Wood flow modelling in Germany

Dr. Holger Weimar
Thünen Institute of International Forestry and Forest Economics, Hamburg

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How much wood do we use? And what for?

Problem:
→ imprecise statistics
→ do not provide all relevant information
Methodology: Material flow analysis

Processes with inflows and outflows of wood

Backflow cycles

Data sources

→ Official statistics
→ Statistics of industry associations
→ Empirical studies
→ Expert estimations
Methodology: Calculation based on the uses of wood

Removals as a basic indicator (e.g.)
Methodology: Reference unit

How to connect the flows?

The material flow covers only the flow of wood fibres. Other materials/non-wood components of products are excluded, e.g. glue.

To connect flows of different products and units (tons, m$^3$ etc.) the reference unit wood fibre equivalent m$^3$ (f) is defined.

It refers only to the volume of the wood fibres in the product or flow

The formal calculation is as follows:

1. The mass $m_w$ of the wood fibres is defined as

$$m_w = m_T - m_{H2O} - \sum_{i=1}^{i} m_{NW_i}$$

where $m_T$ = mass of production; $m_{H2O}$ = mass of water in prod.; $m_{NW_i}$ = mass of $i$ non-wood-materials

2. The volume $V_w$ (the wood fibre equivalent m$^3$ (f)) at fibre saturation level is calculated:

$$V_w = \sum_{j=1}^{j} \frac{m_w}{\rho_j/\alpha_j}$$

where $\rho_j$ = density by volume of the wood species $j$; $\alpha_j$ = share of species $j$ on all wood fibres in product

Source: Weimar (2011)
Results: Wood flow in Germany 2013*

Sources
Supply of wood resources
Processing of wood
Products (1st proc. stage)
Domestic use:
  - Semi-fin. products
  - Energetic use

* Preliminary

## Results: m³ (f) conversion factors

<table>
<thead>
<tr>
<th>Product</th>
<th>Unit</th>
<th>Conv. Factor m³ (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw wood</td>
<td>m³</td>
<td>1,00</td>
</tr>
<tr>
<td>Wood processing residues</td>
<td>m³</td>
<td>1,00</td>
</tr>
<tr>
<td>Wood processing residues (C/NC)</td>
<td>t&lt;sub&gt;air-dry&lt;/sub&gt;</td>
<td>1,98/1,42</td>
</tr>
<tr>
<td>Recovered Wood</td>
<td>t&lt;sub&gt;air-dry&lt;/sub&gt;</td>
<td>1,82</td>
</tr>
<tr>
<td>Sawn wood</td>
<td>m³</td>
<td>1,00</td>
</tr>
<tr>
<td>Veneer</td>
<td>m³</td>
<td>1,00</td>
</tr>
<tr>
<td>Particle board (incl. OSB)</td>
<td>m³</td>
<td>1,25</td>
</tr>
<tr>
<td>Fibre board</td>
<td>m³</td>
<td>1,47</td>
</tr>
<tr>
<td>Wood pulp</td>
<td>t</td>
<td>2,22</td>
</tr>
<tr>
<td>Chemical pulp</td>
<td>t</td>
<td>2,13</td>
</tr>
<tr>
<td>Recovered paper</td>
<td>t</td>
<td>1,54</td>
</tr>
<tr>
<td>Wood pellets</td>
<td>t</td>
<td>2,22</td>
</tr>
<tr>
<td>Wood charcoal</td>
<td>t</td>
<td>1,65</td>
</tr>
</tbody>
</table>

Source: Weimar (2011)
Results: Total balance of wood fibres

Sources of wood fibres

- Roundwood: 47.5%
- Processing residues: 18.2%
- Waste wood: 9.6%
- Landscape care wood: 2.6%
- Other wood-ass.: 0.9%
- Other residuals: 3.5%
- Waste paper: 17.6%

Σ 171 Mio. m³ (f)

Uses of wood fibres

- Sawmills: 21.3%
- Wood panels: 14.1%
- Pulp: 15.1%
- Waste paper processing: 15.1%
- Veneer: 0.1%
- Solid wood fuels: 3.4%
- Export: 6.5%
- Private households: 15.9%
- Firing plants: 17.6%

Source: Weimar (2011)
Results: Removals 2013

Removals 2013*
Recorded: 53.2 Mio. m³
Unrecorded: 22.2 Mio. m³

Roundwood material use
Coniferous: 90 %
Non-Conif.: 10 %

Roundwood energetic use
Coniferous: 43 %
Non-Conif.: 57 %

* Preliminary
→ Estimate removals annually (e.g. JFSQ/JWEE)
→ Improve specific estimations (ongoing)
→ Actualize relevant information regularly
→ Extension of the model:
  > Final products
  > Final consumption
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Dr. Holger Weimar
Thünen Institute of International Forestry and Forest Economics
Leuschnerstr. 91
21031 Hamburg (Germany)
fon:  +49 (0)40 73962-314
fax:  +49 (0)40 73962-399
mail: holger.weimar@ti.bund.de
web: www.ti.bund.de

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Annex

Sources:

(http://literatur.ti.bund.de/digbibExtern/bibv/dn049777.pdf)