Concept of comparison between forest inventory data and wood consumption statistic

Actual and future wood availability

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1. **Find a transparent system**
   acceptable for inventory experts as well as for market analysts.

2. **Keep it easy** –
   even for Non-Forestry-People.

3. **Avoid serious mistakes** –
   it's impossible to stay completely correct for both sides if you want to achieve 1 + 2.
1. Where is the starting point?
2. Total available forest biomass potential
3. Usable stem wood (round wood)
4. Theoretical and available forest rest wood
5. The green band of sustainability
6. Unregistered fellings
7. What does the customer need?
8. How does it all fit together?
9. Comparison of forest inventory and consumption
1. Where is the starting point?

1. **FAWS** = total forest land – forest land not available
   (5% of area; 2,2% of standing volume; 0% of NAI*)
   (*not calculated in total forest assessment as wood resource)

2. **NAI** = gross annual increment – natural mortality
   (5% of gross increment)

The following calculations are based on FAWS and NAI

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1. Where is the starting point?

- Calculation of NAI varies between countries
- In general stem wood is measured, but where? Total stemwood (0 cm) or above 7 cm diameter?
- Above ground or above cutting curve?
- This should be cleared, because it is especially relevant for the calculation of forest restwood.

The following calculations are based on FAWS, Net Annual Increment and (stem) wood above 7 cm diameter above ground.
2. Total available forest biomass potential

Biomass assortments are calculated for later calculation of forest restwood

NAI = 101.4 M m³ = 100 %

<table>
<thead>
<tr>
<th>Biomass Assortments</th>
<th>TFB in Mio. m³</th>
<th>in % of NAI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branches</td>
<td>101.4</td>
<td>18.0</td>
</tr>
<tr>
<td>Needles</td>
<td>18.0</td>
<td>5.7</td>
</tr>
<tr>
<td>Roots</td>
<td>18.3</td>
<td>18.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>143.3</strong></td>
<td><strong>141.4 %</strong></td>
</tr>
</tbody>
</table>

**total available forest biomass on FAWS**

143.3 Mio m³ = 141.4 %
### 3. Usable round wood

<table>
<thead>
<tr>
<th>Component</th>
<th>NAI in M m³</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>101.4</td>
<td>100%</td>
</tr>
<tr>
<td>Bark</td>
<td>8.1</td>
<td>8,0%</td>
</tr>
<tr>
<td>Harvest losses</td>
<td>12.2</td>
<td>12,0%</td>
</tr>
<tr>
<td>Stem wood (gross; &gt; 7cm)</td>
<td>81.1</td>
<td>80,0%</td>
</tr>
<tr>
<td>Unused harvest volume</td>
<td>9,8</td>
<td>9,7%</td>
</tr>
<tr>
<td>Stem wood (net)</td>
<td>71.3</td>
<td>70,3%</td>
</tr>
</tbody>
</table>

Source: Mantau (2007) The legend of the woody biomass reserve in Europe; UNECE Workshop Mobilizing Wood Resources; Geneva January 11-12, 2007; Example data from Germany 2008 Volume: Polley/Kroicher; Percentages: Dieter/Englert
3. Usable round wood – harvest losses

- Felling wedge measurement point
- Cutting karf
- Mid diameter round off to full cm
- 1% allowance for trim overlength
- Bark goes to industry, but is not included in felling statistics
3. Usable round wood – unused stem wood

Examples for unused stem wood (round wood) [1]

When stem wood is measured above ground, this is unused stem wood
3. Usable round wood – unused stem wood

Examples for unused stem wood (round wood) [2]

Unused stem wood is something else than the difference between fellings and removals.

No stem wood, but wood above 7 cm diameter.

No felling, no removal – just cut off stem wood.

Unused stem wood is something else than the difference between fellings and removals.
3. Theoretical and available forest rest wood

<table>
<thead>
<tr>
<th></th>
<th>gross [M m³]</th>
<th>net [Mio. M m³]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63.9 M m³</td>
<td>19.9 M m³</td>
</tr>
</tbody>
</table>

- Harvest losses 10% 1.2
- Unused harvest vol. 75% 7.4
- Branches (< 7 cm) 50% 9.0
- Needles 25% 1.4
- Roots 5% 0.9

Source: Spellmann/Mantau/Polley: Plattform Forst und Holz
4. Total available wood from forests

Overall usable forest biomass

round wood

<table>
<thead>
<tr>
<th>biomass</th>
<th>usable of total biomass</th>
</tr>
</thead>
<tbody>
<tr>
<td>71.3 M m³</td>
<td>78%</td>
</tr>
</tbody>
</table>

currently usable forest restwood

<table>
<thead>
<tr>
<th>biomass</th>
<th>usable of total biomass</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.9 M m³</td>
<td>22%</td>
</tr>
</tbody>
</table>

total usable forest biomass

<table>
<thead>
<tr>
<th>biomass</th>
<th>usable of total biomass</th>
</tr>
</thead>
<tbody>
<tr>
<td>91.2 M m³</td>
<td>100%</td>
</tr>
</tbody>
</table>

Biomass

<table>
<thead>
<tr>
<th>biomass</th>
<th>usable of total biomass</th>
</tr>
</thead>
<tbody>
<tr>
<td>141.3 M m³</td>
<td>65%</td>
</tr>
</tbody>
</table>
5. The green band of sustainability

Different forest biomass potentials/scenarios

NAI - calculated as a result of past inventory data

NAI - calculated as a result of models on future availability
- based on assumptions on uneven-aged forests (reserve), change in rotation rates, forest management etc.

NAI - calculated as a result of ideal forest stand
The calculation of sustainable NAI depends on assumptions on forest management as well as on values.

Thus sustainability may vary in a substantial range of options.
The basis for a comparison of wood consumption with sustainable available woody biomass is the calculation of sustainable options (e.g. five years periods)

- **Scenario high** = medium + intensified management
- **Scenario medium** = low + higher volume old stands
- **Scenario low** - NAI (- bark - losses) cutting volume (Efm)

Example: Data from Germany
Official statistics offer fellings and removals

These removals are definitely included!

But what about these?

Unregistered fellings in Germany in average added up to 15%, with a maximum of 22% in 2005, but since then have been estimated continuously and thereby the difference deceased to less then 10%.
OBS! Calculation of „total removals“

Consequences for forest models of standing volume and NAI.

If only official fellings are calculated the remaining volume is overvalued year by year.

Assuming unregistered fellings of just 10% of all fellings they will add up to annual NAI in less than ten years.

Source: EFI - Forest Information SCENario model EFISCEN (The use of this illustration does not imply, that this is a problem of the presented model!)
### What does the customer need?

<table>
<thead>
<tr>
<th>assortment wood</th>
<th>minimum total wood</th>
<th>desired softwood</th>
<th>desired hardwood</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>stemwood log (by use)</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>other stem (difference)</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>stemwood (sum)</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>forest restwood</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>woody biomass</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
If forestry growth models include a modelling of assortments, they systematically overestimate logs and underestimate other stem wood (pulp wood).

Thus it is better to utilize assortment proportions from the actual use, eg. as a five year moving average.

OBS! Assortment proportion from felling statistics does not represent possible potential for saw mills. Because of quality restrictions it is even smaller.
8. How does it all fit together?
9. Comparison of forest inventory data with consumption

Comparison of total NAI and total consumption in standing volume

in M. m³ (NAI)

Example: Data from Germany
9. Comparison of forest inventory data with consumption

- Standing volume development
- Example of result presentation for decision makers
- Yearly accumulated development of standing volume
9. Comparison of forest inventory data with consumption

Comparison by assortments

Example: Data from Germany

softwood stemwood

minimum requirements
for scenarios

- softwood (stem) - medium consumption
- softwood (stem) - upper consumption
- softwood (stem) - lower consumption
- softwood stemwood - lower availability
- softwood stemwood - upper availability
Comparison by assortments

**hardwood stem wood**

- hardwood (stem) - medium consumption
- hardwood (stem) upper consumption
- hardwood (stem) - lower consumption
- hardwood stemwood - lower availability
- hardwood stemwood - upper availability

Example: Data from Germany
9. Comparison of forest inventory data with consumption

Comparison by assortments

**Forest restwood**

- Forest restwood consumption
- Upper scenario
- Lower scenario
- Forest restwood technically available - lower scenario
- Forest restwood technically available - upper scenario

Minimum requirements for scenarios

Example: Data from Germany

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Mantau: Actual and future wood availability
wood or not wood?
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