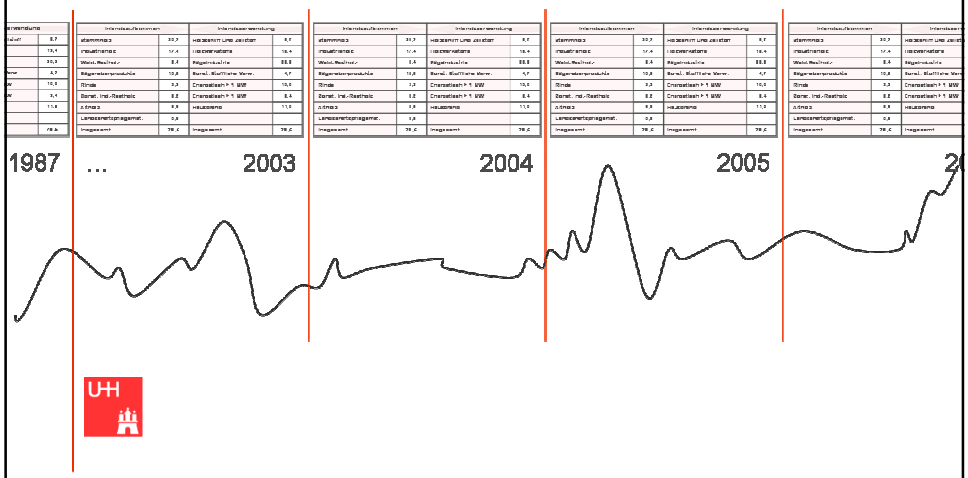


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## Contents

## 1. „Wood balance“

Wood balances have been made since the late fifties.

The focus was an overview of all wooden products in one calculation system via round wood equivalents.

The balance was used to determine consumption as a rest calculation of more or less available statistics.

For policy reasons different supply rates were calculated (t.ex. to determine the dependence of imports).

In the course of time special topics have been analysed (separate paper and wood balances, tropical wood balance etc.)



## 1. „Wood balance“

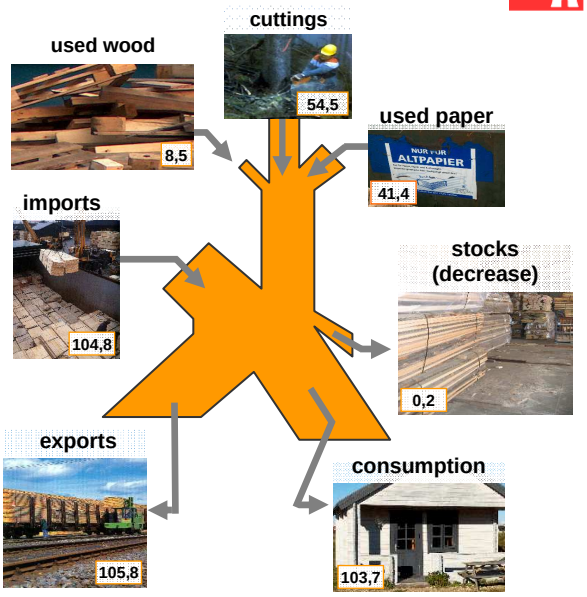
Wood balance (Germany 2004 in M $m^3_{(r)}$)

| sources | | uses | |
|---|---|---|---|
| | 2004 | | 2004 |
| imports | 104,8 | exports | 105,8 |
| recorded cutting | 54,5 | | |
| used paper | 41,4 | | |
| used wood | 8,5 | | |
| stocks, decrease | 0,2 | stocks, increase | -,- |
| | | consumption (balance adjustment) | 103,7 |
| total sources | 209,5 | total uses | 209,5 |

Aus: DIETER, M.: Holzbilanzen Diverse, Quelle: vTI, Institut für Ökonomie

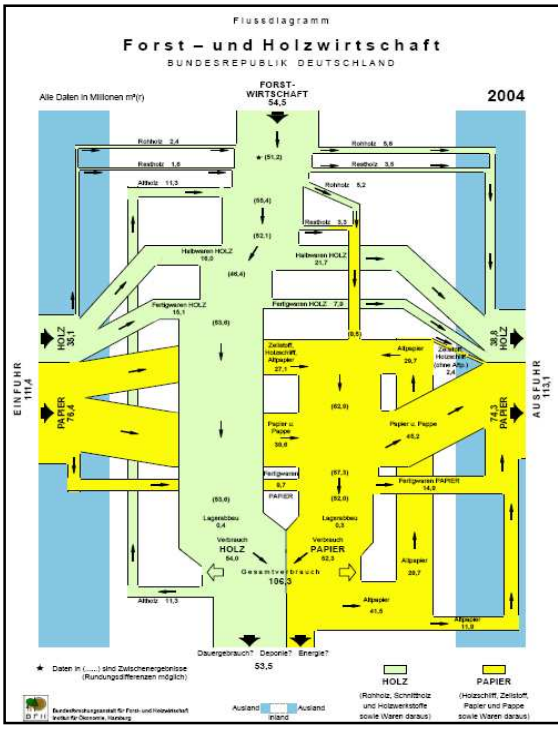
## 1. „Wood balance“ flow chart

wood balance
(Germany
2004 in M m³(r))




Aus: DIETER, M.: Holzbilanzen Diverse, vTI, Institut für Ökonomie






## 1. „Wood balance“

**paper**
**(pulp and paper and paper products)**

**wood**
**(raw wood, semi-fabricated products and end-use-products)**

**round wood equivalent:**
How much m³ of round wood are needed to produce one unit of fabricated product?

1 t of pulp = 4 m³ raw wood

Aus: DIETER, M.: Holzbilanzen Diverse, vTI, Institut für Ökonomie

## 2. „Wood resource balance“

Why wood **resource** balances? (1)

Traditional wood balances did not include energy uses of wood.

Official statistics have deficits
in new resources
(post consumer wood, industrial restwood, landscape–care wood etc.)
and in energy uses
(households, biomass power plants etc.)

Therefore overall consumption cannot be determined as a „gap calculation“ of official statistics.



## 2. „Wood resource balance“

Why wood **resource** balances? (2)

The focus has changed from products to resources.

To judge the sustainability of the wood consumption, all woody biomass and uses (consumption) must be taken into consideration.

Thus a tool is needed for calculating energy consumption.

Furthermore, the interlinkages between sectors like
distribution channels
resource mix of consumers
become more importand and are not covered by traditional statistics.

→ Need for empirical research and modified structure of the balance.

## 2. „Wood **resource** balance“

wood resource balance Europe (EU/EFTA) (in M. m³(r)) 2005

| sources | | uses | |
|---|---|---|---|
| industrial roundwood | 482 | 481 | material use |
| | | 341 | energy uses |
| other forest wood and bark | 48 | | |
| chips, particles & residues | 118 | | |
| other woody biomass | 126 | | |
| balancing adjustment | 47 | | |
| ∑ total | 822 | 822 | total ∑ |

Round wood equivalent (solid cubic meter equivalent): How much solid cubic meter of wood is transfered from one sector to another?

Source: Mantau / Steierer / Hetsch /Prins (2008) : Wood resources availability and demands 2005 – Part I National and regional wood resource balances; Background paper to the UN-ECE/FAO Workshop an wood balances, Geneva, 2008



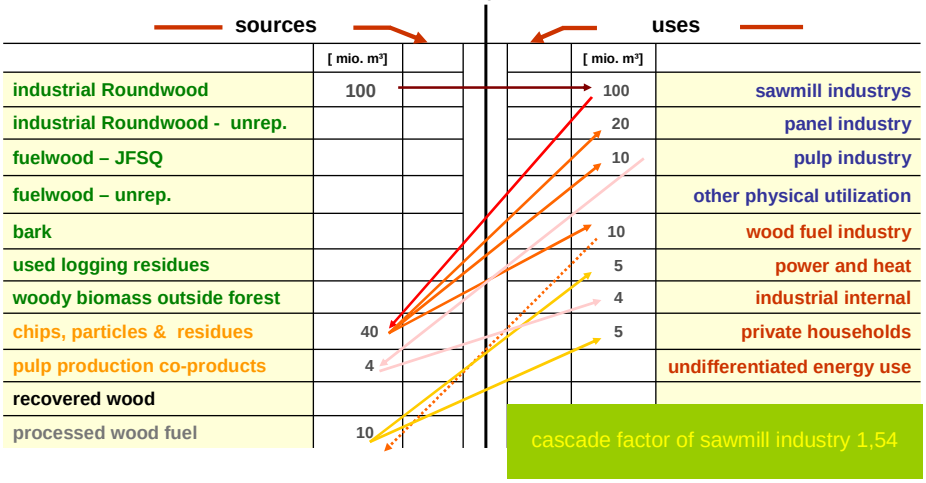
## 2. „Wood **resource** balance“

| sources | [ mio. m³] | % | | % | [ mio. m³] | uses |
|---|---|---|---|---|---|---|
| industrial Roundwood - JFSQ | 381 | 49% | | 26% | 217 | sawmill industry |
| industrial Roundwood - unrep. | 16 | 2% | | 11% | 88 | panel industry |
| fuelwood – JFS | 79 | 10% | | 19% | 155 | pulp industry |
| fuelwood – unrep. | 6 | 1% | | 2% | 14 | other physical utilization |
| Bark | 25 | 3% | | 1% | 7 | wood fuel industry |
| used logging residues | 23 | 3% | | 6% | 49 | power and heat |
| woody biomass outside forest | 20 | 3% | | 8% | 65 | industrial internal |
| chips, particles & residues | 118 | 15% | | 11% | 92 | private households |
| pulp production co-products | 70 | 9% | | 16% | 135 | undifferentiated energy use |
| recovered wood | 29 | 4% | | | | |
| processed wood fuel | 7 | 1% | | | | |
| undefined | 47 | 6% | | | | |
| **∑ total sources:** | **822** | **100%** | | **100%** | **822** | **∑ total uses** |

Source: Mantau / Steierer / Hetsch /Prins (2008) : Wood resources availability and demands 2005 – Part I

## 2. „Wood **resource** balance“

### Cascade uses - example




| ∑ total sources: | 154 | 100% | 100% | 154 | ∑ total uses |
|---|---|---|---|---|---|



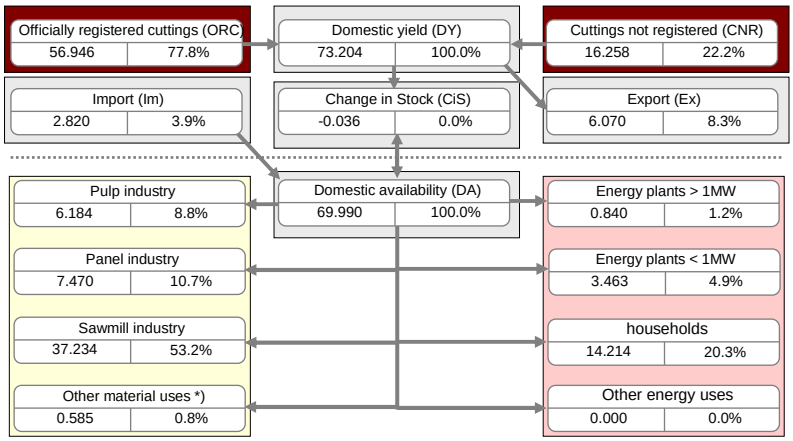
## 2. „Wood **resource** balance“

| comparison | wood balance | wood resource balance |
|---|---|---|
| focus | consumption | resources & sustainability |
| sectors | material uses | all uses |
| calculation | round wood equivalent | solid wood equivalent |
| cascades | single uses (assumed) | cascade uses |
| gap calculation focus on | consumption | resource |
| source | official statistics | additional field research |

**„Wood balances“ and „wood resource balances“ are not contradictory to a methodological point of view. The latter fills some important gaps of actual resource issues. On the other hand end–consumer aspects can be included as well t. ex. to develop carbon sequestration models.**

## 3. Sector analysis

Calculation of real cuttings based on utilized amounts
Germany in M m³ (2005)




DY = DA – Im + Ex + ΔCiS

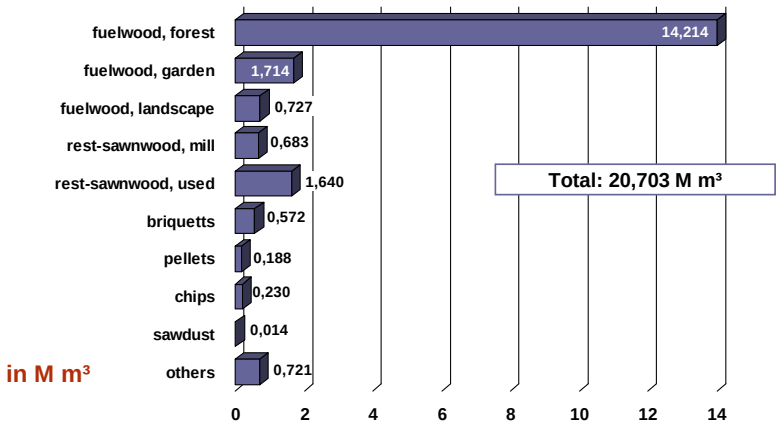
CNR = DY - ORC



## 4. Time series


- 1. Step
  Understand the current situation
  determine quantities
- 2. Step
  “Produce” time series
  in unknown markets.
  “No time series - no modeling.”
- 3. Step
  Get back to good old econometrics
  and other modeling?

## Fuelwood assortments used in private households (2005) in cubic meter äquivalent (in M)




Source: MANTAU, U., SÖRGEL, C. (2006): Energieholzverwendung in privaten Haushalten. Hamburg 2006, 23 S.





Creating time series and forecasting

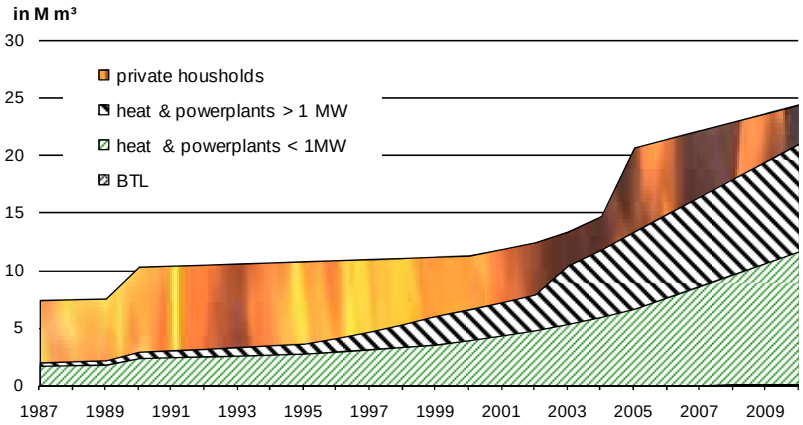
**Few empirical information – many assumtions**
**solution: openess in assumptions**

| | Total [Mio. m³] | Rate | *fuelwood. total* | assortment share in % fuelwood forest | fuelwood garden | fuelwood LCW | SMBP | post cons. | SMPB briquettes | SMBP pellets | SMPB chips | SMBP dust | others | Sum % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1987 | *7,424* | | | 65,8% | 7,9% | 3,4% | 6,0% | 14,4% | 2,5% | 0,0% | 0,0% | 0,0% | 0,0% | 100% |
| 1988 | *7,492* | 0,9% | | 65,8% | 7,9% | 3,4% | 6,0% | 14,4% | 2,5% | 0,0% | 0,0% | 0,0% | 0,0% | 100% |
| 1989 | *7,560* | 0,9% | | 65,8% | 7,9% | 3,4% | 6,0% | 14,4% | 2,5% | 0,0% | 0,0% | 0,0% | 0,0% | 100% |
| 1990 | *10,323* | 36,5% | | 65,8% | 7,9% | 3,4% | 6,0% | 14,4% | 2,5% | 0,0% | 0,0% | 0,0% | 0,0% | 100% |
| 1991 | *10,416* | 0,9% | | 65,8% | 7,9% | 3,4% | 6,0% | 14,4% | 2,5% | 0,0% | 0,0% | 0,0% | 0,0% | 100% |
| 1992 | *10,511* | 0,9% | | 65,8% | 7,9% | 3,4% | 6,0% | 14,4% | 2,5% | 0,0% | 0,0% | 0,0% | 0,0% | 100% |
| 1993 | *10,607* | 0,9% | | 65,8% | 7,9% | 3,4% | 6,0% | 14,4% | 2,5% | 0,0% | 0,0% | 0,0% | 0,0% | 100% |
| **1994** | **10,703** | **0,9%** | ***77,1%*** | **65,8%** | **7,9%** | **3,4%** | **6,0%** | **14,4%** | **2,5%** | **0,0%** | **0,0%** | **0,0%** | **0,0%** | **100%** |
| 1995 | *10,800* | 0,9% | 78,5% | 67,0% | 8,1% | 3,4% | 5,5% | 13,1% | 2,6% | 0,1% | 0,0% | 0,0% | 0,3% | 100% |
| 1996 | *10,898* | 0,9% | 79,9% | 68,2% | 8,2% | 3,5% | 4,9% | 11,8% | 2,6% | 0,1% | 0,1% | 0,0% | 0,5% | 100% |
| 1997 | *10,997* | 0,9% | 81,4% | 69,4% | 8,4% | 3,6% | 4,4% | 10,5% | 2,6% | 0,2% | 0,1% | 0,0% | 0,8% | 100% |
| 1998 | *11,097* | 0,9% | 82,8% | 70,6% | 8,5% | 3,6% | 3,8% | 9,2% | 2,7% | 0,3% | 0,1% | 0,1% | 1,1% | 100% |
| 1999 | *11,198* | 0,9% | 84,2% | 71,9% | 8,7% | 3,7% | 3,3% | 7,9% | 2,7% | 0,3% | 0,2% | 0,1% | 1,3% | 100% |
| **2000** | **11,300** | **0,9%** | ***85,6%*** | **73,1%** | **8,8%** | **3,7%** | **2,7%** | **6,6%** | **2,8%** | **0,4%** | **0,2%** | **0,1%** | **1,6%** | **100%** |
| 2001 | *11,865* | 5,0% | 84,6% | 72,2% | 8,7% | 3,7% | 2,9% | 6,9% | 2,8% | 0,5% | 0,4% | 0,1% | 2,0% | 100% |
| 2002 | *12,458* | 5,0% | 83,6% | 71,3% | 8,6% | 3,6% | 3,0% | 7,1% | 2,8% | 0,6% | 0,6% | 0,1% | 2,3% | 100% |
| 2003 | *13,393* | 7,5% | 82,5% | 70,4% | 8,5% | 3,6% | 3,1% | 7,4% | 2,8% | 0,7% | 0,7% | 0,1% | 2,7% | 100% |
| 2004 | *14,732* | 10,0% | 81,5% | 69,5% | 8,4% | 3,6% | 3,2% | 7,7% | 2,8% | 0,8% | 0,9% | 0,1% | 3,1% | 100% |
| **2005** | **20,703** | **40,5%** | ***80,4%*** | **68,7%** | **8,3%** | **3,5%** | **3,3%** | **7,9%** | **2,8%** | **0,9%** | **1,1%** | **0,1%** | **3,5%** | **100%** |

SOURCE: MANTAU, U.; SÖRGEL, C.; WEIMAR, H.; (2007): Holzrohstoffbilanz Deutschland, Bestandaufnahme 1987 bis 2005, Hamburg, 2007, 66 S.

## 4. Time series

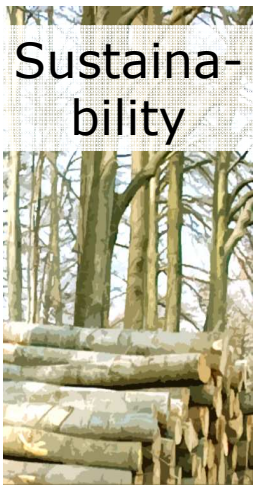
### Wood energy consumption




MANTAU, U.; SÖRGEL, C.; WEIMAR, H.; (2007): Holzrohstoffbilanz Deutschland, Szenarien des Holzaufkommens und der Holzverwendung bis 2010, Hamburg, 2007, 70 S.



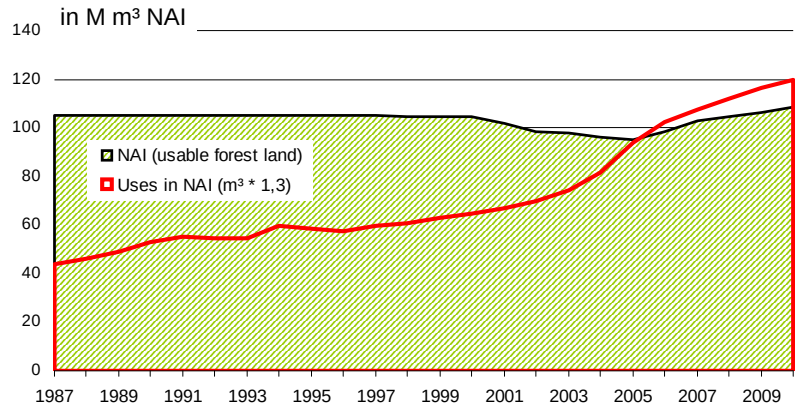
## 5. Wood availability (sustainability)




- „Not harvest more then grow again“ is not a sufficient measurement for sustainability.
- Inventory data on growing stock is not sufficient for valuation of sustainability.
- The development of consumption is a similar important information for the understanding of wood availability (sustainability).

## 5. Wood availability (sustainability)

Comparison of yearly increment and consumption in Germany in M m³ NAI

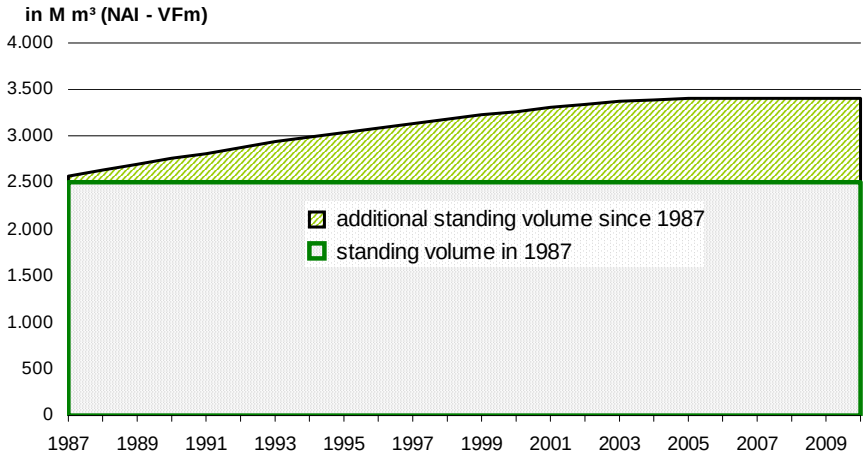



MANTAU, U. (2008): Konzept der dynamischen, naturalen Nachhaltigkeit (Holzrohstoffnachhaltigkeit)
Concept for a dynamic, natural sustainability (wood resource sustainability), discussion paper



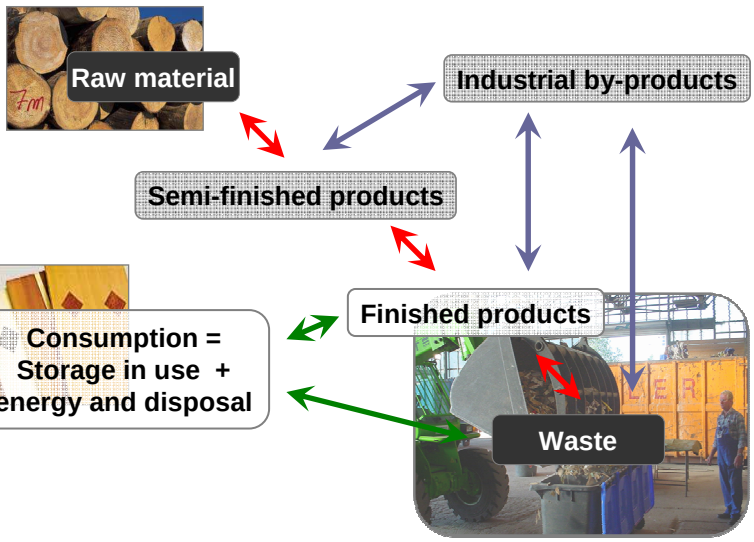
## 5. Wood availability (sustainability)

Dynamic wood availability – better understanding of resource potential (example: Germany)




MANTAU, U. (2008): Konzept der dynamischen, naturalen Nachhaltigkeit (Holzrohstoffnachhaltigkeit)
Concept for a dynamic, natural sustainability (wood resource sustainability), discussion paper

**circular flow modell**








**Example Germany:**
**Total wood products: 31,561 M. m³ per year**
**or 7,890 t of carbon = 100%**

| *Storage in use:* *4,515 M. t C or 57,2%* | *Energy and disposal* *3,375 M. t C or 42,8%* |
|---|---|

| | Storage in use | Energy and disposal |
|---|---|---|
| **Construction** | 2,411 = 67,2% | 1,601 = 32,8% |
| **Furniture** | 1,601 = 66,4% | 0,810 = 33,6% |
| **Packaging** | 0,226 = 18,4% | 1,002 = 81,6% |

Quelle: MANTAU, U.; BILITEWSKI, B. (2004): Stoffstromanalyse Holz 2002.

## Final comments


- Wood resource balances are analytical tools for many actual topics.

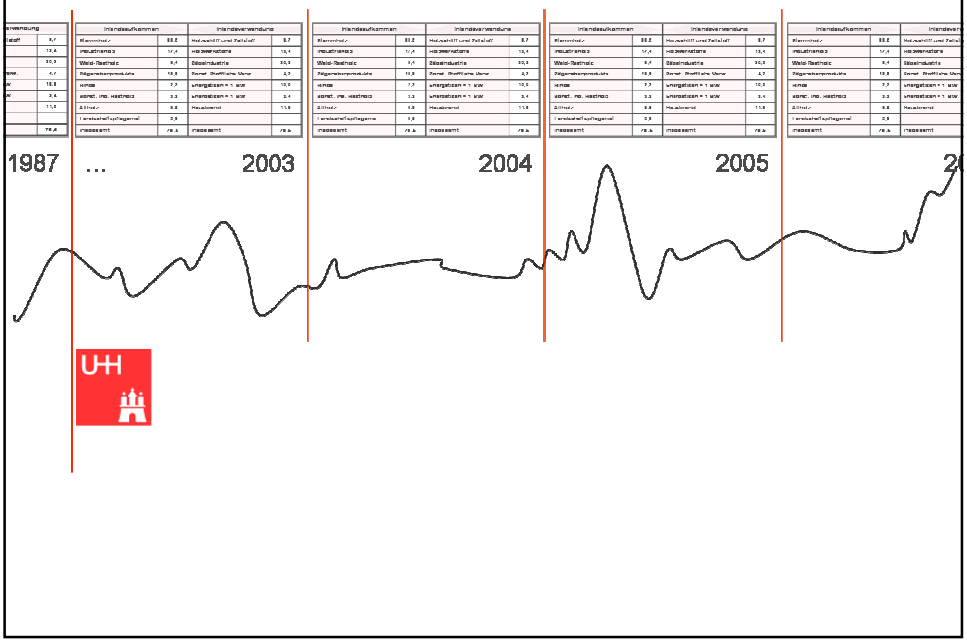
✓ Understanding of wood resource developments

✓ Sector analysis and interlinkages

✓ Dynamic wood availability (sustainability)

✓ End-use and carbon sequestration

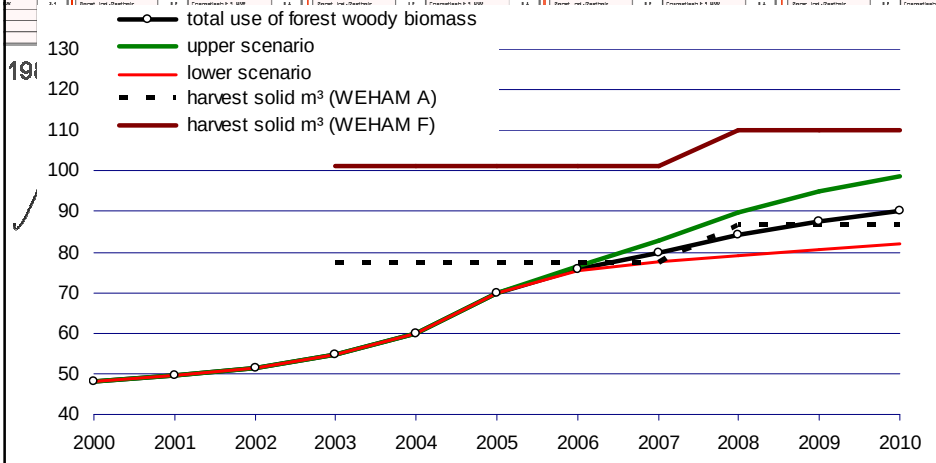




## 5. Wood availability (sustainability)

Dynamic comparison of consumption and potential over time

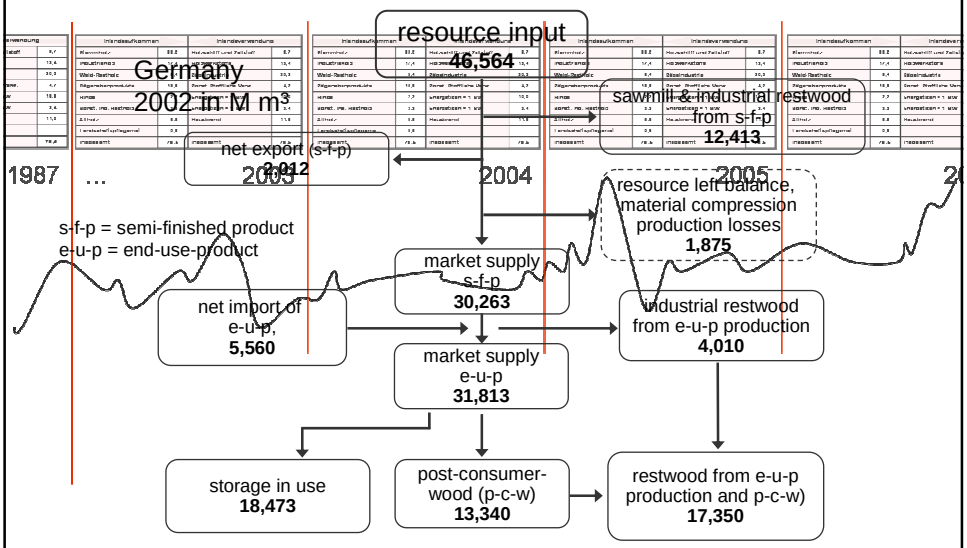
harvest solid m³ = NAI - bark harvest losses




MANTAU, U.; SÖRGEL, C.; WEIMAR, H.; (2007): Holzrohstoffbilanz Deutschland, Szenarien des Holzaufkommens und der Holzverwendung bis 2010, Hamburg, 2007, 70 S.



## 6. End-use and carbon sequestration




Quelle: MANTAU, U.; BILITEWSKI, B. (2004): Stoffstromanalyse Holz 2002. Abb. nach KIBAT, K. D.