

# Sustainable Materials Management of Wood Fibers

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# Outline

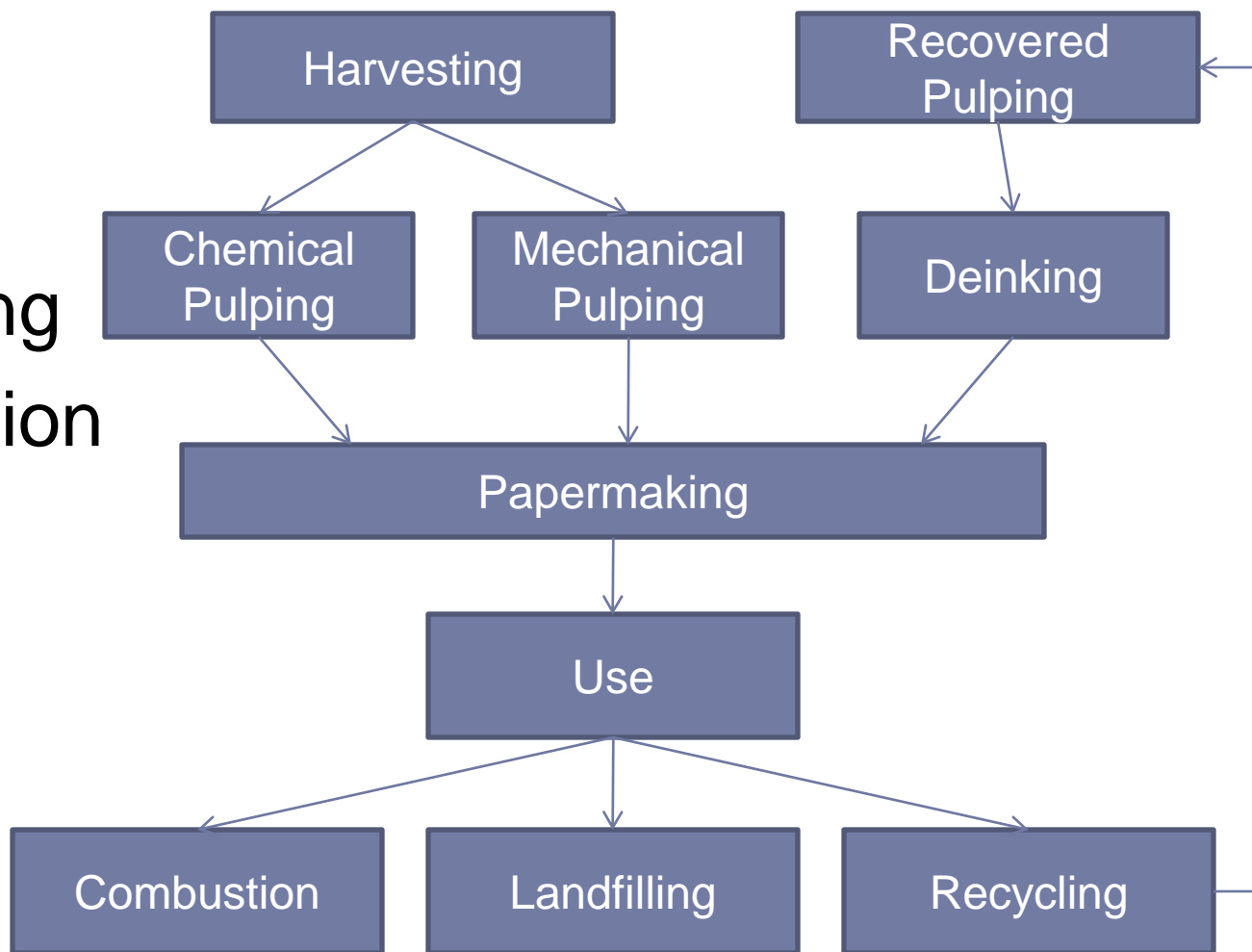
- Background on pulp and paper sector
- Pulp and paper life-cycle
- Major findings
- SMM opportunities and barriers
- Outlook and trends
- Conclusion

# Paper: a valuable commodity with opportunities to improve sustainability

- The pulp and paper sector is a large consumer of energy water, and manages large carbons stocks:
  - Almost 400 million metric tons 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 fossil CO<sub>2</sub> emissions and actively manages more carbon than any other industries except fossil energy, agriculture, waste management
- Important sector of the global economy in terms of employment scope and product application

# The Life Cycle of Paper

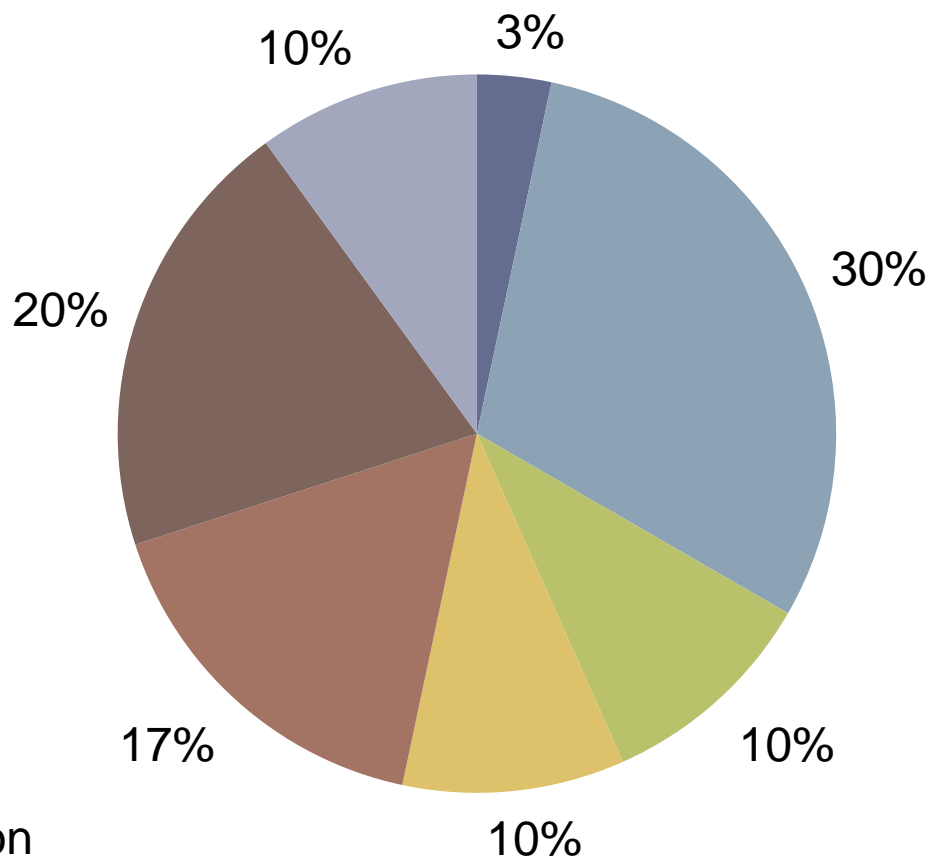
- Harvesting
- Pulping
- Papermaking
- Transportation
- End-of-life



# Major Findings: Energy

**Energy (GJ / metric ton)**

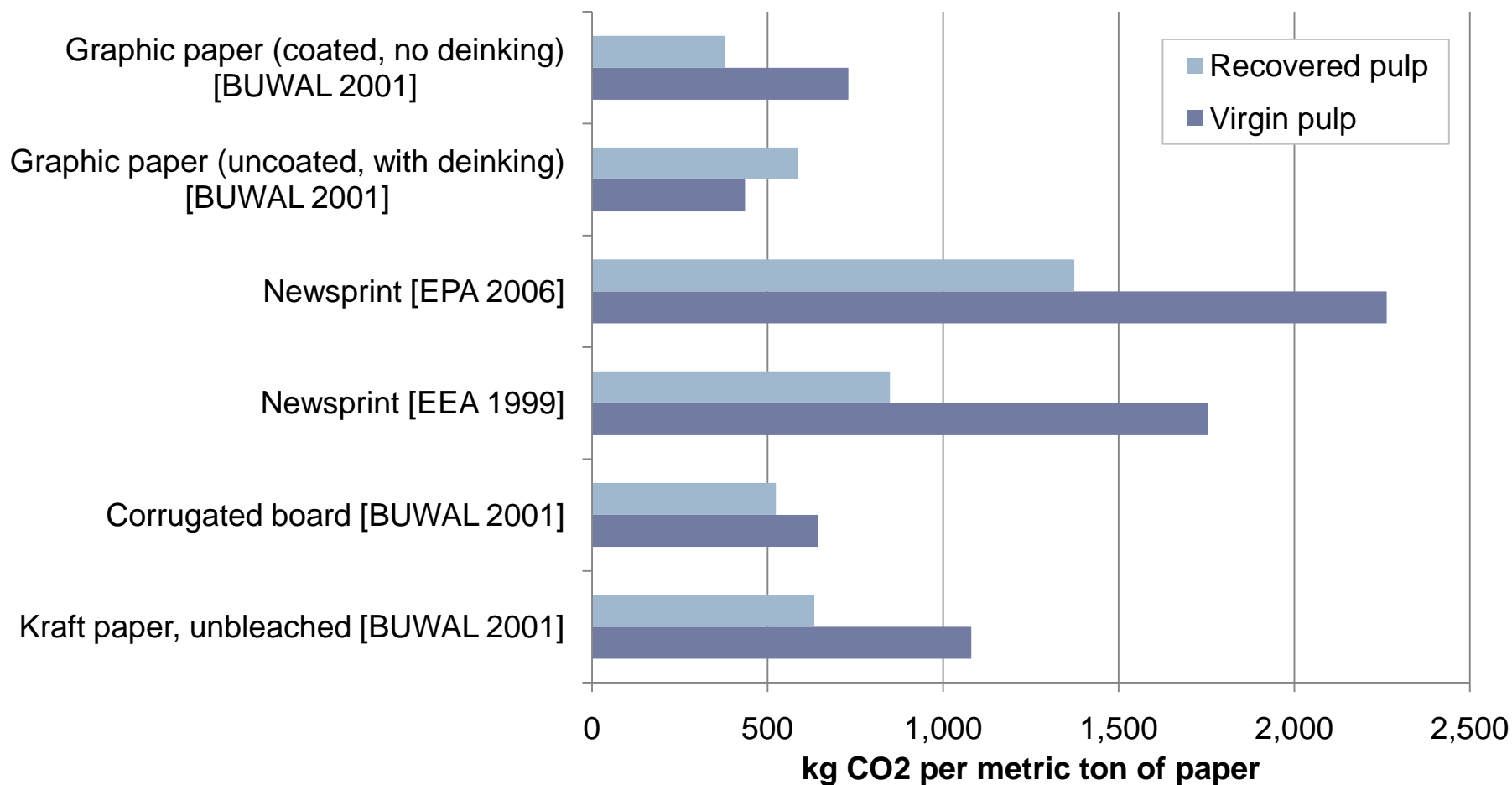
- Harvest
- Mechanical Pulping
- Bleaching
- Pulp Drying
- Papermaking
- Paper Drying
- Transportation



Total → 21-32 GJ per metric ton

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.

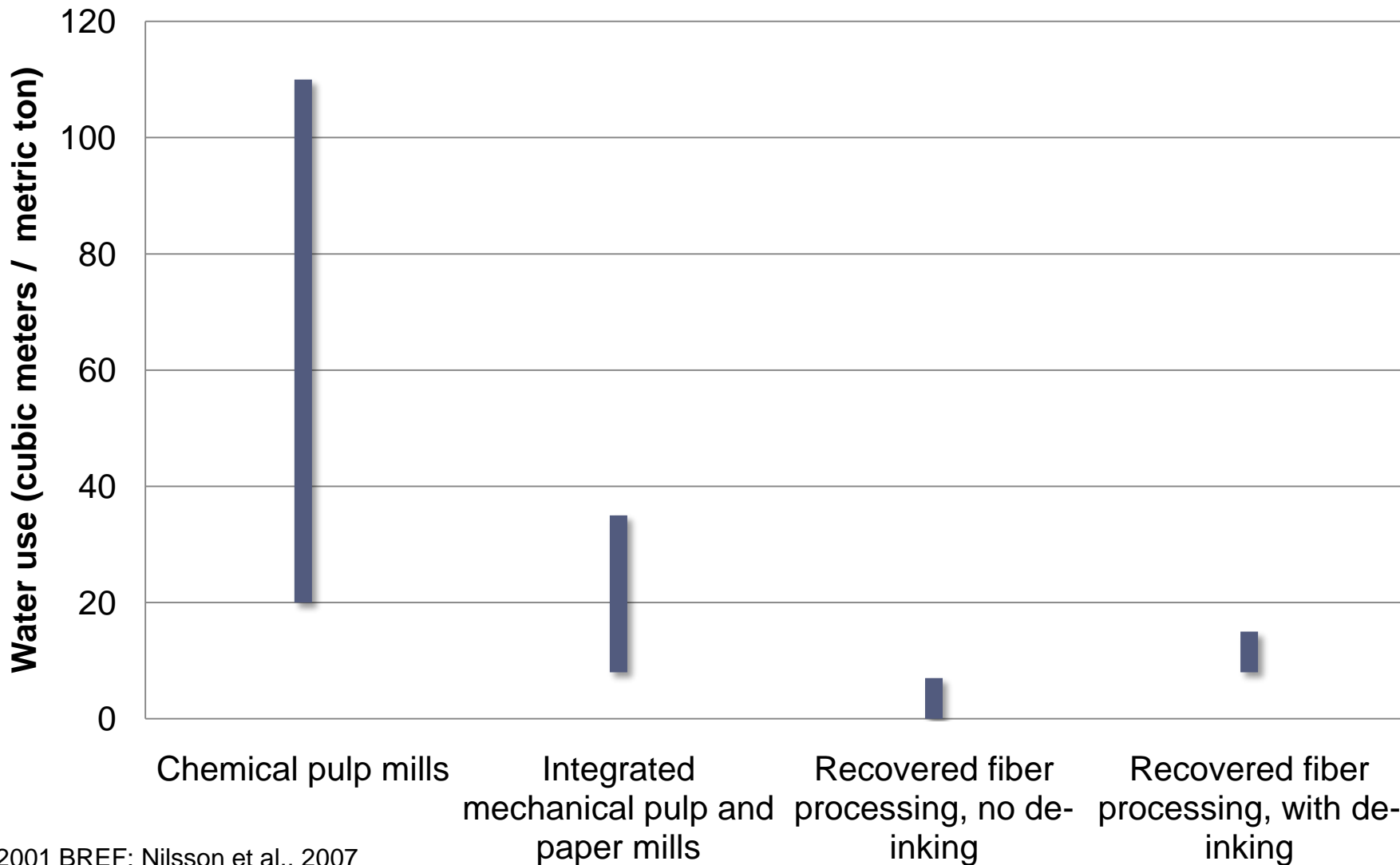
# Major Findings: End of Life Energy and GHG Emissions

	<b>Energy use</b> (GJ / metric ton)	<b>GHG emissions</b> (metric tons CO <sub>2</sub> e / metric ton)
Recycling	-19 to -7	-0.8 to +0.2 -3.4 to -3.1*
Combustion	-10 to -6	-0.8 to -0.2
Landfilling with methane-to-energy recovery	-1.4 to 0.2	-1.3 to 0.2
Landfilling without methane recovery	0.6	-0.5 to 4

\*Including carbon forest sequestration.

EPA 2006; EC 2001

# Major Findings: Water Use



EC 2001 BREF; Nilsson et al., 2007

# SMM Technologies and Practices

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

# 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 fiber industry is a major consumer of energy, water, and manages large carbon stocks.
- There are considerable opportunities to reduce energy use, water use, and GHG emissions across the life-cycle.
- Promoting SMM of fibers will require addressing barriers that impede adoption.

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# Thank You!

- Questions?

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# Appendix

## Criteria and example indicators for sustainable forest management



Source: Ministerial Conference on the Protection of Forests in Europe