Sustainable Materials Management of Wood Fibres

OECD Global Forum on Environment Focusing on Sustainable Materials Management
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Outline

- Background on pulp and paper sector
- Pulp and paper life-cycle
- Major findings
- SMM opportunities and barriers
- Outlook and trends
- Conclusion
Paper: a valuable commodity with opportunities to improve sustainability

- Important sector of the global economy in terms of employment scope and product application
- Large consumer of energy, water, and manages large carbons stocks:
  - Almost 400 million tonnes of paper produced and consumed annually worldwide (58 kg of paper per capita)
  - Fourth largest industrial consumer of energy (5.7% of global industrial energy use)
  - Contributes 2% of global CO₂ emissions and actively manages more carbon than most industries
Paper: a valuable commodity with opportunities to improve sustainability over the life cycle
The Life Cycle of Paper

- Harvesting
- Pulping
- Papermaking
- Transportation
- End-of-life

Harvesting

Pulping
- Chemical Pulping
- Mechanical Pulping

Papermaking

Use

Recycling
- Combustion
- Landfilling

Recovered Pulping

Deinking
Major Findings: Energy

Total → 21-32 GJ per tonne

Energy (GJ / tonne)

- Mechanical Pulping: 30%
- Harvest: 3%
- Paper Drying: 20%
- Papermaking: 17%
- Pulp Drying: 10%
- Bleaching: 10%
- Transportation: 10%

EC BREF 2001; Jacobs & IPST 2006
Major Findings: GHG Emissions

Note: Only includes GHG emissions from paper manufacturing stages. Recovered pulp emissions do not consider forest carbon sequestration.
## Major Findings: Energy and GHGs of End-of-Life Pathways

<table>
<thead>
<tr>
<th>EOL Pathway</th>
<th>Energy use (GJ / tonne)</th>
<th>GHG emissions (tonnes CO$_2$e / tonne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycling</td>
<td>-19 to -7</td>
<td>-0.8 to +0.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-3.4 to -3.1*</td>
</tr>
<tr>
<td>Combustion</td>
<td>-10 to -6</td>
<td>-0.8 to -0.2</td>
</tr>
<tr>
<td>Landfilling with methane-to-energy recovery</td>
<td>-1.4 to 0.2</td>
<td>-1.3 to 0.2</td>
</tr>
<tr>
<td>Landfilling without methane recovery</td>
<td>0.6</td>
<td>-0.5 to 4</td>
</tr>
</tbody>
</table>

*Including forest carbon sequestration.

EPA 2006; EC 2001
Major Findings: Water Use

Water use (cubic meters / tonne)

- Chemical pulp mills
- Integrated mechanical pulp and paper mills
- Recovered fibre processing, no de-inking
- Recovered fibre processing, with de-inking

EC 2001 BREF; Nilsson et al., 2007
## SMM Technologies and Practices

<table>
<thead>
<tr>
<th>Life-cycle Stage</th>
<th>Potential Reduction</th>
<th>Example Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesting</td>
<td>Large carbon storage potential</td>
<td>Sustainable Forestry Management</td>
</tr>
<tr>
<td>Pulping</td>
<td>Energy use: 25% to 30% Water use: 25% to 50%</td>
<td>Combined Heat and Power Elemental chlorine-free bleaching Increased use of biomass</td>
</tr>
<tr>
<td>Papermaking</td>
<td>Energy use: 30% to 40% Water use: Up to 50%</td>
<td>Upgrade to best available drying and press technologies</td>
</tr>
<tr>
<td>Transportation</td>
<td>Energy use: 2 MJ / km GHG emissions: 50%</td>
<td>Efficient routing; supply chain optimization Improved fuel efficiency</td>
</tr>
<tr>
<td>End-of-life</td>
<td>Recycling: 7 to 19 GJ / tonne</td>
<td>Increased paper recovery Limit biomass discards to landfill Improved reuse, source reduction</td>
</tr>
</tbody>
</table>
Drivers and Barriers

Technical
- Slow rates of capital equipment turnover for new technologies
- Over time, significant improvements are achieved

Economic
- Cost savings associated with increased efficiency
- High capital costs and variability in market prices

Social
- Increased consumer awareness of environmental sustainability issues
- A lack of access to data availability and information sharing
Outlook and Trends

- The global pulp and paper market is projected to grow through 2030 at a projected rate of 2.3% per year.

- Investment in new technologies could be challenged by high capital investment requirements and slow or uncertain growth / economic conditions.

- Shift of trade flows and production from established to emerging markets (e.g., China, India, Latin America)
Conclusions

- Wood fibre industry is a major consumer of energy, water, and manages large carbon stocks.
- Considerable opportunities exist to reduce energy use, water use, and GHG emissions across the life-cycle.
- Promoting SMM of fibres will require addressing barriers that impede adoption.
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Thank You!

Questions?

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References


Appendix

Criteria and example indicators for sustainable forest management

- Growing stock
- Carbon storage
- Forest resources & global carbon cycles
- Balance between growth & removals
- Forest area under management
- Non-wood products
- Forest health & vitality
- Productive functions of forests
- Cultural values
- Public participation & awareness
- Research and education
- Recreational services
- Socio-economic aspects
- Employment
- Significance of forest sector
- General protection
- Biological diversity
- Threatened species
- Biodiversity in production forests
- Rare
- Water conservation
- Soil erosion
- General protection
- Nutrient balance & acidity
- Different damages
- Air pollutants
- Defoliation
- Land use & forest area
- Growing stock
- General capacity

Source: Ministerial Conference on the Protection of Forests in Europe