Land areas and biomass available for bioenergy purposes in the Nordic and Baltic countries

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Forest fraction (%)

- 0-10
- 11-25
- 26-50
- 51-75
- 76-100

Reworked from Kempeneers et al. (2011)
Total forest land area: 60.8 mill. ha; 52.1% of total land area
Growing stock in the ENERWOODS countries

Total growing stock: 7,400 mill. m³
Sources for forest fuels

Slash

Stumps

Small-sized trees

Roundwood

Effects on forest fuels:
- Felling rate
- Changed top diameter
  c 30% residues
Opportunities to increase forest fuels

1) Increased use of
- Slash
- Stumps
- Small-sized trees

2) Increased growth and increased fellings
Total annual growth: 276 mill. m$^3$ yr$^{-1}$
Obstacles to biomass supply

1. Conflicts with other interests (eg. conservation, social values)
2. Technical problems (eg. steep terrain, wetlands)
3. Management restrictions (eg. foreign tree species, clone material)
4. Damage (eg. animal browsing, frost)
6,600 of 7,400 mill. m³ is available for wood supply (89 %)
179 of 276 mill. m³ is harvested annually (65 %)
Annual current harvest potential of forest fuels in the Nordic and Baltic countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Denmark</th>
<th>Finland</th>
<th>Norway</th>
<th>Sweden</th>
<th>Estonia</th>
<th>Latvia</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential, lowest restriction level</td>
<td>Mton DM</td>
<td>2,3</td>
<td>35</td>
<td>5,11</td>
<td>29,33</td>
<td>3,2</td>
<td>4,52</td>
</tr>
<tr>
<td></td>
<td>TWh</td>
<td>11,5</td>
<td>186</td>
<td>27,1</td>
<td>143,4</td>
<td>16,8</td>
<td>23,9</td>
</tr>
<tr>
<td></td>
<td>PJ</td>
<td>41,5</td>
<td>670</td>
<td>98</td>
<td>522</td>
<td>62,2</td>
<td>87</td>
</tr>
<tr>
<td>Potential, highest restriction level</td>
<td>Mton DM</td>
<td>1</td>
<td>22</td>
<td>3,84</td>
<td>10,89</td>
<td>1,7</td>
<td>4,52</td>
</tr>
<tr>
<td></td>
<td>TWh</td>
<td>5,1</td>
<td>117</td>
<td>20,4</td>
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<td>9,1</td>
<td>23,9</td>
</tr>
<tr>
<td></td>
<td>PJ</td>
<td>18,3</td>
<td>420</td>
<td>74</td>
<td>194</td>
<td>33,4</td>
<td>87</td>
</tr>
</tbody>
</table>

The current forest fuel potential is 229 to 409 TWh yr⁻¹
Opportunities to improve sustainable growth in our forests

- Genetic improvement
- Climate change
- Harvest increase
- Site adaptation
- Establishment efficiency
- Management systems
- Damage reduction
- Fertilization
- Afforestation
Other available land for afforestation, 1,000 ha

<table>
<thead>
<tr>
<th>Country</th>
<th>Area</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>250 - 470</td>
<td>Forest land share to be 20-25 %</td>
</tr>
<tr>
<td>Finland</td>
<td>276</td>
<td>Fallows and uncultivated arable land</td>
</tr>
<tr>
<td>Norway</td>
<td>195</td>
<td>Mainly coastal heathland</td>
</tr>
<tr>
<td>Sweden</td>
<td>300 - 500</td>
<td>Not or partly used areas</td>
</tr>
<tr>
<td>Estonia</td>
<td>306</td>
<td>86 % is unmanaged agricultural land</td>
</tr>
<tr>
<td>Latvia</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,587 - 2,007</td>
<td></td>
</tr>
</tbody>
</table>
Current use of renewable energy is large (primary supply 514 TWh yr\(^{-1}\)) in the Nordic and Baltic countries and dominated by biomass and waste.

The potential to further increase the use of forest fuels is high and is an important tool in the vision of independence of fossil energy sources.

Availability of growing stock for wood supply is 89% in the region. 65% of annual increment is used today, indicating that harvest levels may increase without sacrificing the well-stocked forests and biodiversity.

The current potential for forest fuel resources was estimated to over 400 TW yr\(^{-1}\), i.e. 30% of total end use of energy.
Land areas and biomass production for current and future use in the Nordic and Baltic countries