Energy wood supply chains in Finland

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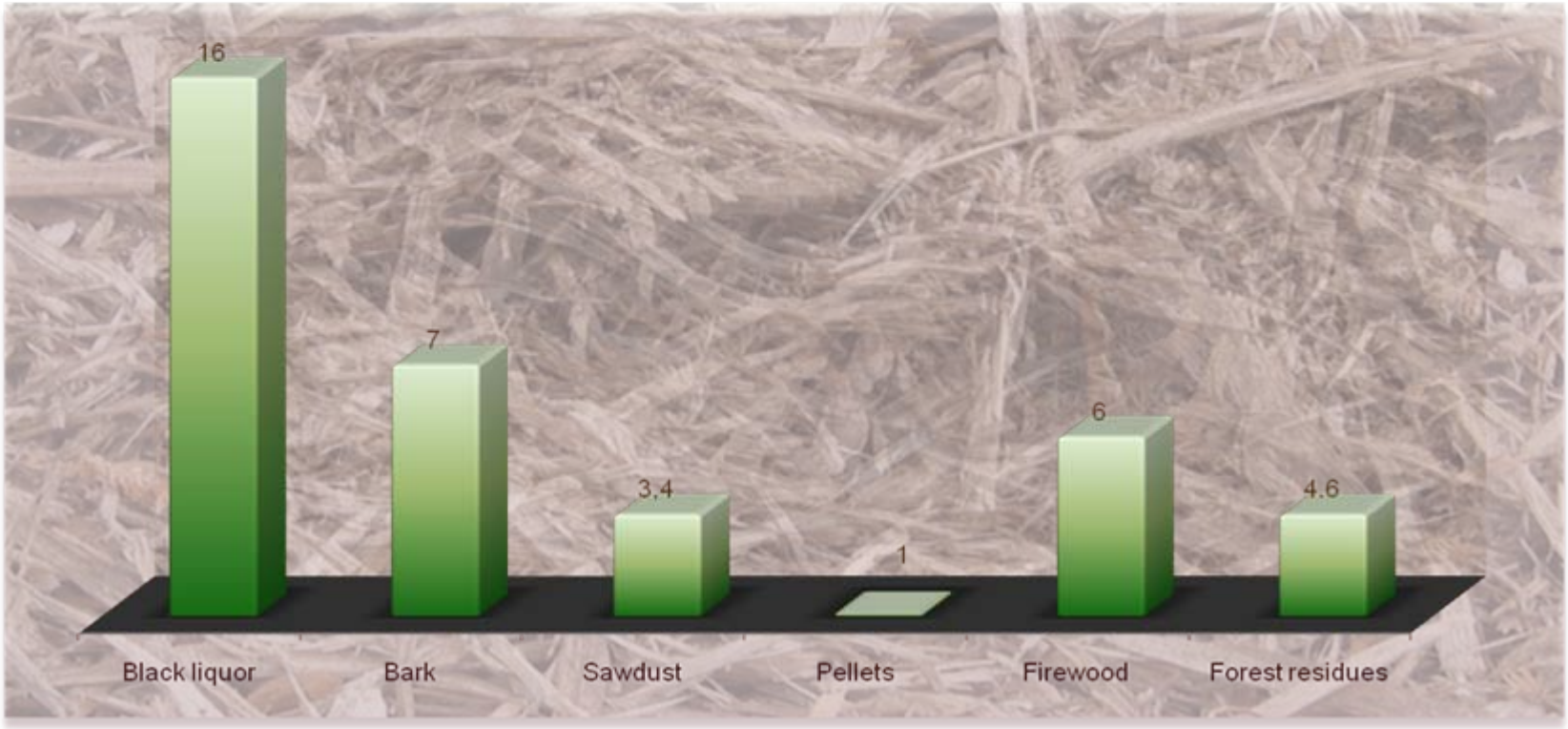
Finnish Russian bioenergy wg excursion 8.-10.6.2010

Forest ownership:

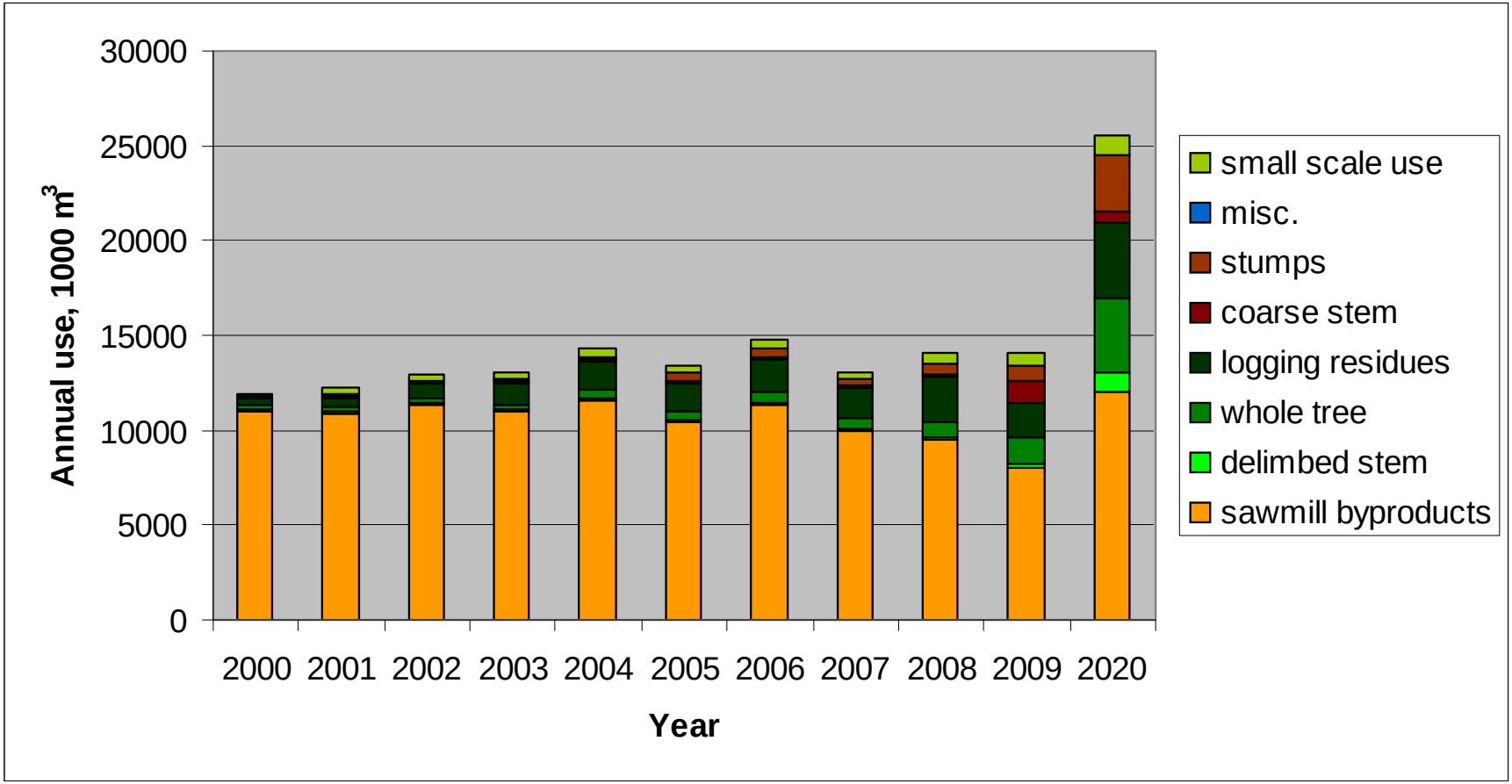
- State 25%
- Private (families) 61%
- Companies 9%
- Others 5%

Forest energy in Finland 2009

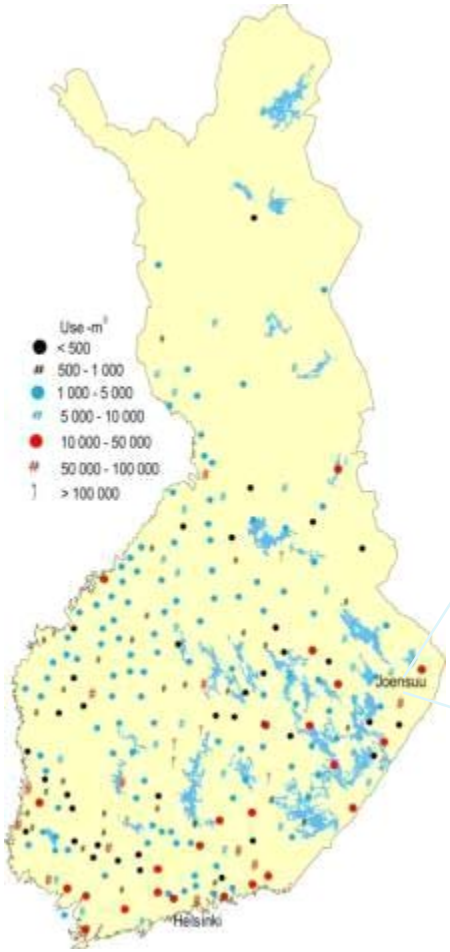
- **Wood fuels ~20 % of primary energy production**
- **38 Mm^3,16 Modt**



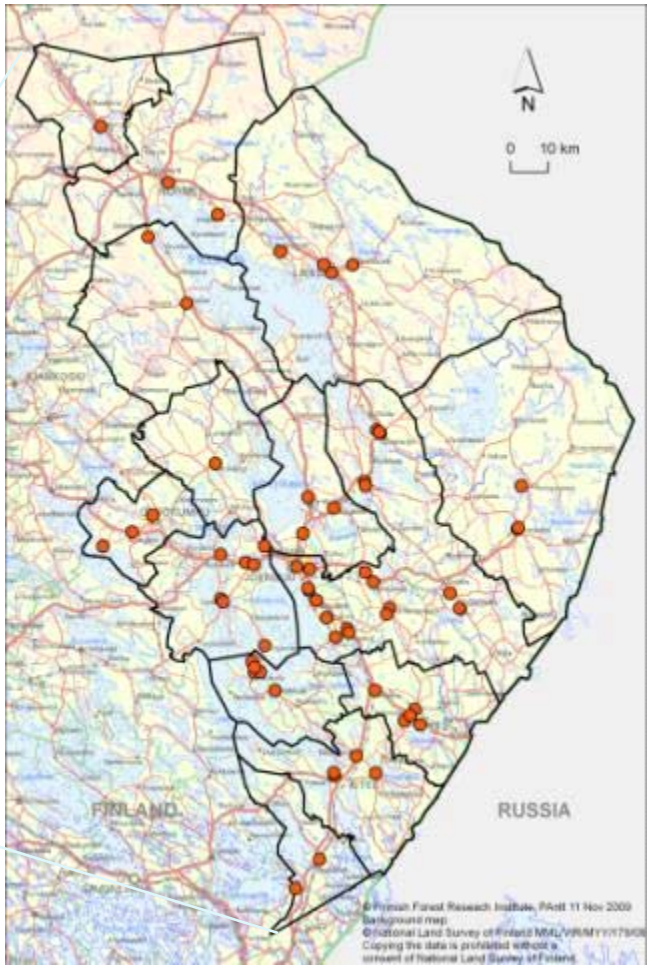
Use of solid wood fuels in Finland



Users of forest energy in Finland & North Karelia



> 750 heating plants



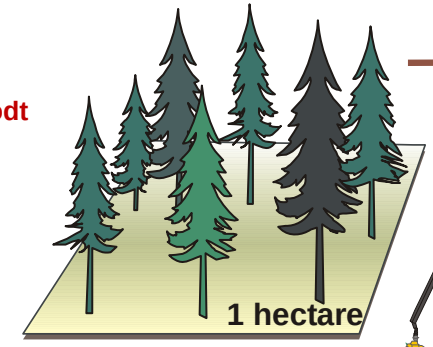
70 % of energy production from wood

HARVESTING SYSTEMS

Integration

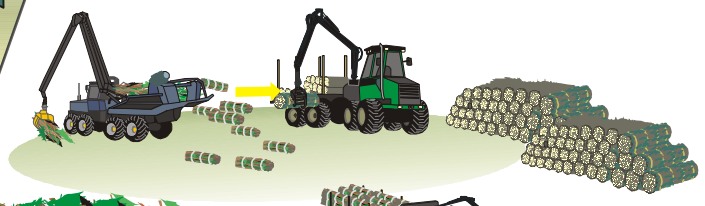
STAND:
Round wood 250 m^3 105 odt
Forest residues 100 m^3
42 odt

At least one third
of the logging residues and
stumps will be left in the
forest as a fertiliser



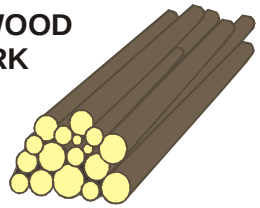
STUMPS
Potential 60 - 80 m^3 25-35 odt
For energy 50 - 60 m^3 20-25 odt

BUNDLING OF FOREST RESIDUES

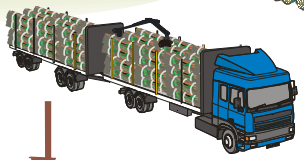


HARVESTING

ROUND WOOD WITH BARK



FOREST RESIDUES

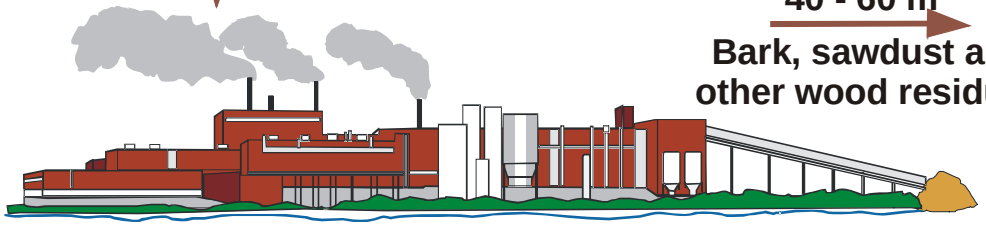


250 m^3
105 odt

Forest chips
110 - 120 m^3
47-51 odt

17-25 odt
40 - 60 m^3

Bark, sawdust and other wood residues



SAWMILL/PULP MILL 190 - 210 m^3
80-90 odt

TOTAL WOOD FUELS
150-180 m^3 = 300 - 360 MWh 63-76 odt
Heat production = 170 - 200 MWh
Electricity production = 85 - 100 MWh

VTT
E.Alakangas

Logging residues

- Regeneration areas of spruce, where accumulation of merchantable wood is at least 200 m³
- In pine stands and birch stands at least 300 m³ (preferably larger than 1 ha)
- Forwarding distance preferably under 350 m

Piling of logging residue

Logging residue procurement

- Slash piling is integrated into roundwood cutting
- Piling compensation

Forwarding of logging residue

Roadside storage

Roadside chipping – large scale

Transportation – large scale

Chipping at plant

Bundling

THINNINGS

Thinning

Before

After


Sampo
ROGENLEW
1046 J


PONSSE

Manual thinning -15%

Roadside storages

Transport

STUMPS

Stump harvesting and transport

Stump lifting heads with splitting knife

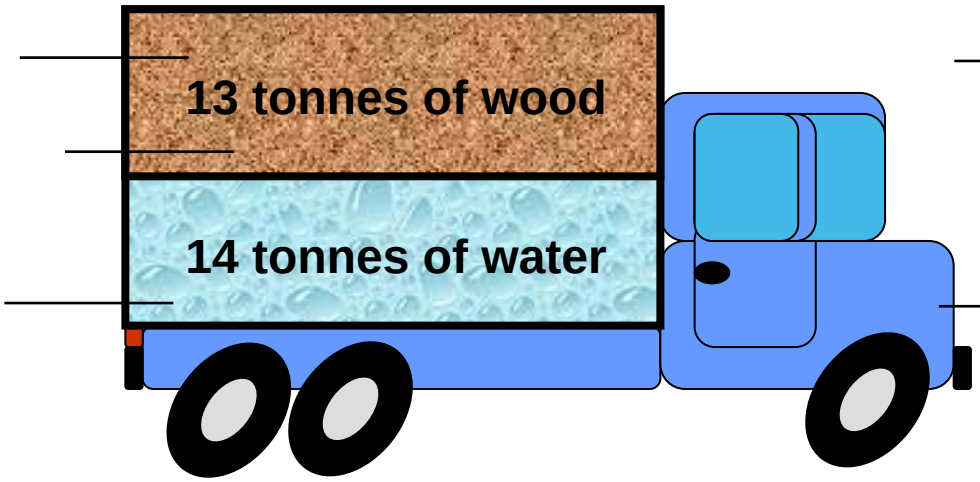
Photos: A Hirvonen Oy, UPM Forest, Korsun Teräs Tmi

Transportation – stumps

Moisture content in long distance transportation

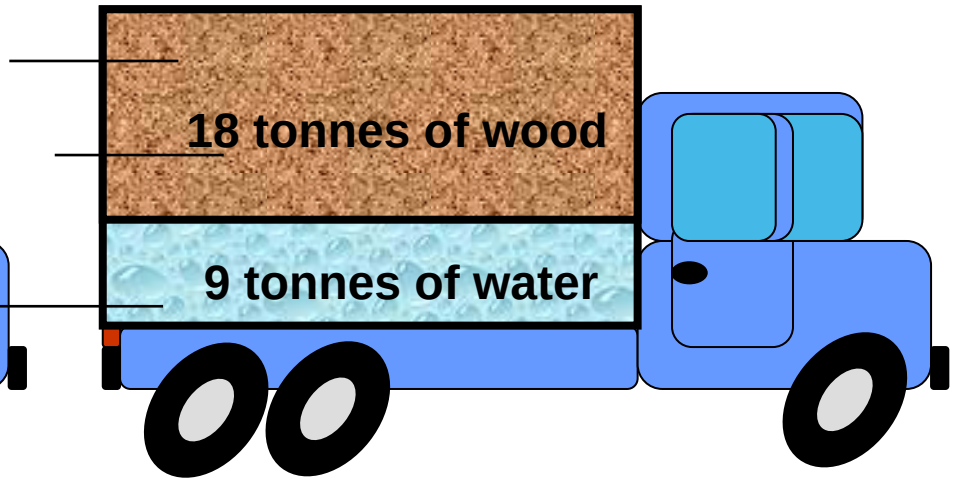
27 tonnes Brittish chip lorry
70 £ per hour, 2 hours per roundtrip

Moisture content > 50%



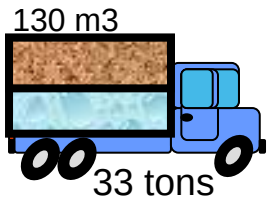
32 m^3
850 kg/m^3
71 MWh
USD 4.2 / MWh

Moisture content ~30%



45 m^3
600 kg/m^3
108 MWh
USD 2.25 / MWh

Moisture content in long distance tranportation



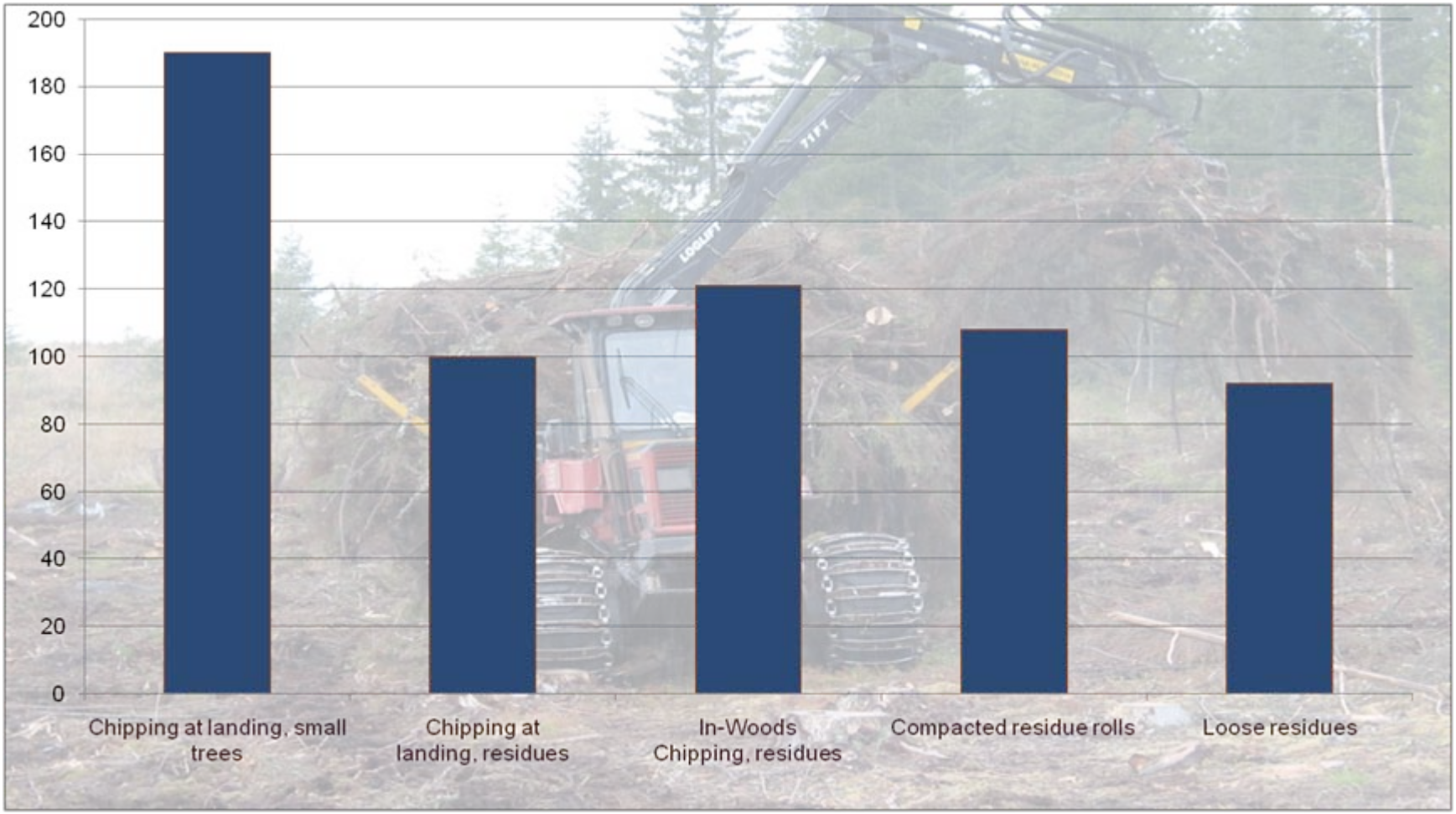
Fuel need 170 000 MWh/a

150 km roundtrip

	30%	50%
Truckloads	1 435	2 241
Chip demand m^3	157 742	210 206
Costs, CAD	48 100	83 700
CO_2 emissions, t	859	1341

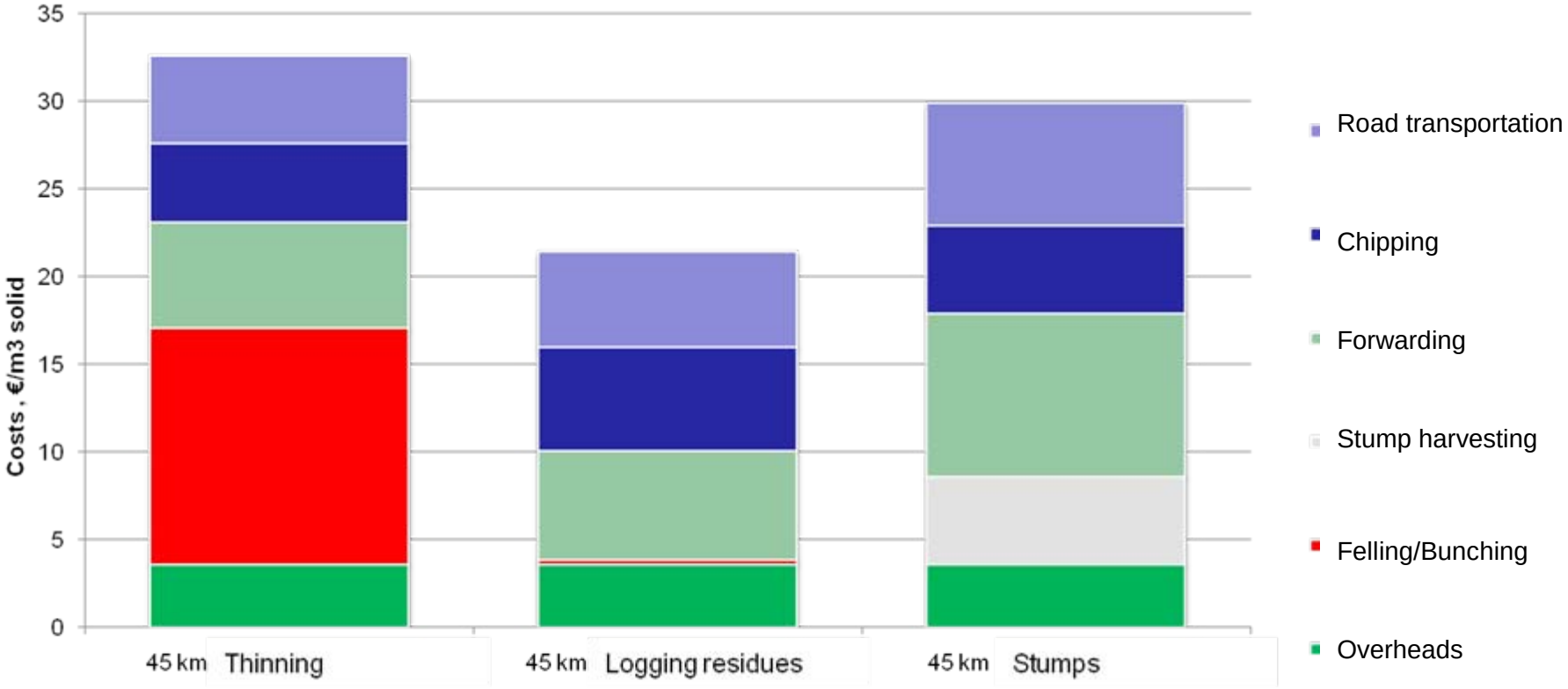
ECONOMICS

Cost comparison of supply chains

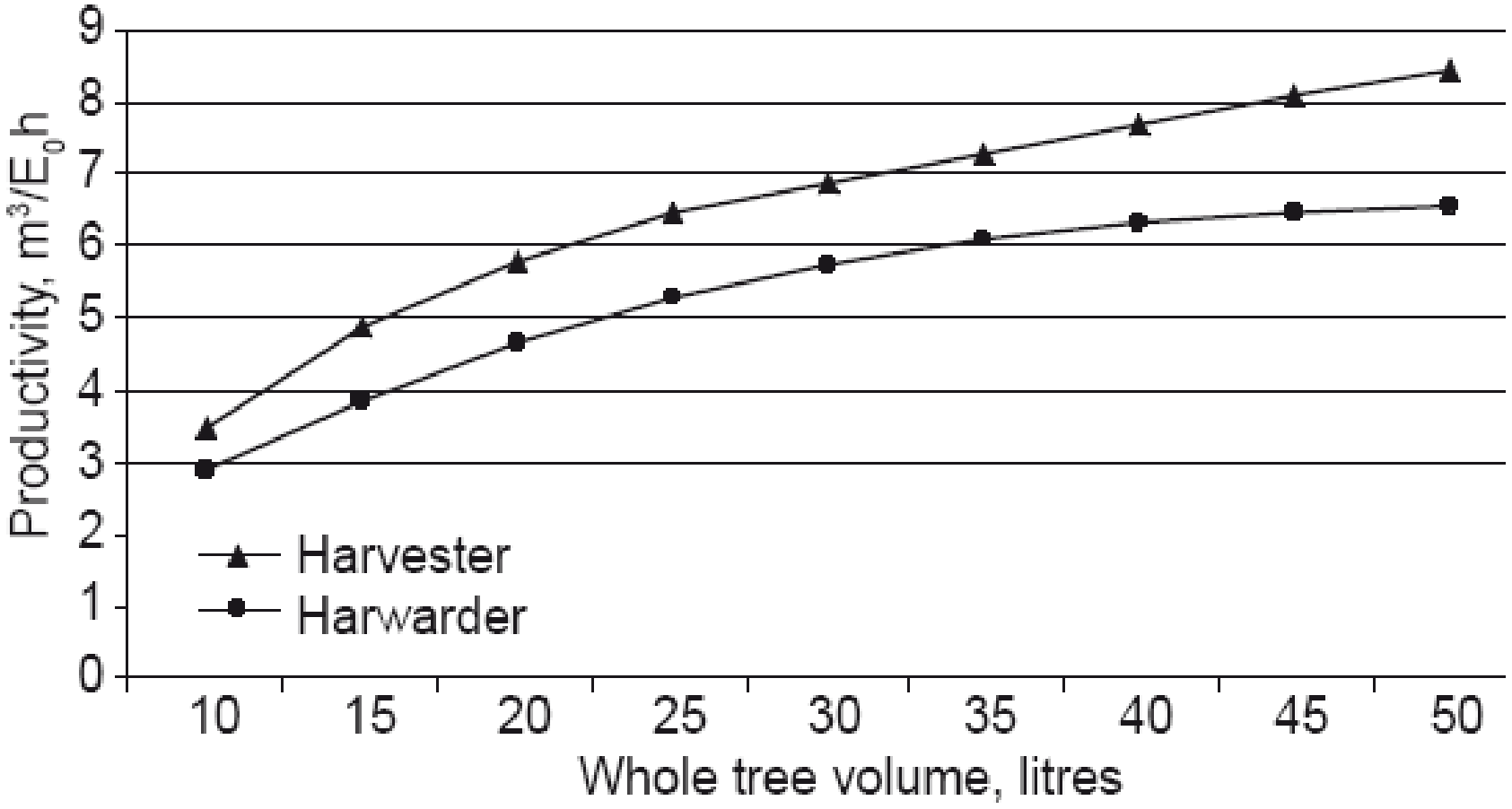


40 km transportation distance

Cost comparison

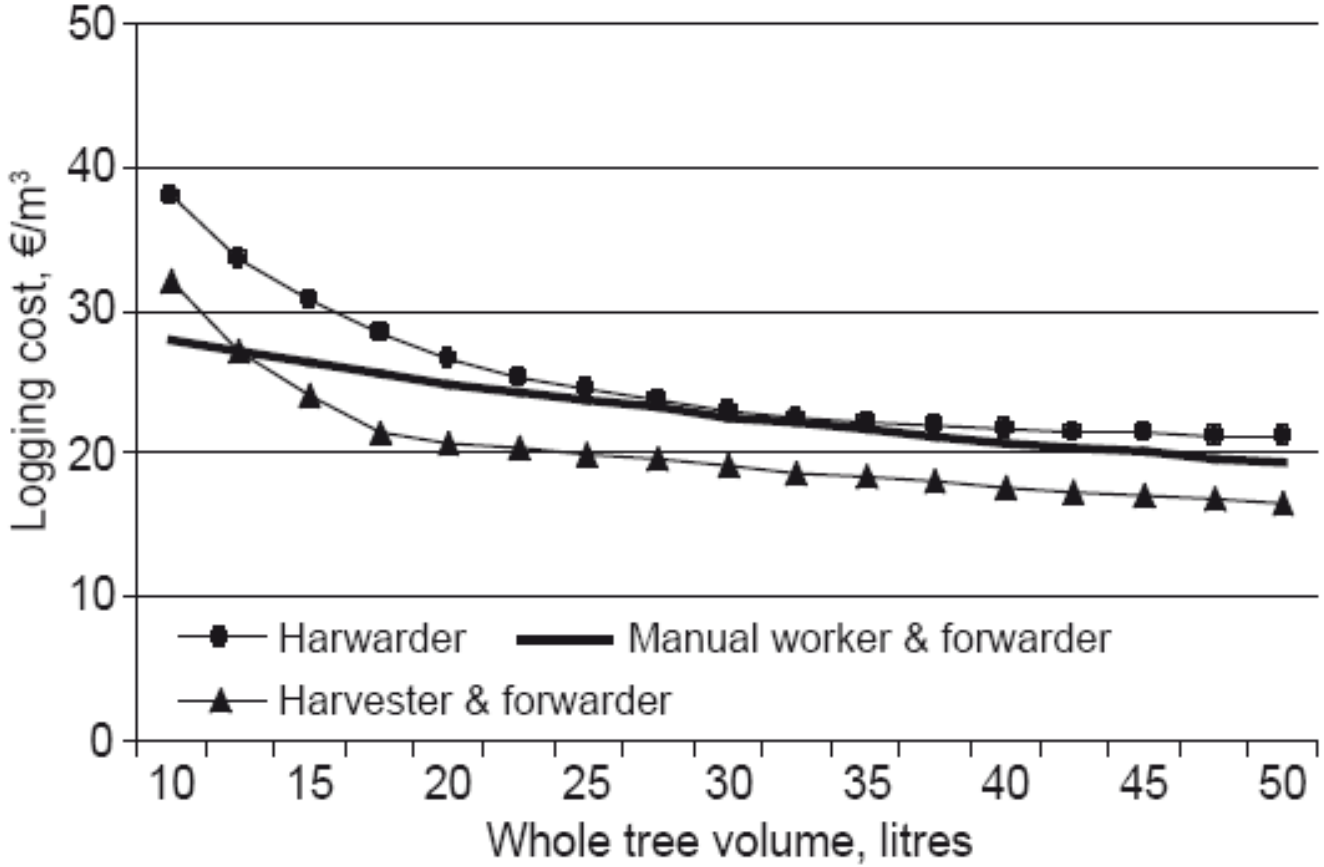


Productivity of mechanized thinnings



Removal: 60 m3/ha

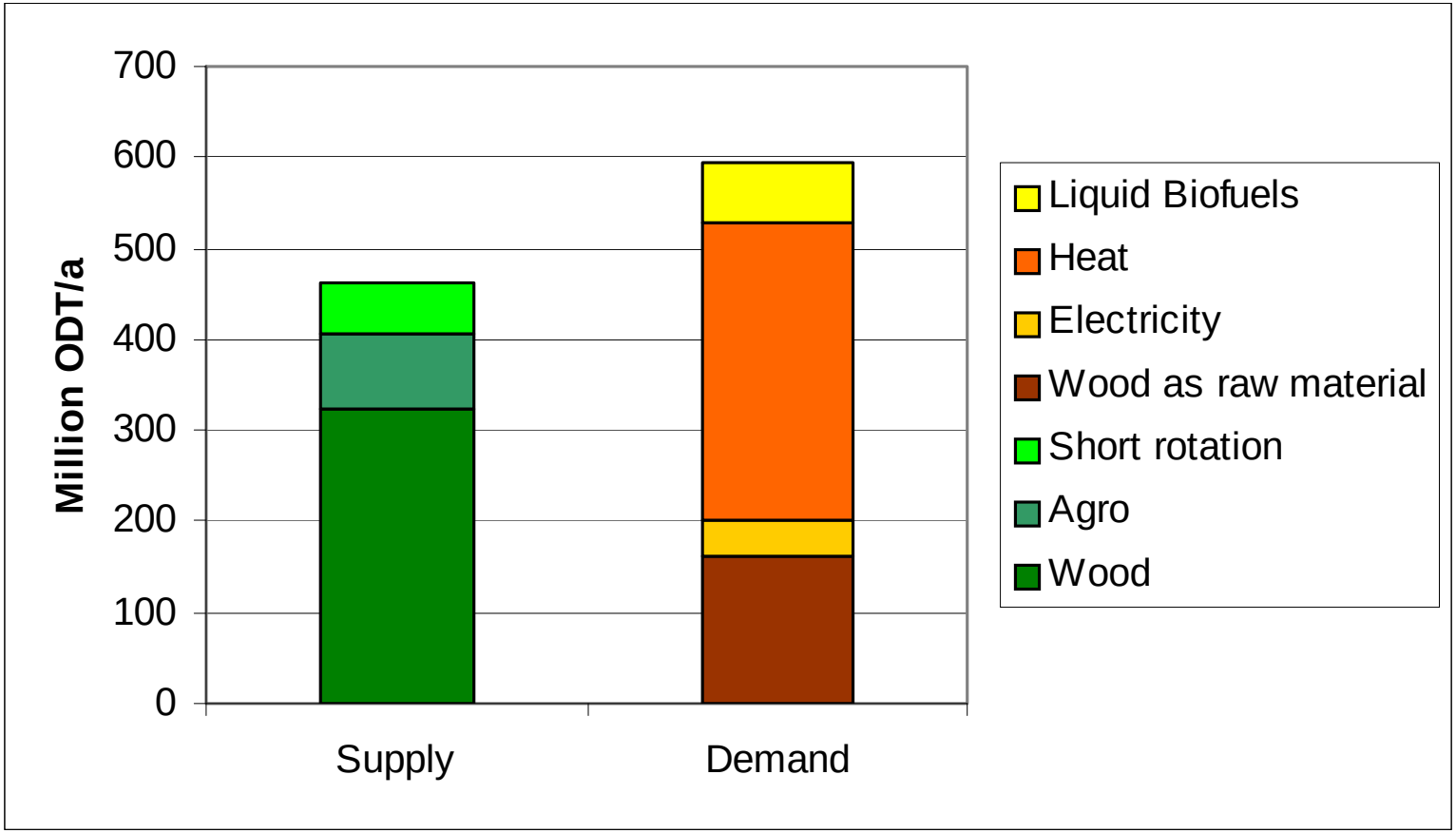
Logging costs of thinnings



Removal: 60 m3/ha
Forwarding distance 200 m

Laitila 2008

Biomass supply vs. demand in 2020, EU27



Rettenmaier et al. 2008

Conclusions

- Finland and EU have unutilized biomass potentials
- The use of stemwood from early thinnings will increase substantionally
- Utilization of logging residues can not grow much
- Harvesting of stumps for energy grows, but ecological limitations restrict growth
- Import of woody biomass for energy becomes important in Eastern Finland and at coasts