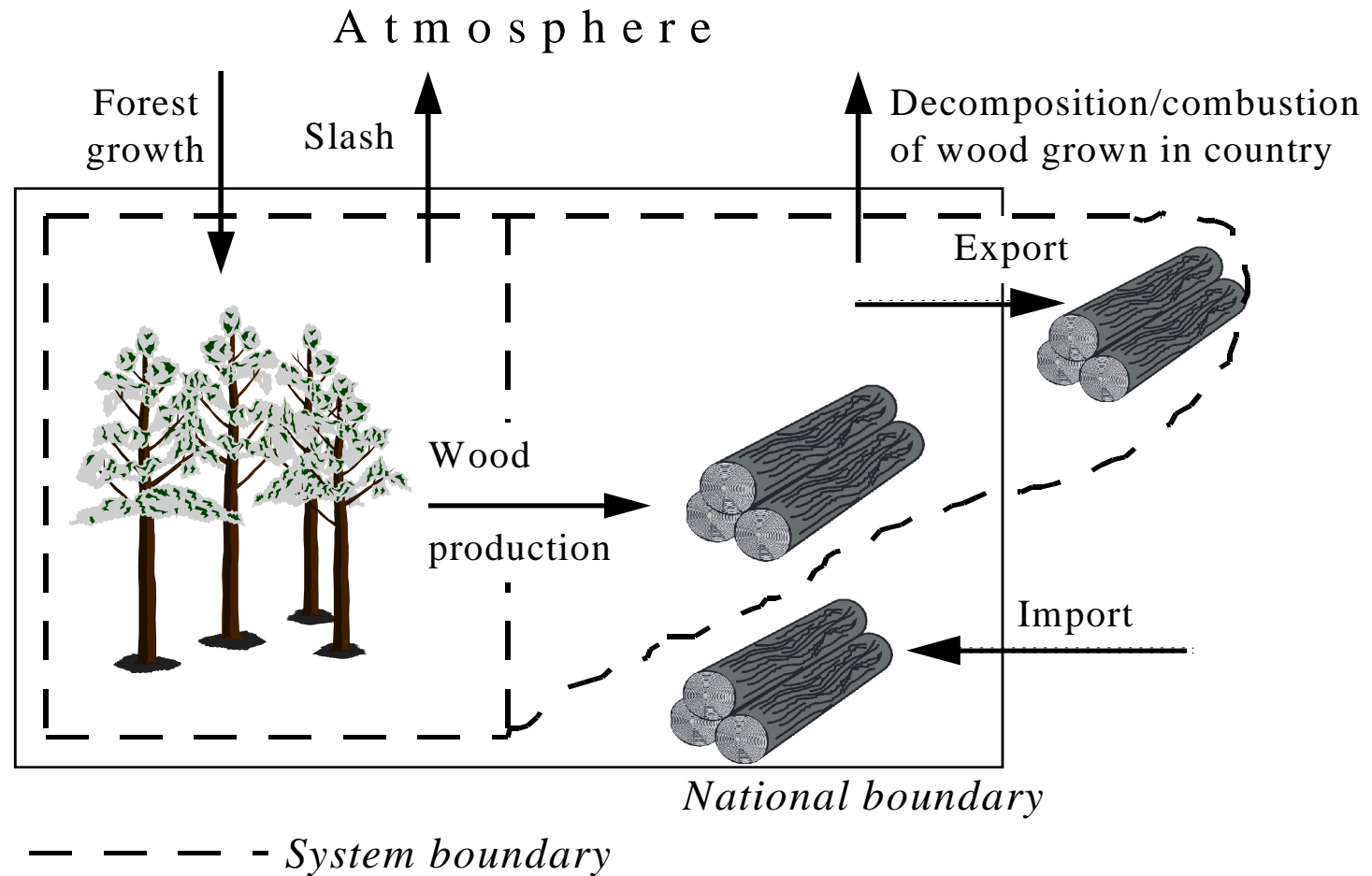
# Stock change approach (SCA) (Brown et al. 1999, Lim et al. 1999)



$$\begin{aligned}
 \text{Removal} = \text{Stock change} &= (\text{stock change forest}) + (\text{stock change consumed products}) \\
 &= (\text{forest growth} - \text{slash} - \text{wood production}) \\
 &+ (\text{wood consumption} \\
 &- \text{decomposition/combustion of wood consumed})
 \end{aligned}$$

$$\text{Removal due to HWP} = \text{stock change consumed products}$$

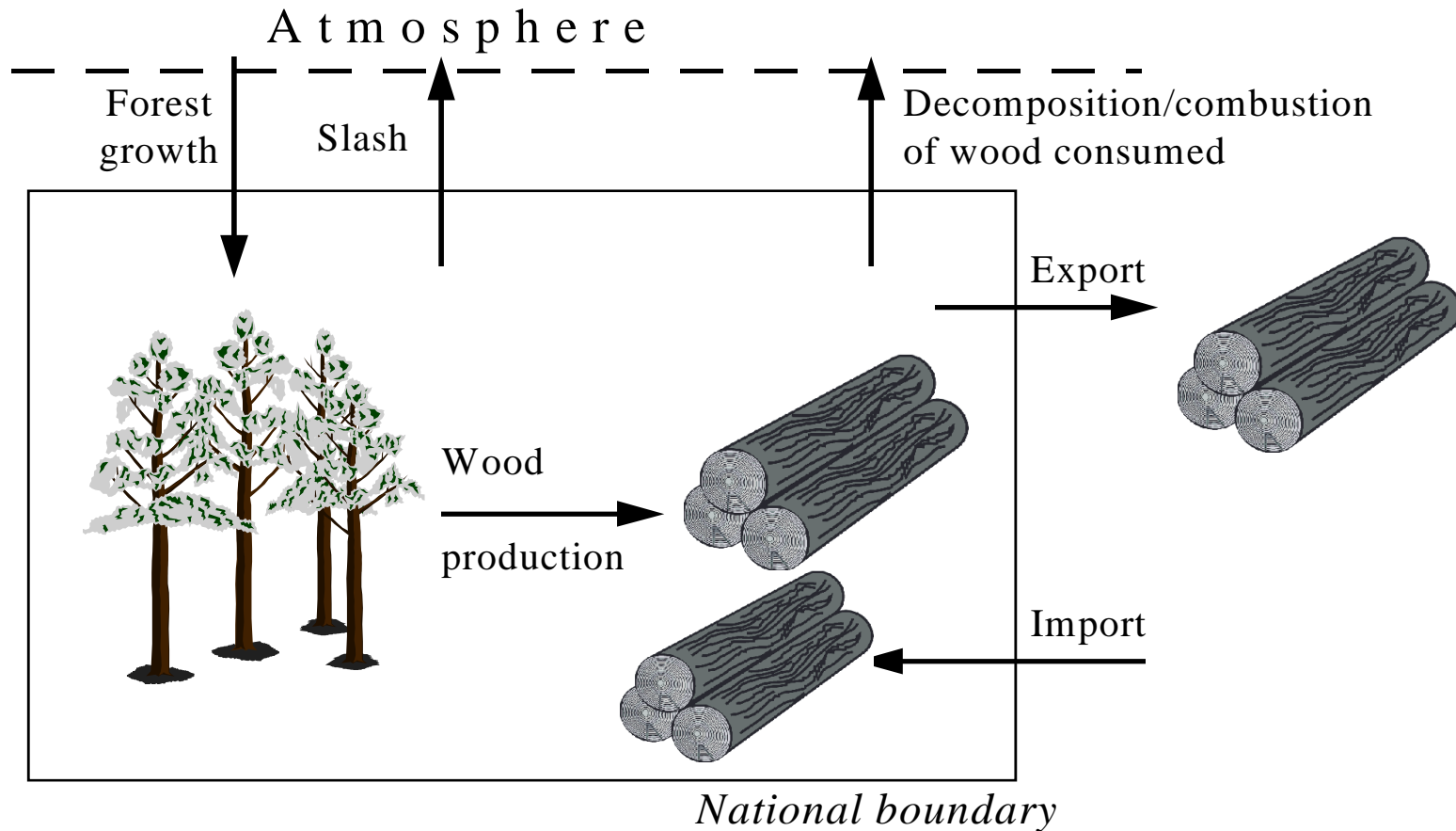
**Production approach (PA)** (Brown et al. 1999, Lim et al. 1999) =  
**Simple decay approach (SD)** (Ford-Robertson, 200x)



$$\begin{aligned}
 \text{Removal} &= \text{Stock change} = (\text{stock change forest}) + (\text{stock change domestic-grown products}) \\
 &= (\text{forest growth} - \text{slash} - \text{wood production}) + (\text{wood production} - \\
 &\quad \text{decomposition/combustion of wood grown in country}) \\
 &= \text{forest growth} - \text{slash} - \text{decomposition/combustion of wood grown in country}
 \end{aligned}$$

*Removal due to HWP = stock change domestic-grown products*

# Atmospheric flow approach (AFA) (Brown et al. 1999, Lim et al. 1999)

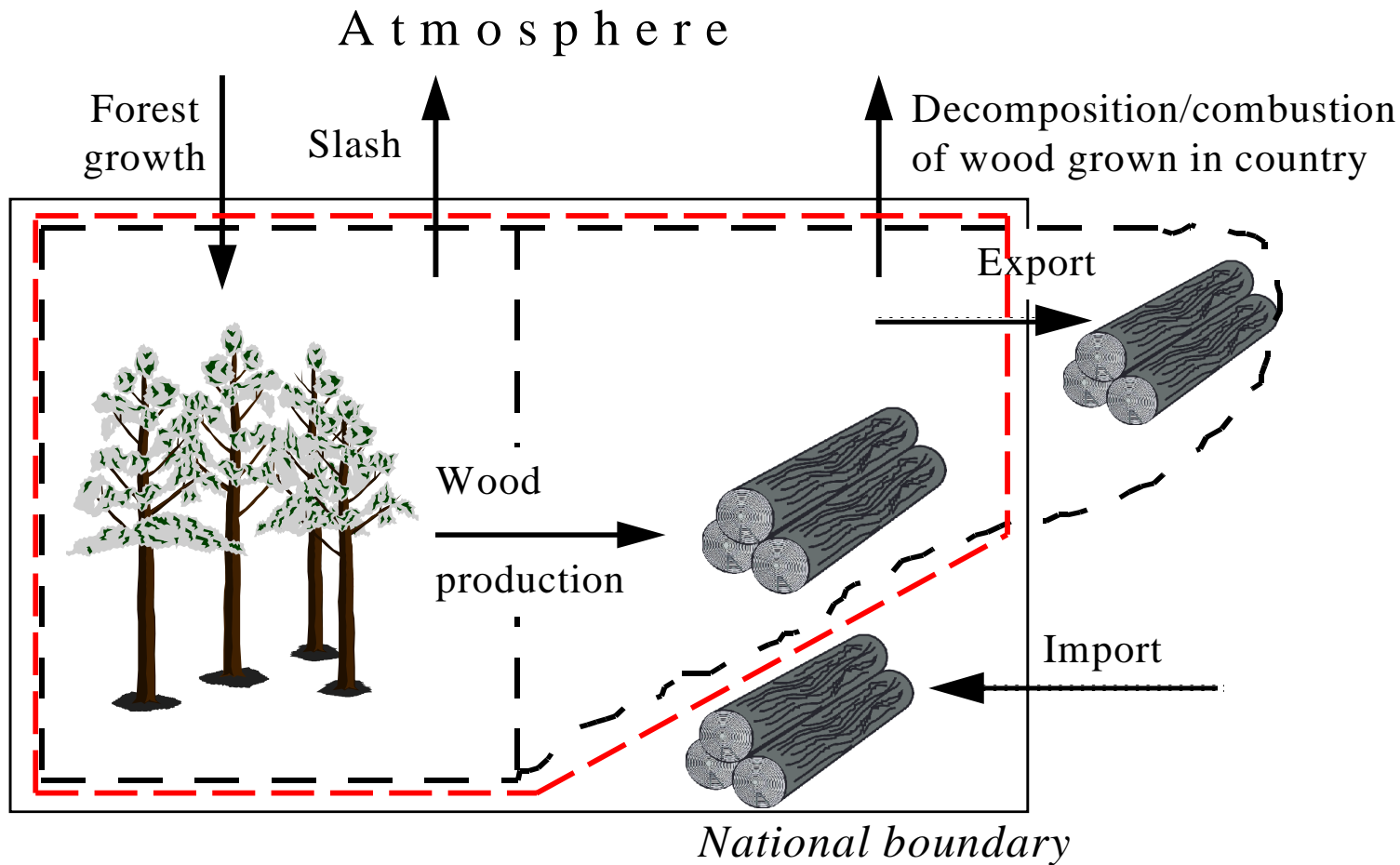


**Removal =**

$$\begin{aligned} \text{Atmospheric flow} &= \text{forest growth} - \text{slash} - \text{decomposition/combustion of wood consumed} \\ &= (\text{stock change forest}) + (\text{stock change consumed products}) + \text{export} - \text{import}. \end{aligned}$$

**Removal due to HWP = stock change domestic-grown products + export - import**

# Stock change approach for HWP of domestic origin (SCAD) (Cowie, Pingoud, Schlamadinger 2006)



**Removal =** - - - - System boundary

$$\begin{aligned} \text{Stock change} &= (\text{stock change forest}) + (\text{stock change domestic-grown products, in domestic use}) \\ &= (\text{forest growth} - \text{slash} - \text{wood production}) + (\text{wood production} - \\ &\quad \text{decomposition/combustion of wood grown and in use in country}) \end{aligned}$$

**Removal due to HWP = stock change domestic-grown products in domestic use**

## Including HWP to GHG accounting of LULUCF sector (1)

- NOTES: Distinction between reporting under UNFCCC and accounting under Kyoto Protocol.
  - Objective of reporting is to report extensively human induced emissions to UNFCCC to get a picture of the development of the emissions globally.
  - HWP can voluntarily be reported in national inventories under UNFCCC although the reporting approach is undecided (should be decided next).
  - The accounting rules are *political*, resulting from climate negotiations (e.g. activity-based acc.).
  - The issue is, should HWP be included in the accounting after 2012 (having impact on the national commitments)?
  - IPCC default approach is **not** used in the present (Kyoto) accounting, because there is no full-carbon accounting of forests (Article 3.4).

## Including HWP to GHG accounting of LULUCF sector (2)

- How should HWP accounting be *balanced* with the accounting rules of forests?
  - The basic HWP approaches SCA, AFA, and PA above propose a full-carbon accounting of forests and HWP; the post-2012 accounting system **most likely will differ** from that.
  - Activity-based accounting continuing after 2012? HWP could be connected to forestry activities (such as Article 3.4 under Kyoto).
  - Similar rules for forests and HWP to avoid bad incentives such as unsustainable forestry: e.g. inclusion of HWP only if forests included in the accounting, combined caps/discounting etc with forests?
  - Gross-net vs net-net accounting after 2012?
  - Annex vs non-Annex countries and HWP trade?

## Including HWP to GHG accounting of LULUCF sector (3)

- Should we start with new products (e.g. since 2013) ignoring the decay of old products?
  - This is a good example of creating calculatory, non-existing removals in the accounting system.
  
- Accounting and uncertainties of HWP models?
  - Based on models, validation/verification could be problematic. Direct inventories of HWP stocks would be desirable, but practicable only in few countries.
  
- Just HWP in use, or *also* in landfills?
  - An additional uncertainty factor, especially in production approach (PA). Creating artificial removals in national inventories?
  - If HWP in landfills accounted for, why not other biomass?
  - Wrong incentives for landfills? Contradictory with the EU waste directive.

# Pros and cons of the approaches with regard to the data (1)

## "IPCC default approach":

- Pros:
  - No new reporting systems required
  - The substitution benefits (=displacement of fossil C emissions due energy and material substitution) might give already now sufficient incentives to wood use.
  - The other alternatives might be worse: 1) "cheating" in HWP accounting by exaggerating the C sequestration, because cross-checking of the model results against direct HWP stock inventories is seldomly possible, 2) creating accounting systems with calculatory removals without any true climate benefits
- Cons:
  - At least the reporting system should reflect the real C balance as much as possible, (by choice also the accounting system); the present system ignores the global C sequestration into HWP that in reality occurs at the moment
  - Even the present system does not prevent use of imported wood from unsustainable sources like illegal loggings

# Pros and cons of the approaches with regard to the data (2)

## Stock-change approach (SCA):

- Pros:
  - Simplest of the other approaches with regard to data required.
  - Direct stock inventories could be practicable, if supported by national statistics (e.g. buildings)
- Cons:
  - Imported wood from deforestation or other unsustainable sources like illegal loggings could also be used to achieve removals in national GHG inventories. (However, even the present system does not prevent it.)

# Pros and cons of the approaches with regard to the data (3)

## Production approach (PA) and simple decay (SD):

- Pros:
  - Describes wood lifecycle from forest to end-use.
- Cons:
  - The system boundary differs from national boundary, unlike reporting/accounting of other emission sources.
  - Complexity and uncertainties of estimates higher than in SCA; difficult to utilise national statistics: e.g. HWP of imported roundwood excluded, but exported HWP from domestic roundwood included. Estimation of HWP pool in landfills in the export market extremely uncertain.
  - The reporting country has a responsibility of carbon stocks that are not under control of the country (i.e. exported HWP).

# Pros and cons of the approaches with regard to the data (4)

## Atmospheric flow approach (AFA):

- Pros:
  - Statistical data required obtained nearly as easily as in SCA.
- Cons:
  - Inconsistency with the whole existing reporting/accounting system of LULUCF, based on a stock-change philosophy
  - As a consequence, wood trade would be treated in different manner compared to other biomass. For instance, imported wood-based biofuels would form a C emission in the importing country, whereas all the other imported biofuels would remain C neutral ("discontinuity").
  - Wood exporting countries could account all their wood export flux as a C removal.

# Pros and cons of the approaches with regard to the data (5)

## Stock change approach for HWP of domestic origin (SCAD):

- Pros:
  - The cons of SCA with imported, potentially unsustainable wood could be avoided.
  - Provides a conservative estimate of the true C sequestration in HWP (in case the decay rate of HWP is not strongly underestimated).
- Cons:
  - Complexity and uncertainties of estimates higher than in SCA; in practice could be difficult to judge from HWP end use, what proportion is of domestic origin, what is imported
  - Application of direct inventories to the purpose of SCAD difficult.
  - Estimation of HWP balance in landfills even more difficult.

# Incentives/disincentives of the different approaches (1)

Table 1. Summary of potential impacts of the main different HWP accounting approaches

	IPCC default approach	Stock-change approach	Production approach	Atmospheric-flow approach
Promotion of sustainable forest management	discourages harvesting of forests	incentive to import HWPs, possible inclusion of wood products from non-sustainably managed forests	possible increase in national production and exports of long-life products	wood exports might be promoted, imports reduced, possible focus on national wood production
Impacts on recycling	incentives for recycling of products,		least incentive for recycling of products	greatest incentives for recycling of products
Use of wood fuels	incentives to switch from fossil-fuels to domestically-produced wood fuels, and to import wood fuels			
Internalizing the carbon value of wood and national planning	no specific incentives	incentives to improve national wood products inventories		
Trade	minor influence on international wood prices			?

## Incentives/disincentives of the different approaches (2)

Factors having an impact on the incentives in total (1):

- The HWP basic approach that is chosen; but also how the approach is modified in the forthcoming accounting system.
- Most likely the accounting system of forests and HWP will not be on full-carbon basis, so the approaches cannot be considered in their pure form presented above. In activity based accounting there could be **caps** (such as Art. 3.4 in Kyoto), **discounting**, or some other limitations. If accounting of HWP will be **voluntary**, could have strong impact.

## Incentives/disincentives of the different approaches (3)

The factors having an impact on the incentives in total (2):

- The asymmetry of the global GHG accounting system (e.g. Annex countries with commitments vs. non-Annex countries).
- Fossil emissions that can be displaced by using HWP instead of their competitors. The displacement factors vary dependent on wood end-uses (energy, different material uses). These factors together with the HWP approach determine the incentives (in quantitative terms).
- The potentially rising price of CO<sub>2</sub> in emissions-trading will have an impact on the competitiveness of HWP in longer run (depending on the approach).

# Some numerical estimates using the IPCC HWP model

# Application of HWP approaches to estimate the annual CO<sub>2</sub> emission from the HWP pool in each EU member state + in the other Annex I countries (1)

- 5 approaches\* considered: stock change (SCA), atmospheric flow (AFA), production (PA) and simple decay (SD) approaches + the stock change approach for HWP originated and consumed domestically (SCAD)

## ESTIMATION METHOD USED:

- The HWP model included in the 2006 IPCC Guidelines was used in the **calculations** (Chapter 12. Harvested Wood Products. 33 p.+ HWP Worksheet MS Excel. In: *2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4, Agriculture, Forestry and Other Land Use*. <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.htm>).
- First-order decay (=exponential decay) of HWP assumed.

\* Emissions calculated as a difference to the IPCC default approach

## Application of HWP approaches to estimate the annual CO<sub>2</sub> emission from the HWP pool in each EU member state + in the other Annex I countries (2)

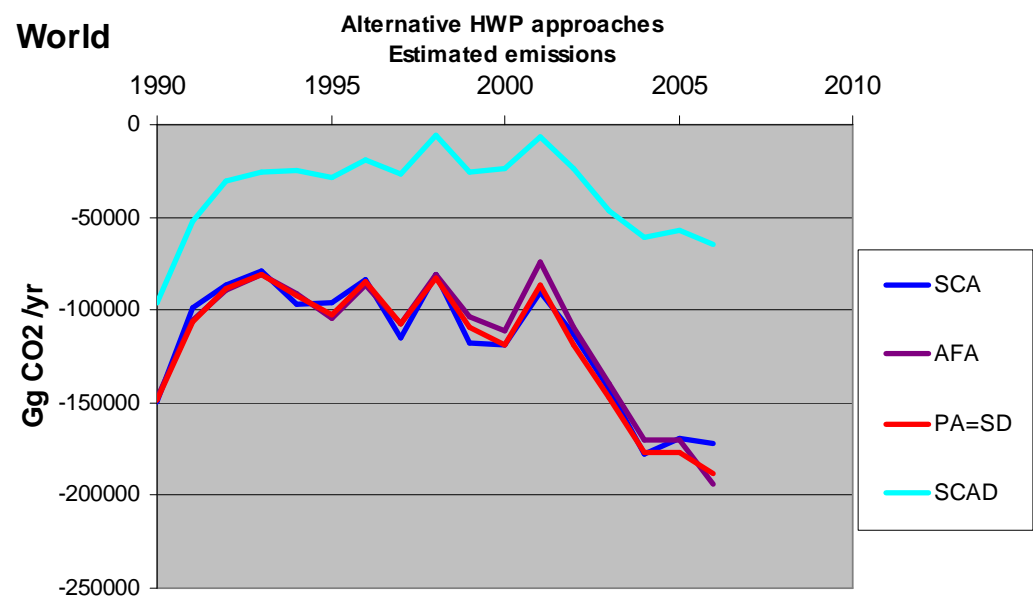
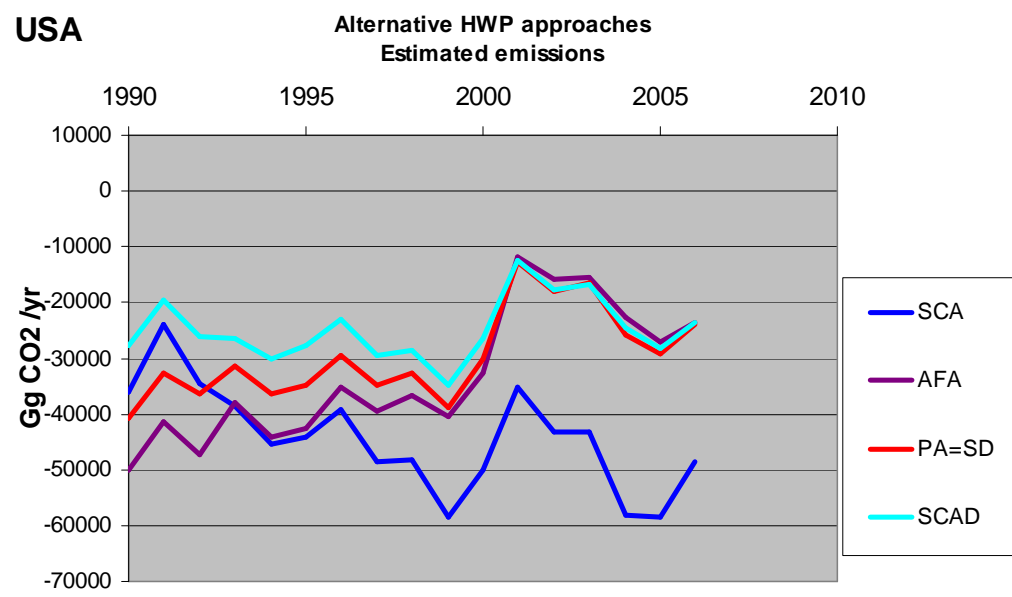
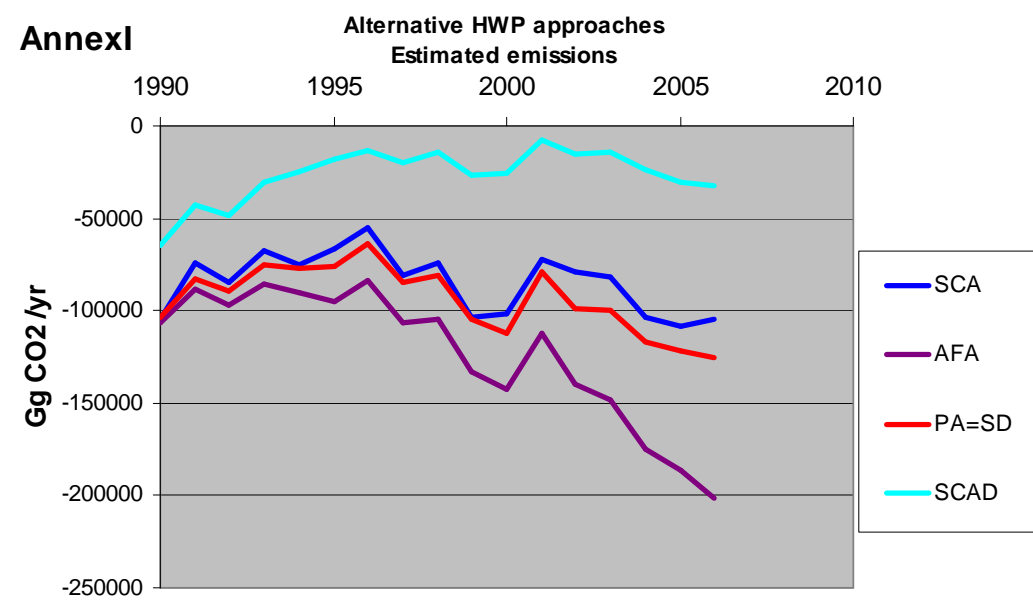
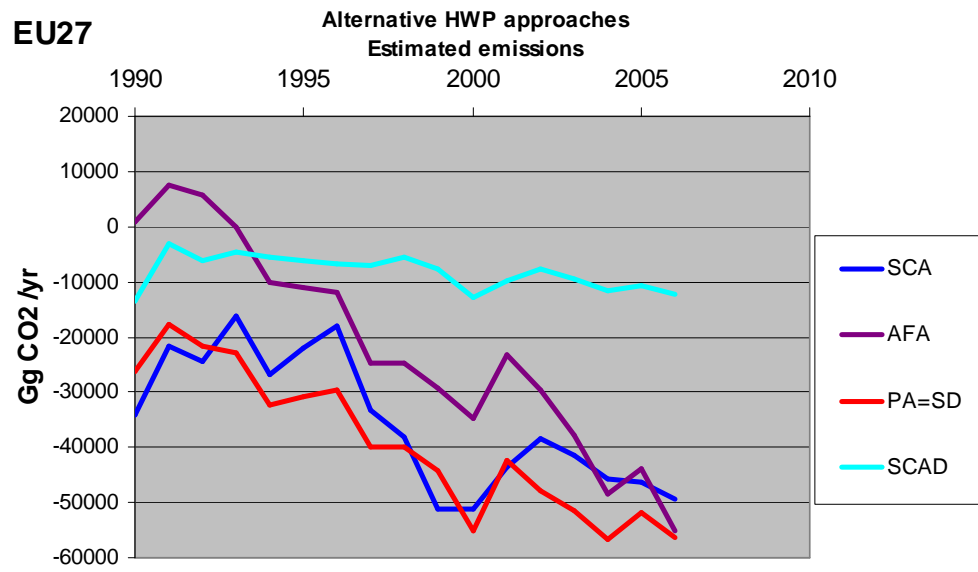
- The model was slightly modified to include the SCAD approach.
- The activity data were downloaded between 14 and 22 May 2008 from the FAO statistics: <http://faostat.fao.org/site/381/default.aspx>
- The emissions with respect to IPCC default were calculated.
- A report with complete results for all Annex I countries delivered to EU negotiators

## Basic assumptions in the calculations

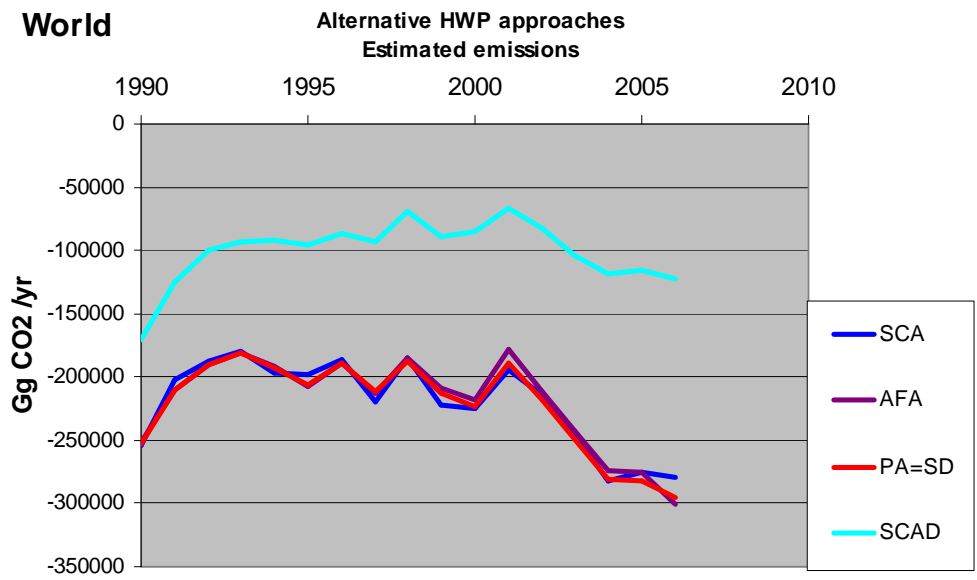
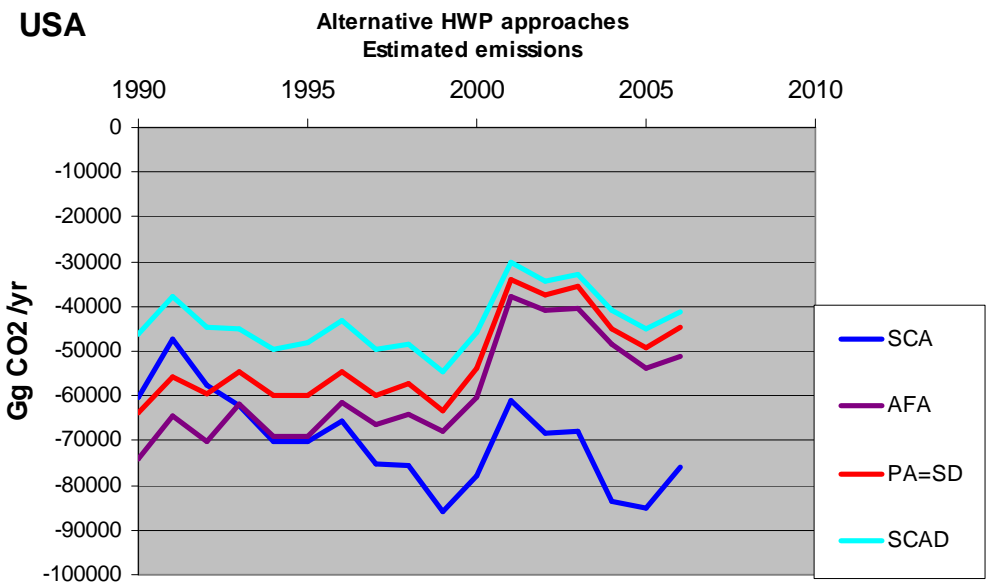
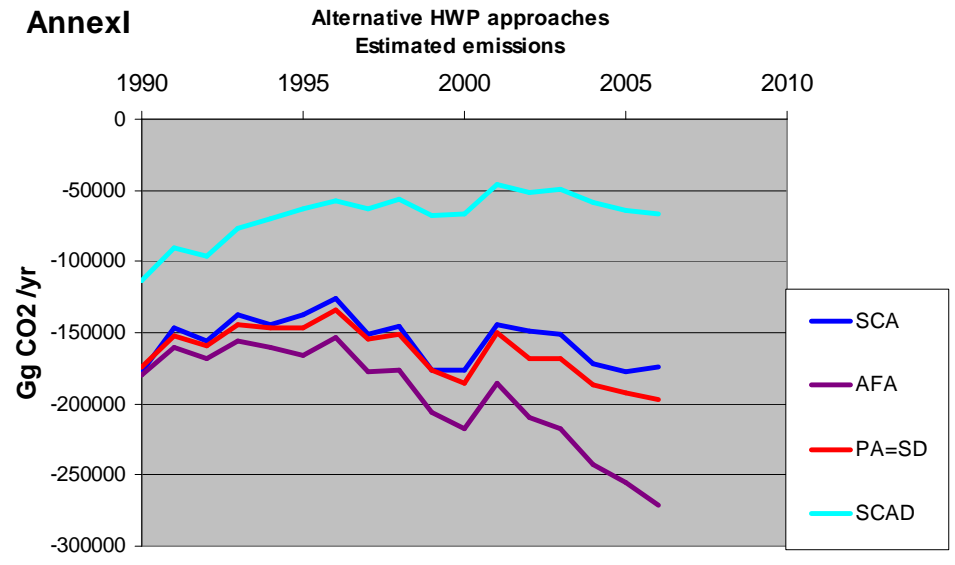
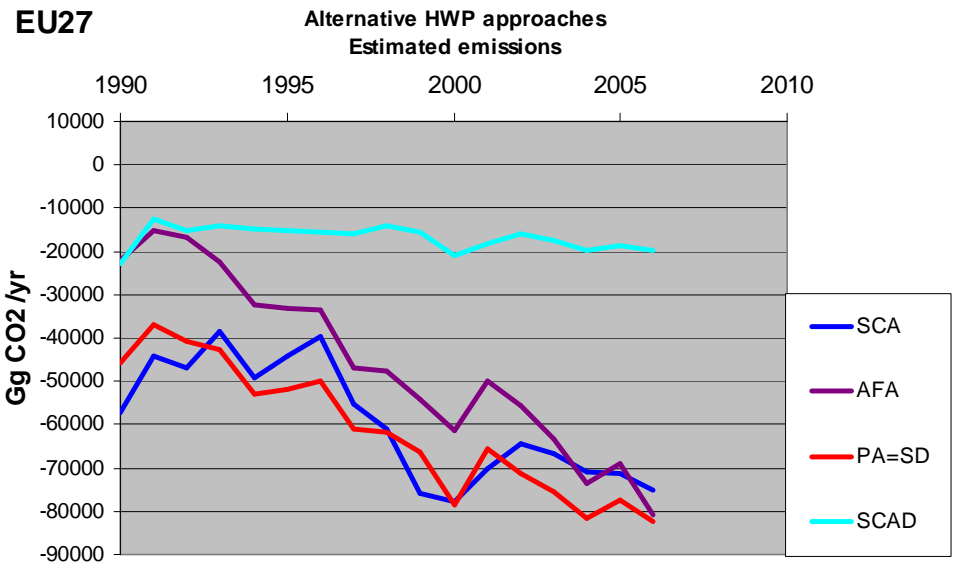
- Landfills **not** considered, because no unified database for different countries available
- Activity data:
  - FAO time series basically from 1961 to 2006
  - An annual growth 1.51%\* in HWP activity data series is assumed from 1900 to 1961.

\* 1.51% is the estimated annual increase for industrial roundwood production in Europe for the period 1900 to 1961 (IPCC 2006 GL, Vol.4, Ch 12, Table 12.3, p. 12.18)

SET 1: Half-life of solid wood products **15 yrs** (=average lifetime 22 yrs), paper products **1 yr**

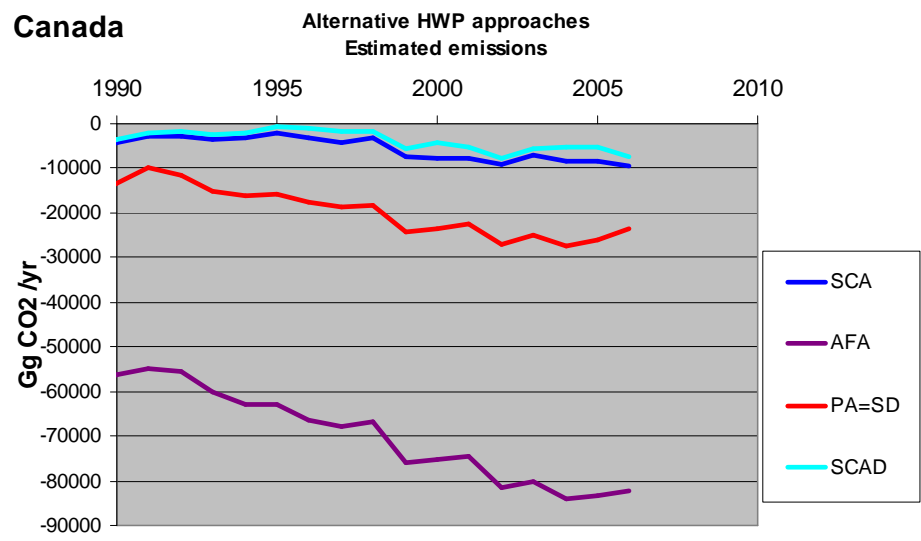
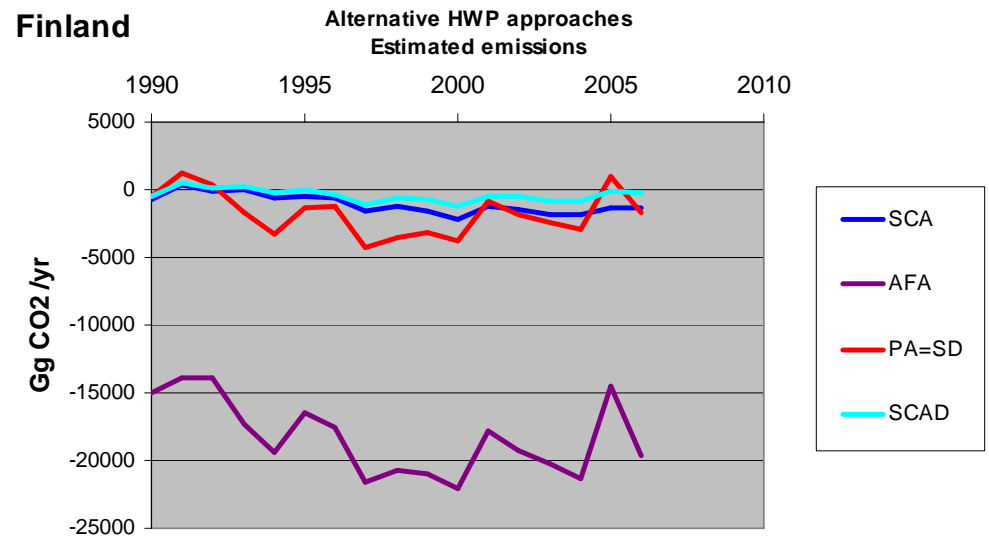


SET 2: Half-life of solid wood products **30 yrs** (=average lifetime 43 yrs), paper products **2 yrs**

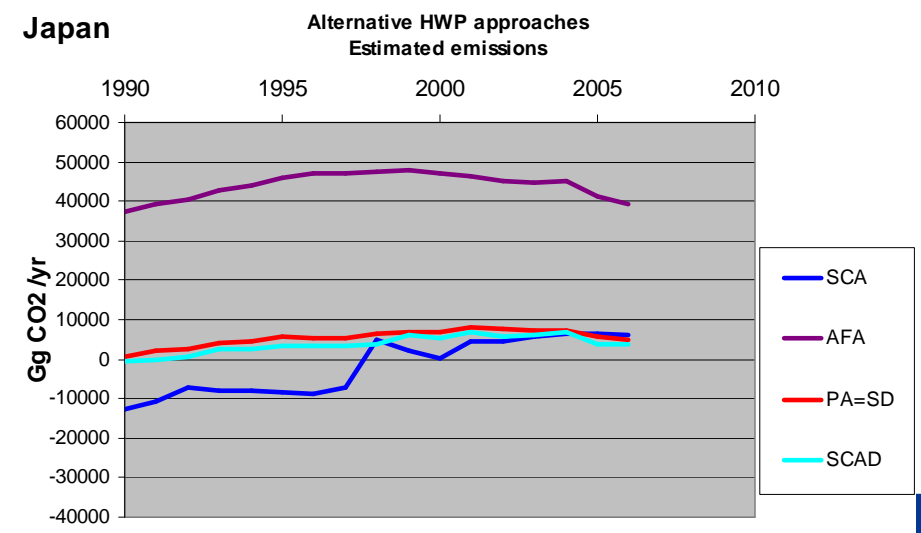


**Examples of individual countries:**

**Some HWP exporters**



**Some HWP importers**



## Conclusions on the numerical calculations

- The global removal due to increasing C stocks in HWP of the order **0.6 - 0.9%** of of global GHG emissions in 2004, according to estimates (excluding landfills).
- For some specific countries, HWP are much more important
- Especially AFA has strong impact on national carbon balance of some countries: for instance in Finland, removal due to HWP applying AFA would **nearly 30%** of the sum of all the other GHG emissions in 2005.

## Sources of uncertainties, suggested improvements (1)

- The quality of the FAO activity data (production and trade flows of roundwood and semi-finished products varies by country (e.g. lack of historical time series, changes in classification in national statistics delivered to the FAO)).
- Trade of final products (e.g. furniture, pre-fabricated houses, books) are not included in the FAO statistics, which can cause substantial errors in estimated flows into the HWP pools.
- Correction of the activity data, especially trade, so that the true consumption flows in a reporting country could be estimated, requires national efforts.
- Additional uncertainties are also generated from some approaches (PA, SCAD).

## Sources of uncertainties, suggested improvements (2)

- Better default values for conversion factors and especially for lifetime parameters can be given in the future. The experiences from direct HWP inventories and more elaborated HWP models could be utilised to prepare a database on default values.
- A sensitivity analysis of the IPCC HWP model should be performed
- The above Tier 1 level model could also be somewhat simplified, some variables seem to be unimportant for most countries
- A choice of the approach which all countries must use would also lead to a simplified model with less data requirements