Metsäteho

Impact of HCT articulated vehicles in boosting efficiency of timber transport
Summary of the Prestudy

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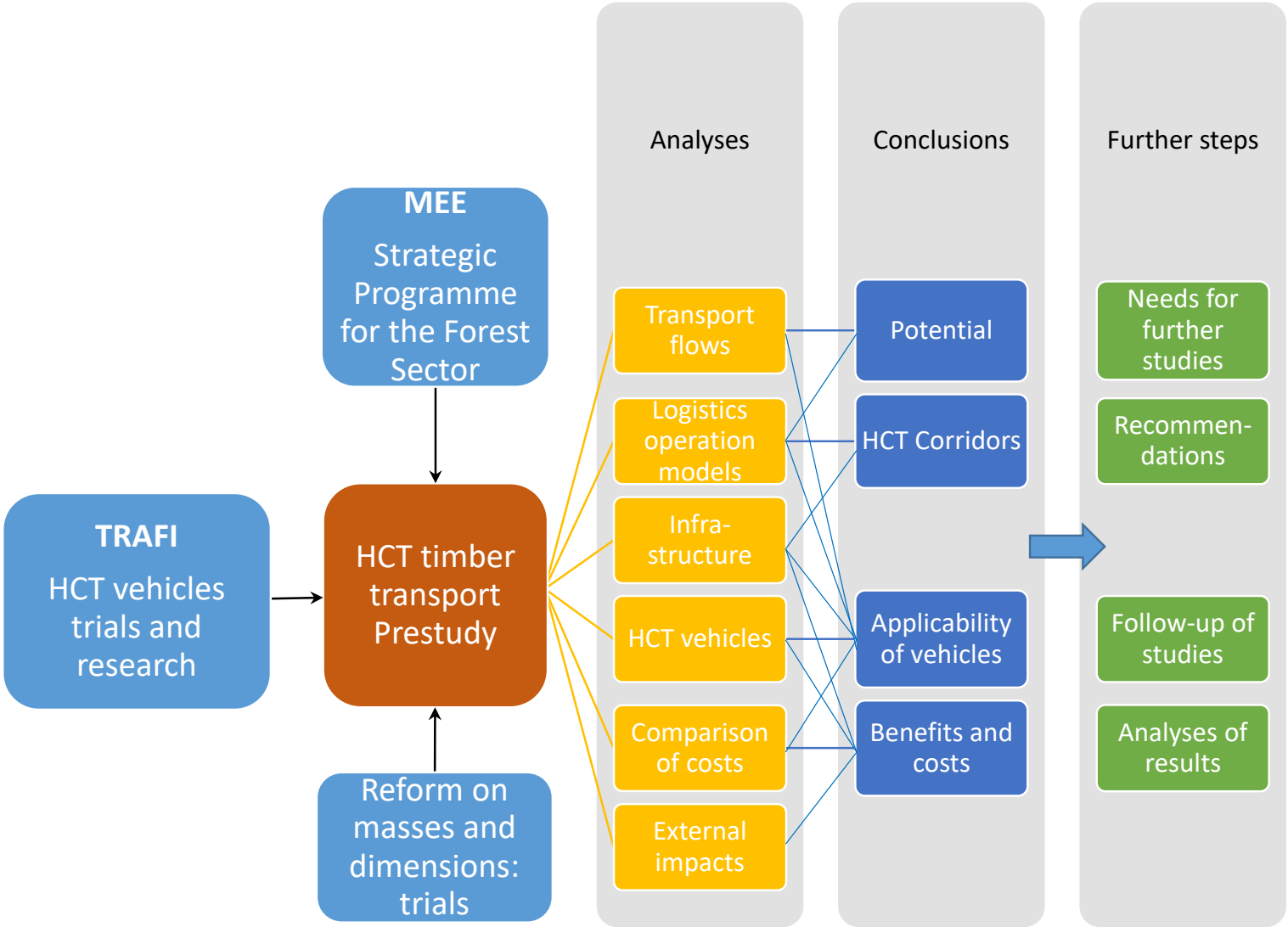
Background

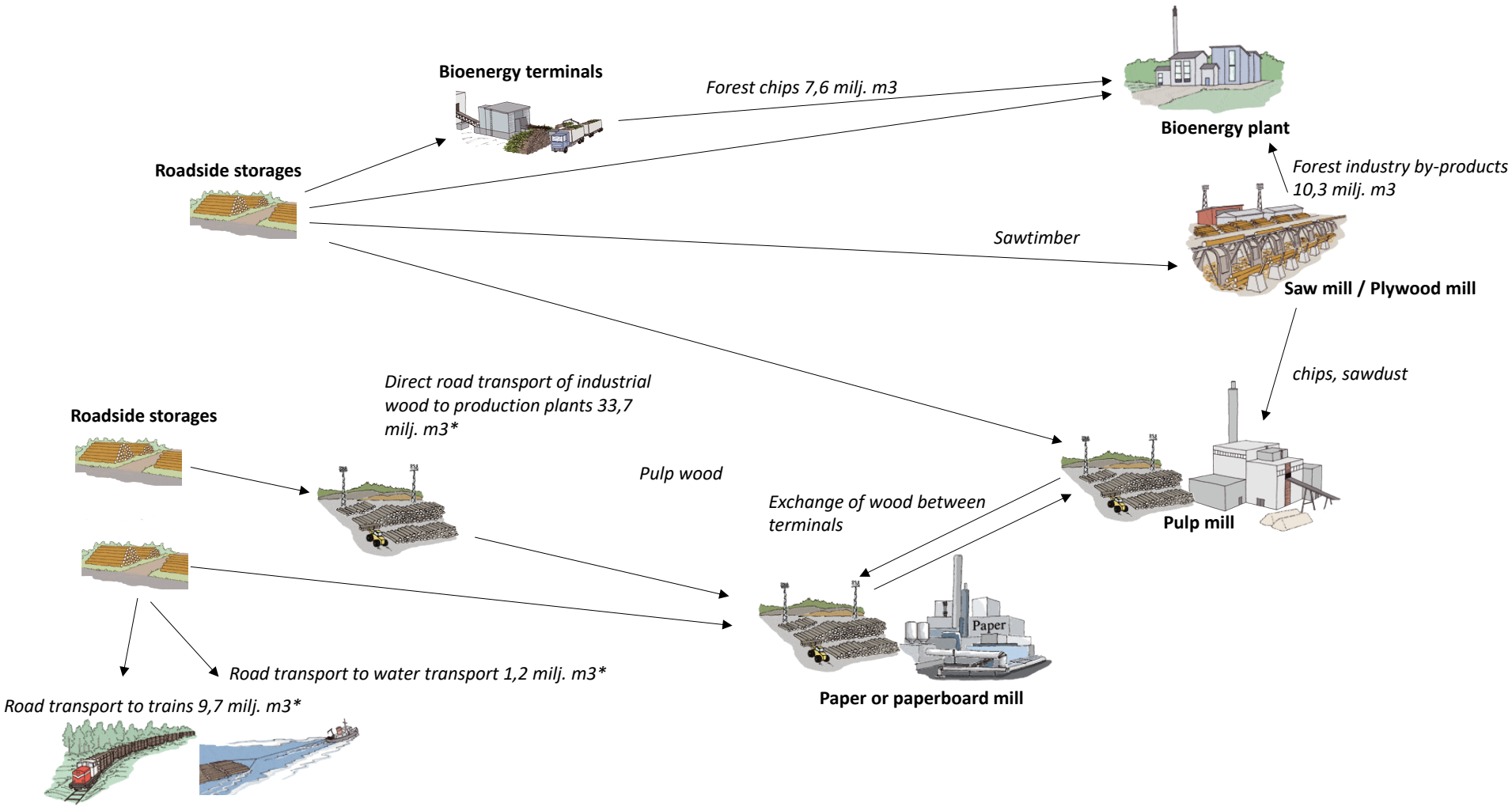
- This slide show summarises the main results from a study commissioned by the Finnish Ministry of Employment and the Economy and carried out by Metsäteho Oy *”Impact of HCT articulated vehicles in boosting efficiency of timber transport”*
- The study is available at https://www.tem.fi/ajankohtaista/julkaisut?C=98033&xmid=5456
- The results from various studies on HCT timber transport are available on the page www.metsateho.fi/hct

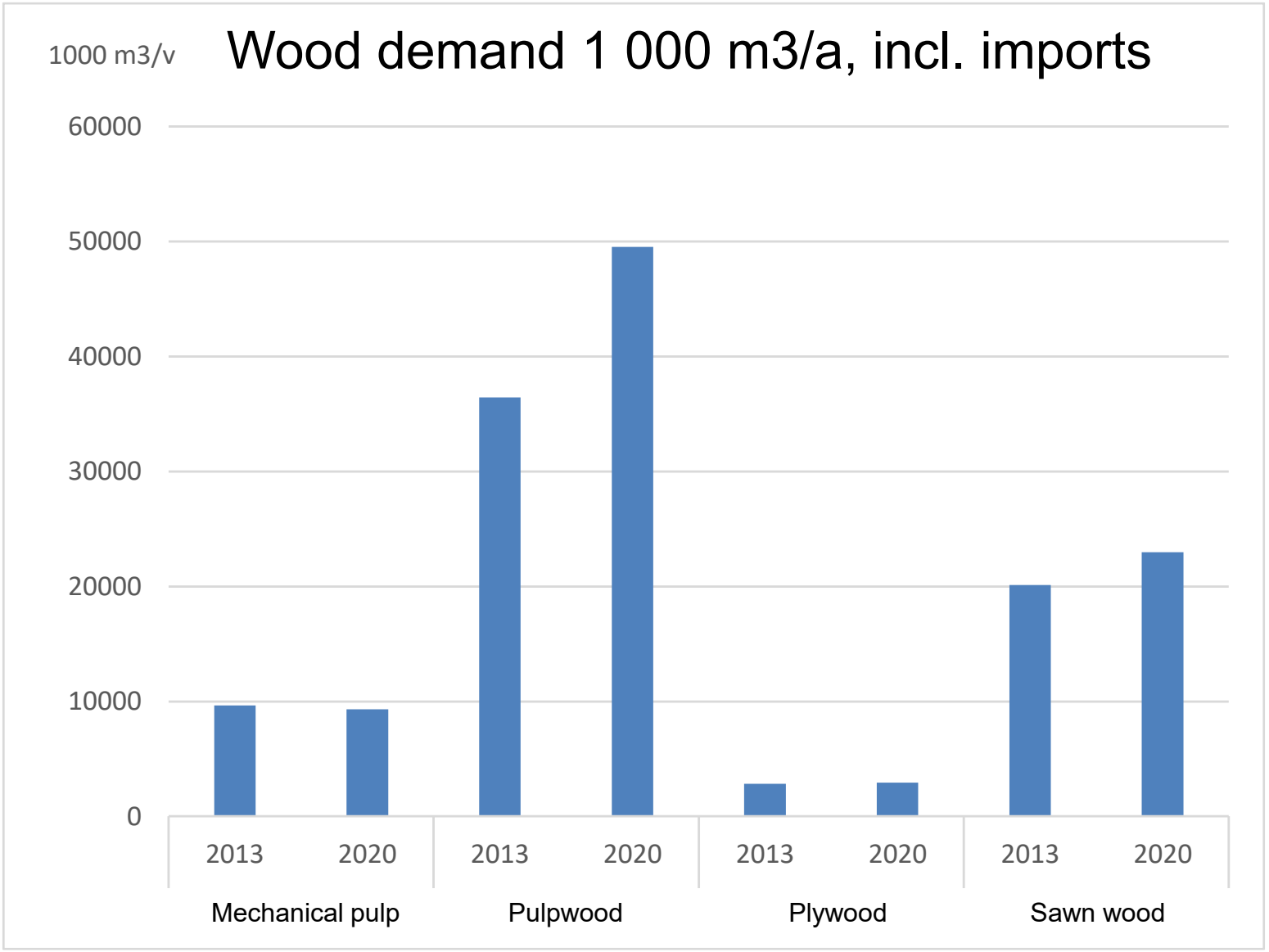
The themes of the HCT timber transport prestudy



Transport companies and users	Type of articulated vehicle Axles and masses; Lengths	Applied trial route
Orpe Kuljetus **(UPM-Kymmene)**	Tractor+semi-trailer+trailer 3+4+5 28+31+42=101 t (allowed 94 t), 13+12 m; 31 m	Kotka–Kuusankoski–Lappeenranta/Ristiina–Around the Lake Saimaa
Ketosen Kuljetus **(Metsähallitus, Stora Enso, Metsä Group)**	Tractor+semi-trailer+trailer 4+4+5 34+28+42=104 t 13+13 m; 32 m	Ivalo–Rovaniemi–Kemi
Veljekset Hannonen **(Metsä Group)**	Prime mover+trailer 5+5 42+42=84 t 10,8 +12,0 m; 26,6 m	Hammaslahti–Tohmajärvi–Kitee–Lappeenranta
Itä-Suomen Kolmiokuljetus **(Stora Enso)**	Chip truck: Tractor+semi-trailer+trailer 3+3+5 27+24+42=93 t 13,9+13,6 m; 31,9 m	Uimaharju–Värtsilä–Imatra–Kotka–Hamina
Kari Malmstedt **(Stora Enso)**	Prime mover+trailer+central axle drawback trailer 4+5+3 33,3+42+24=99,3 t (application 90 t), 13 + 6 m; 30,2 m or 10,2 + 6; 32,7 m	Uimaharju–Värtsilä–Imatra–Kotka–Hamina
P&A Trans **(Metsähallitus, QTeam Systems)**	Prime mover+trailer 5+5 42+42=84 t 12 + 13 m; 25 m	From the Inari, Kittilä, Sodankylä, and Rovaniemi regions to the Rovaniemi rail freight terminal
Kuljetusliike O Malinen **(Metsähallitus, QTeam Systems)**	Prime mover+trailer 5+5 42+42=84 t	From the Kuhmo, Ristijärvi, and Puolanka regions to Eno, Kuopio, Kemi and Oulu

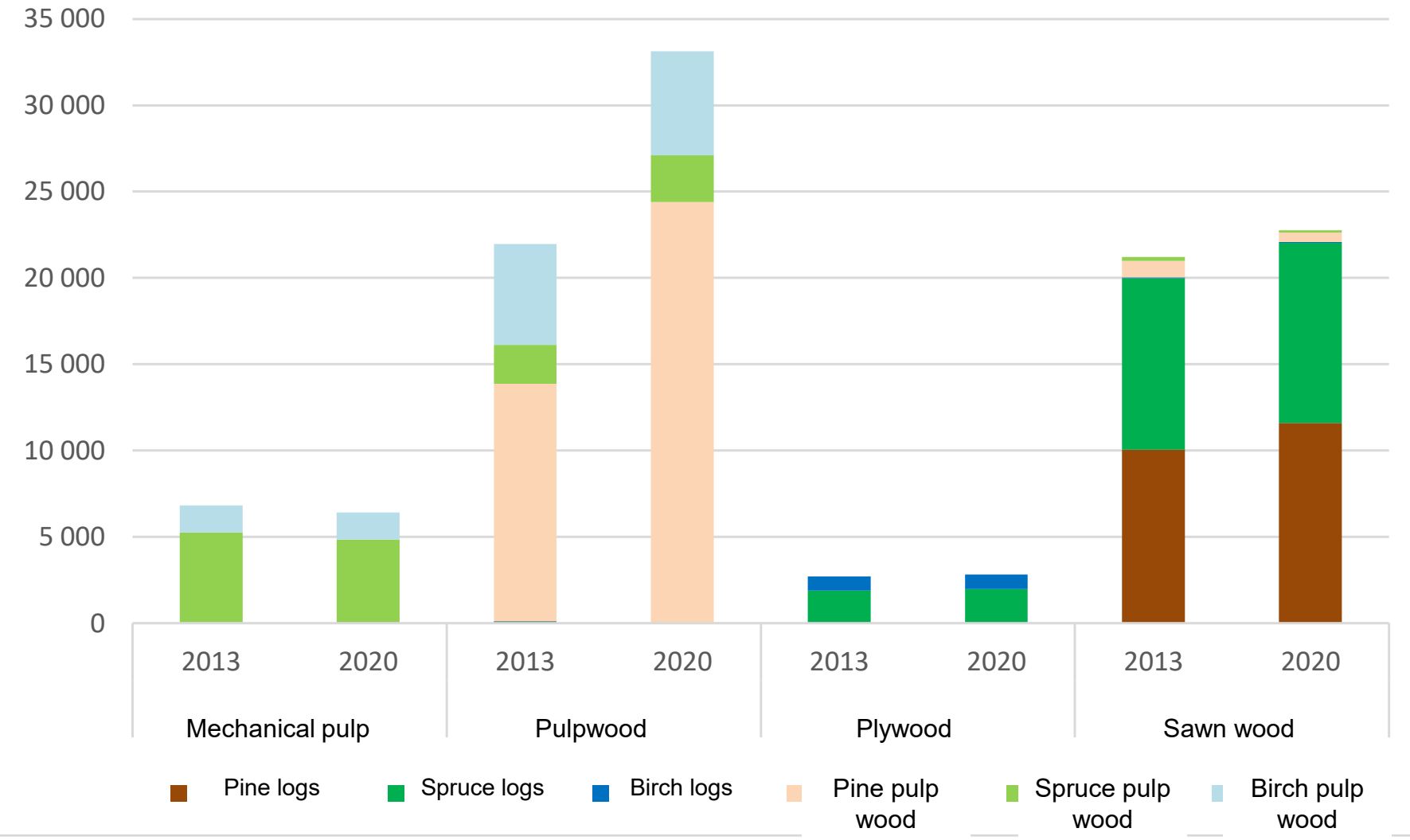
Major wood transport flows in Finland



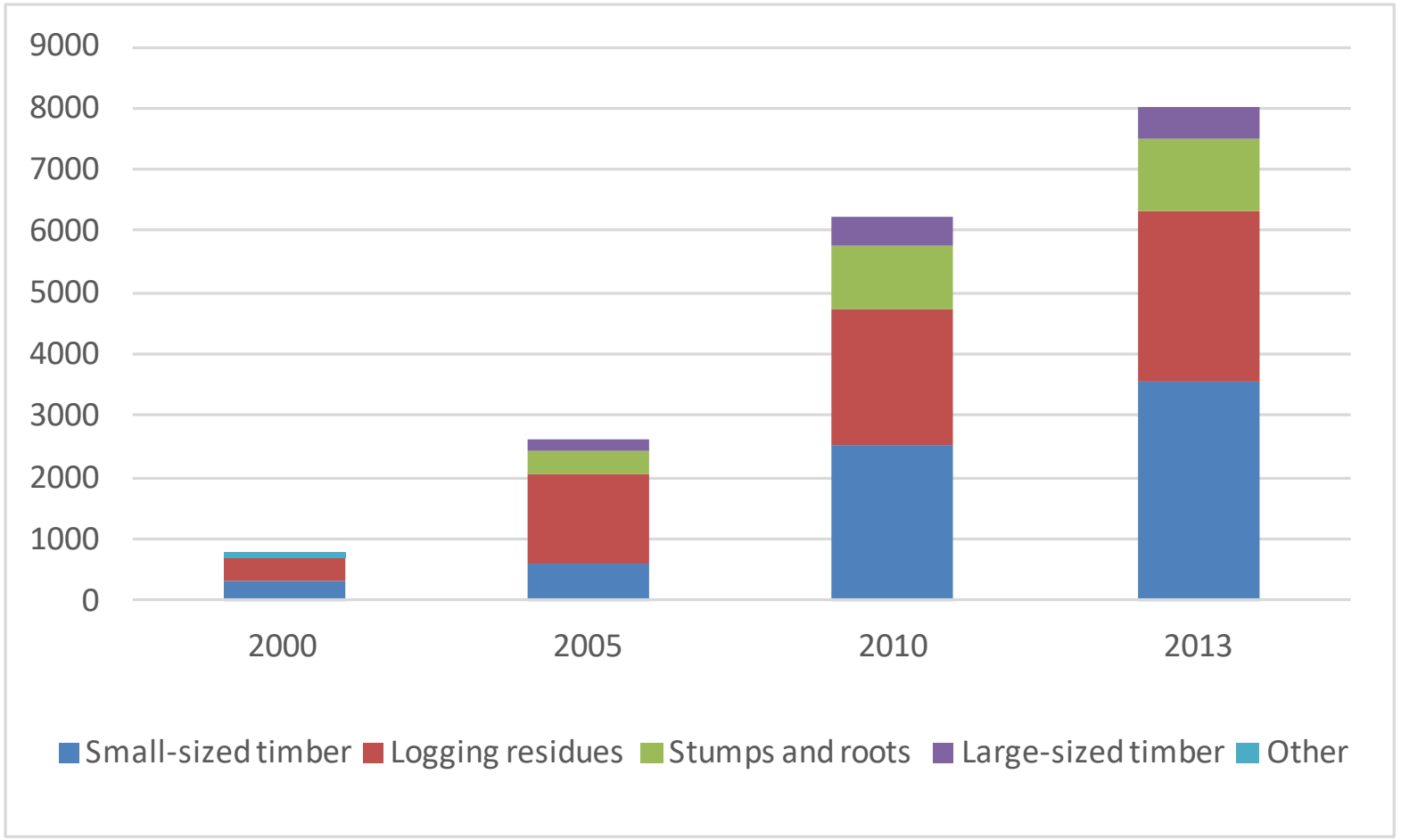


Räsänen, 2015

Domestic wood demand 1 000 m3/a



Consumption of forest chips (1 000 m3/a)

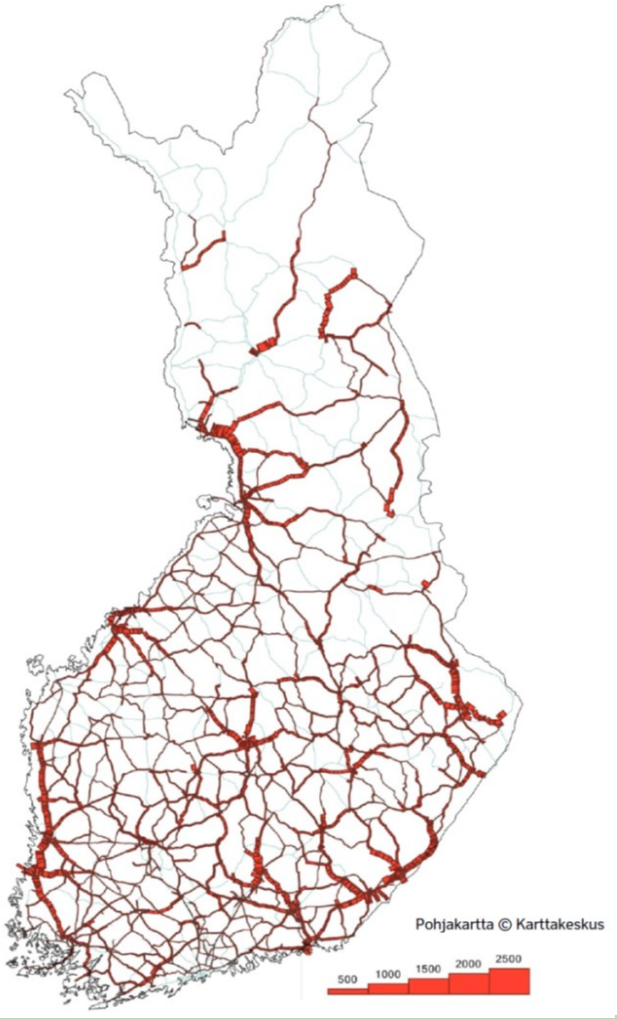


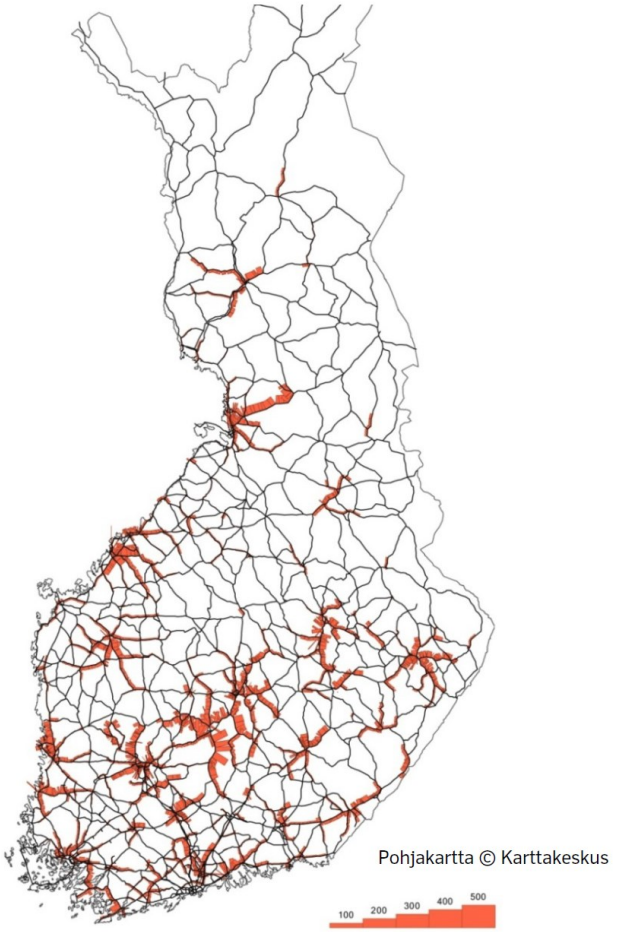
Metsäntutkimuslaitos, 2014

Use scenarios of forest chips and pulpwood in production of electricity, heat, and liquid bio-fuels

Consumption	2012	2030	2050
Uses			
Electricity and heat production	15,3	29–34	29–32
Production of liquid bio-fuels	0	7–19	21–33
In total (TWh)	**15,3**	**37–53**	**52–65**
Wood types			
Stumps	2,2	4–6	2–9
Branches, crowns etc.	5,2	11–12	11–14
Small-sized timber, excl. fuelwood	7,2	18–24	20–25
Pulpwood	0,7	0–10	12–27
In total (TWh)	**15,3**	**34–49**	**52–63**

Optimised industrial and energy wood transport flows on the main road network





Iikkanen ym. 2010 ja 2014

Share of full-load* transport

Commodity	Share of full-load transport (%)	Full-load transport in million km
Logs and pulpwood	94	75
Papermass, pulp	85	8
Sawdust, chips	80	18
Paper, paperboard, printed matter	38	14
Energy wood	37	5
Products of mechanical forest industry	36	16

*Full-load is defined here as more than 90 % vehicle capacity use (in weight)

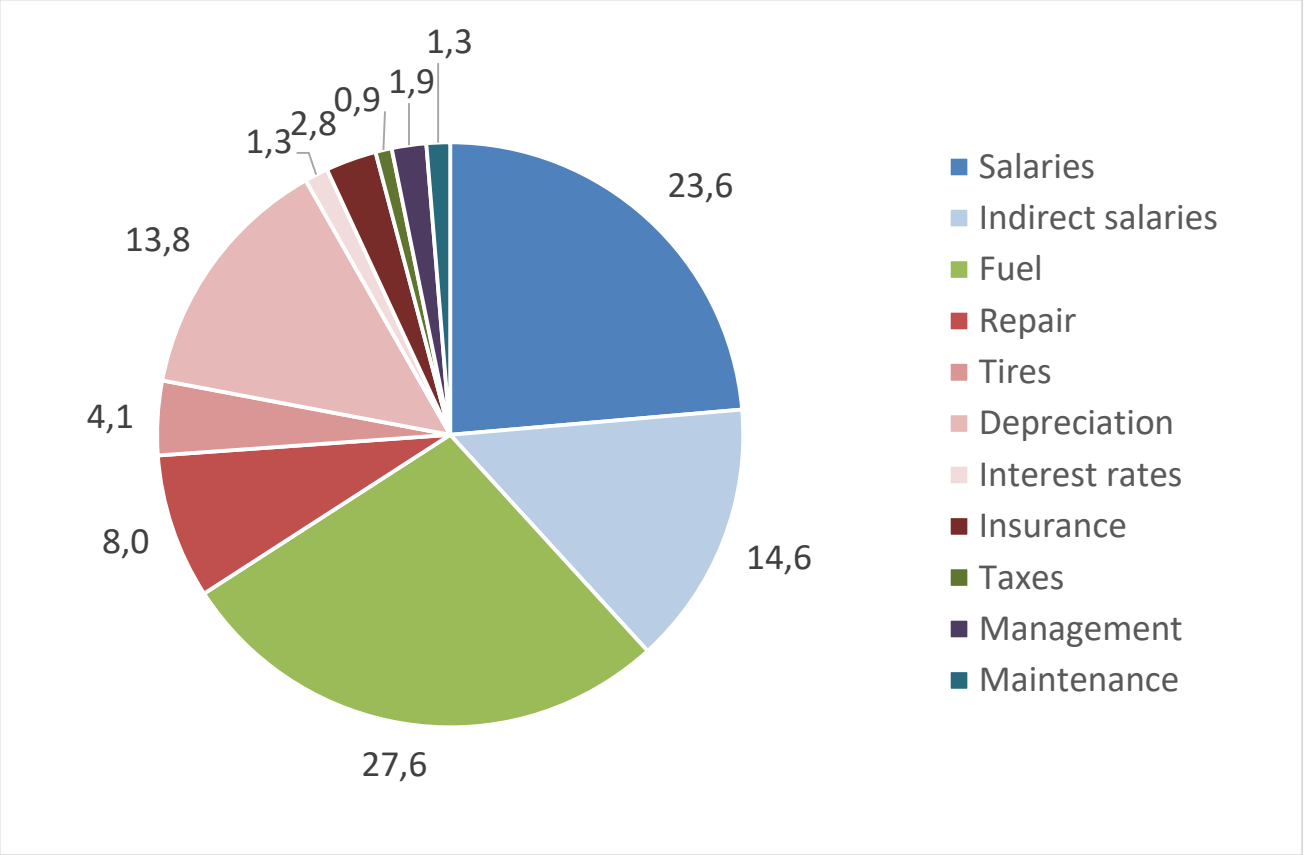
Liimatainen & Nykänen, 2014

Estimated size distribution of timber vehicles

Total weight, tons %

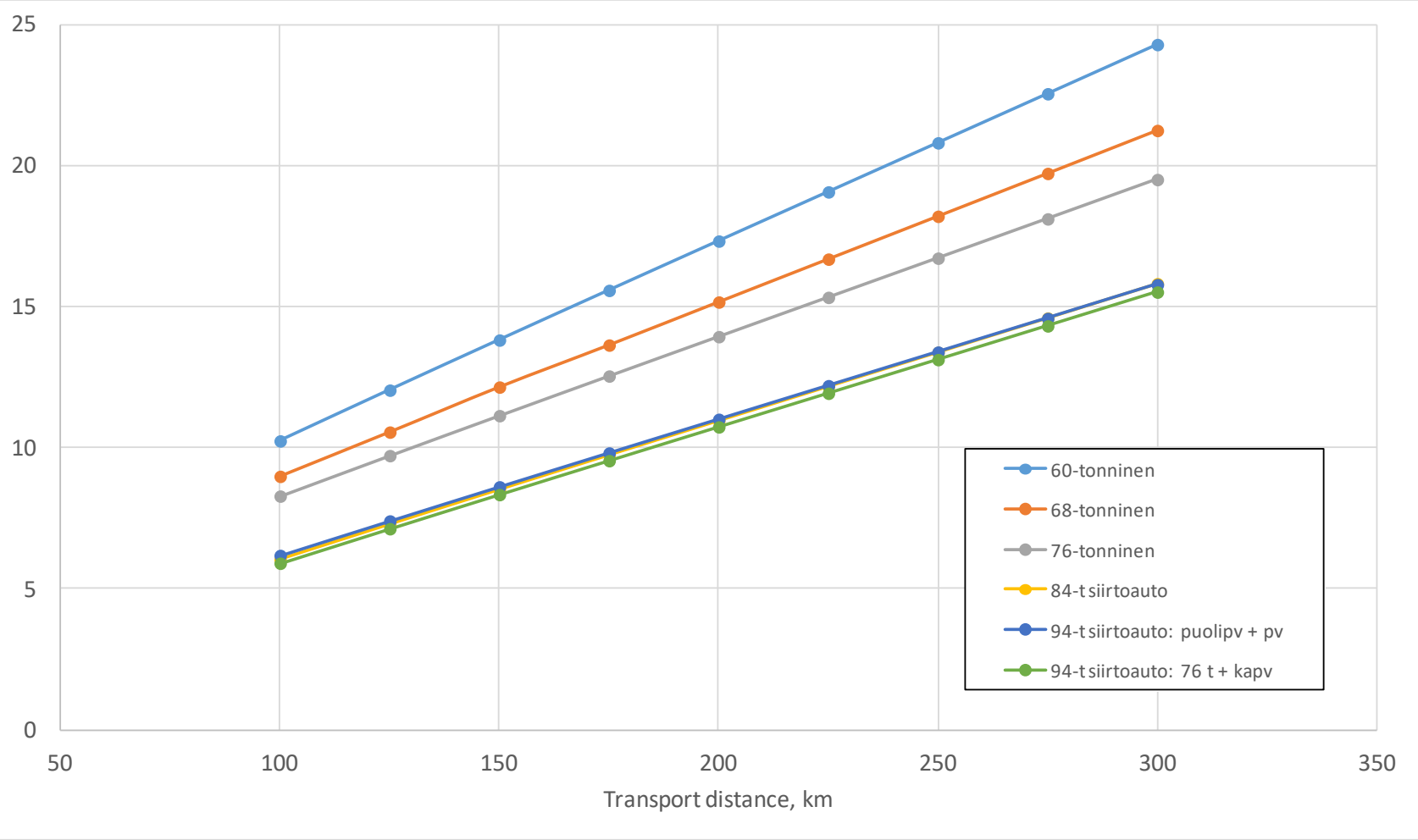
2014	60 - 64	68	76	Total
At the beginning of the year	70	25	5	100
In May	58	32	10	100
In September	41	45	14	100

Avarage distribution of costs of a timber articulated vehicle in 2010 (%)



Statistics Finland, 2013

Timber transport costs per ton (excl. transshipment costs)



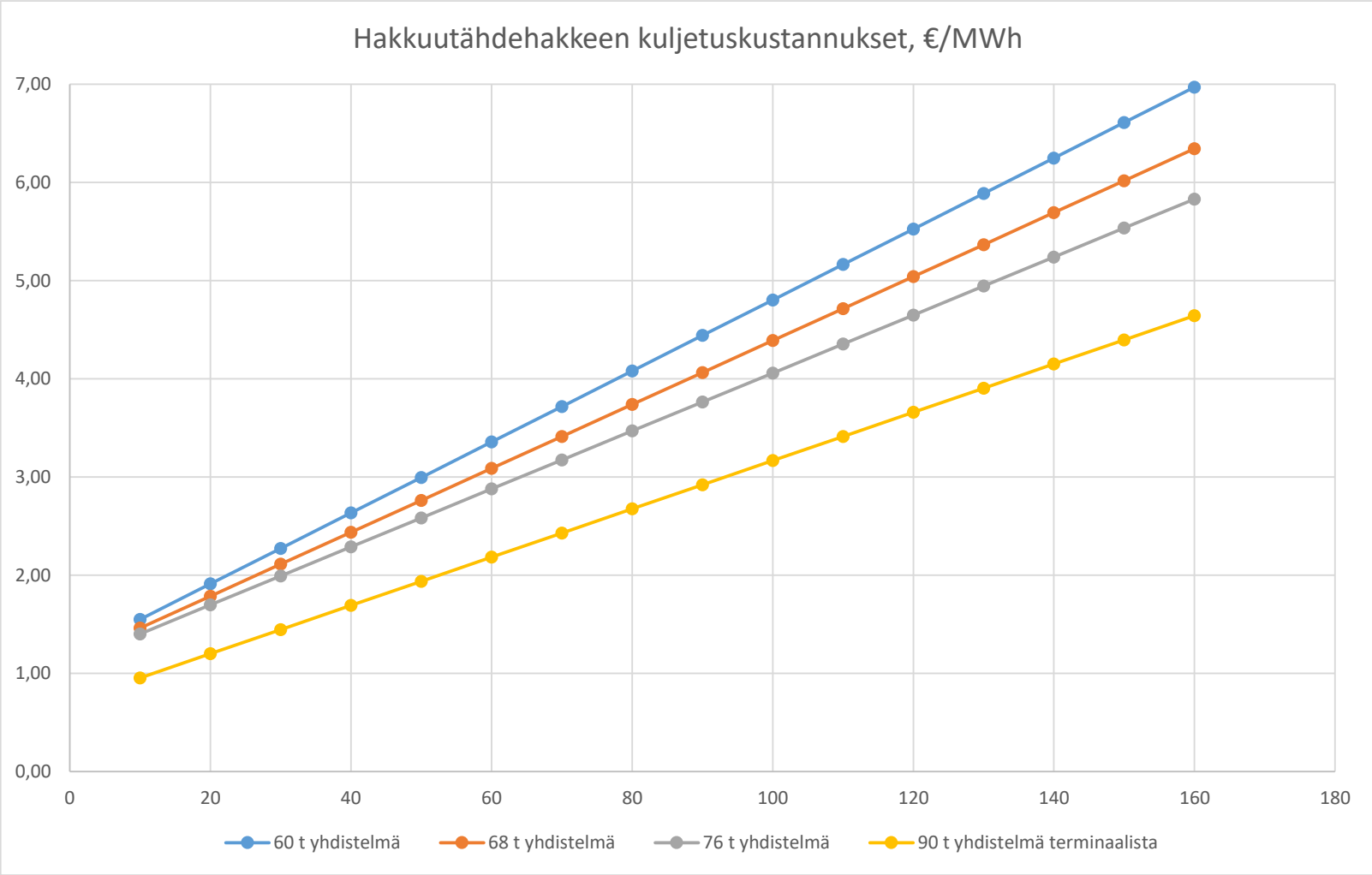
Transport costs per carried ton

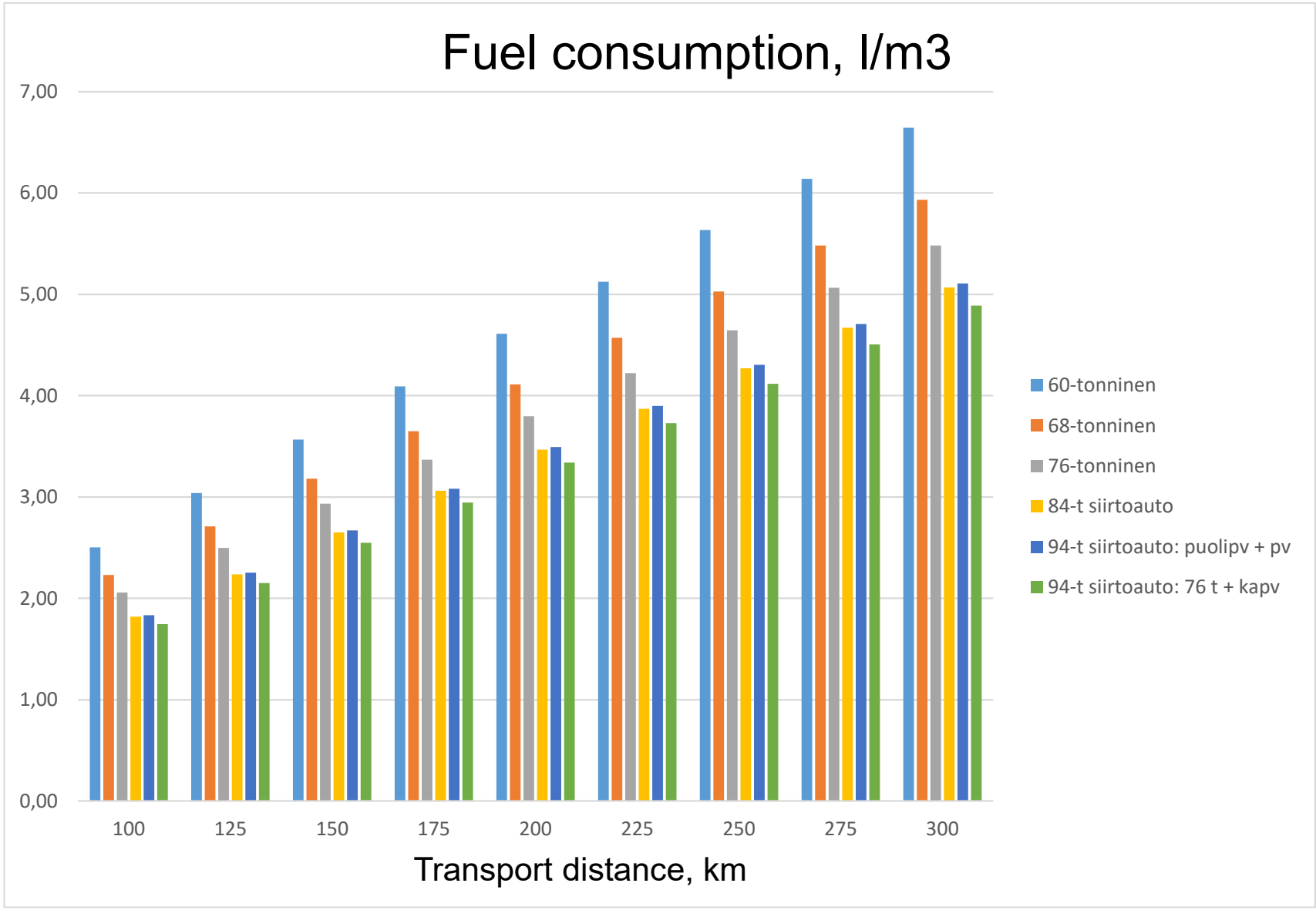
For HCT vehicles pre-carriage transport and transshipment costs are included

Distance	76 t	84-t		94-t semi-trailer+trailer		94-t 76t + central axle drawback trailer	
km	€/t	€/t	difference	€/t	difference	€/t	difference
125	9,73	9,67	0,06	9,84	-0,11	9,29	0,44
150	11,15	10,91	0,24	11,07	0,08	10,51	0,63
175	12,55	12,14	0,41	12,28	0,28	11,72	0,83
200	13,95	13,37	0,58	13,48	0,47	12,93	1,02
225	15,34	14,58	0,76	14,67	0,67	14,12	1,22
250	16,73	15,80	0,93	15,86	0,87	15,32	1,42
275	18,12	17,01	1,112	17,06	1,07	16,51	1,62
300	19,52	18,23	1,29	18,25	1,27	17,71	1,82

Transport costs of chipped logging residues

For the 90 ton vehicle, costs from a terminal

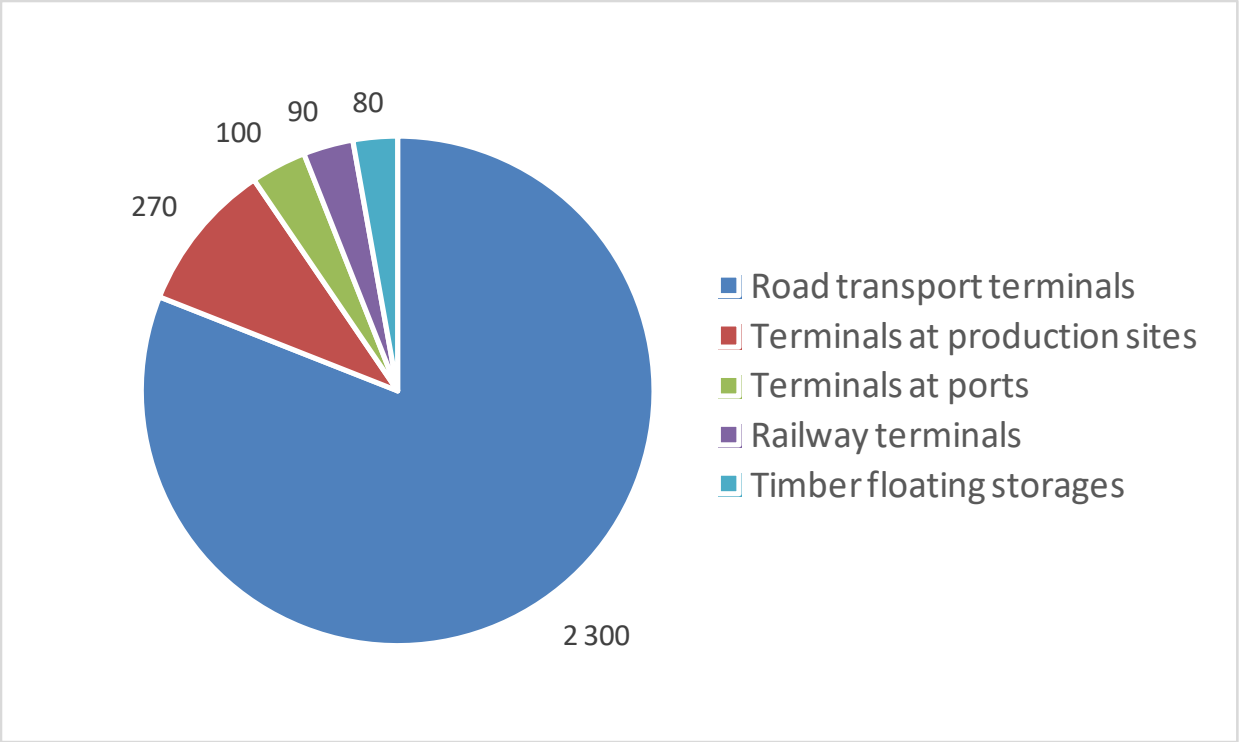



Fuel consumption, l/m3
7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
100
125
150
175
200
225
250
275
300
Transport distance, km
60-tonninen
68-tonninen
76-tonninen
84-t siirtoauto
94-t siirtoauto: puolipv + pv
94-t siirtoauto: 76 t + kapv

Traffic loading on roads

	Masses, t			
Articulated vehicle	**Prime mover**	**Trailers**	**In total**	**Traffic loading index**
3+4-axles	26	34	60	100
4+5-axles	34	42	76	81
5+5-axles	42	42	84	92
Tractor+semi-trailer + trailer	28	24+42	94	70
76-t + central axle drawback trailer	34	40+20	94	67

Types of timber terminals



Roadside storages app. 200 000

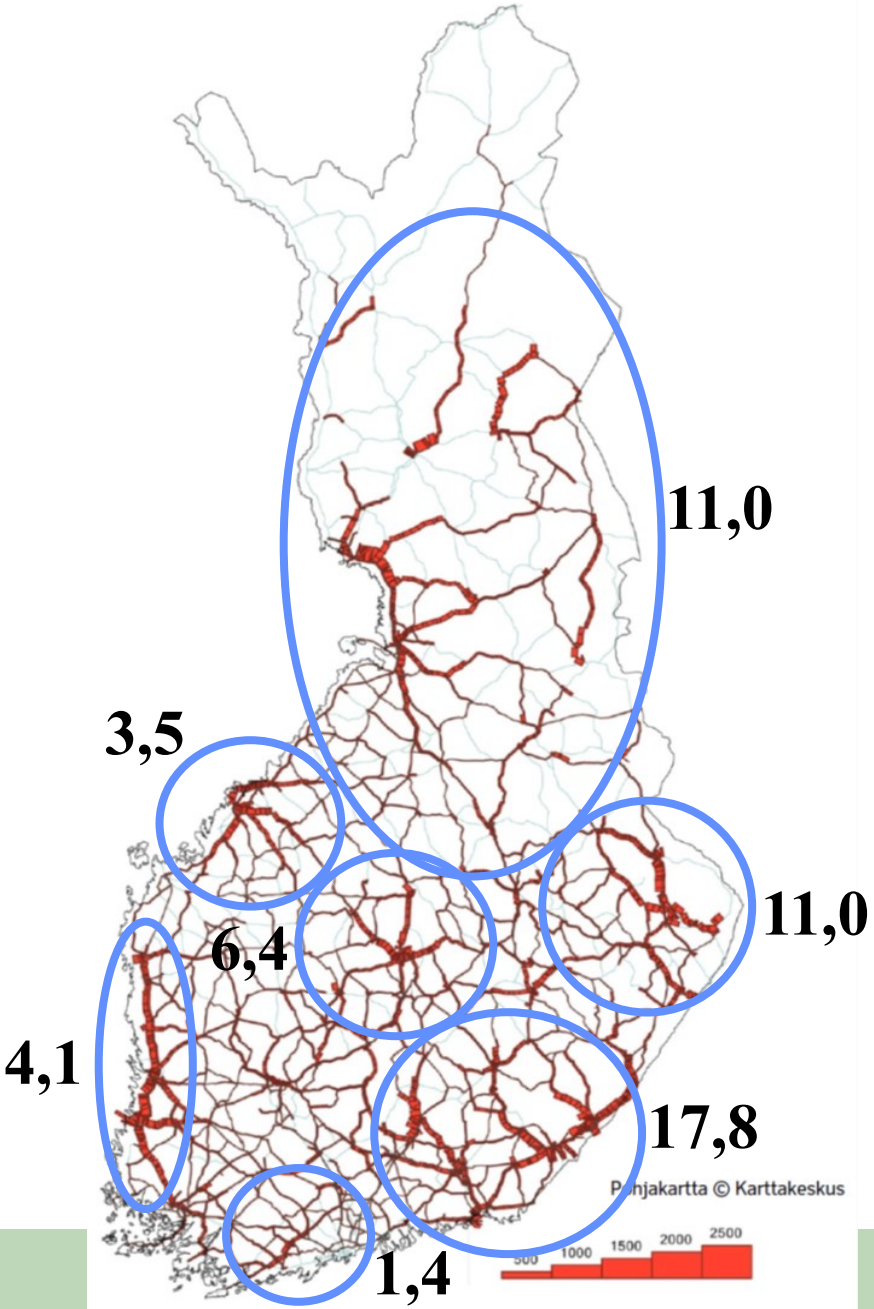
Benefits of roundwood terminals

- Use of efficient handling equipment
- Feed-in terminal for sites with small storage areas
- Reduction of wood quality changes (cold storage)
- Prevention of forest insect damages
- Balancing temporal and regional differences in wood demand and supply
- Reduction of environmental impacts (noise, waste)
- Anticipation of frost heave seasons
- Storing and combining partial truck loads
- Replenishment of the load before delivery
- Limitations to road side storage
- Sorting of mixed loads (from small tree farms)
- Short-term storing of loaders
- Energy wood: even supply of wood, drying wood, wood quality management

Criterias for suggested HCT Corridors for timber transport

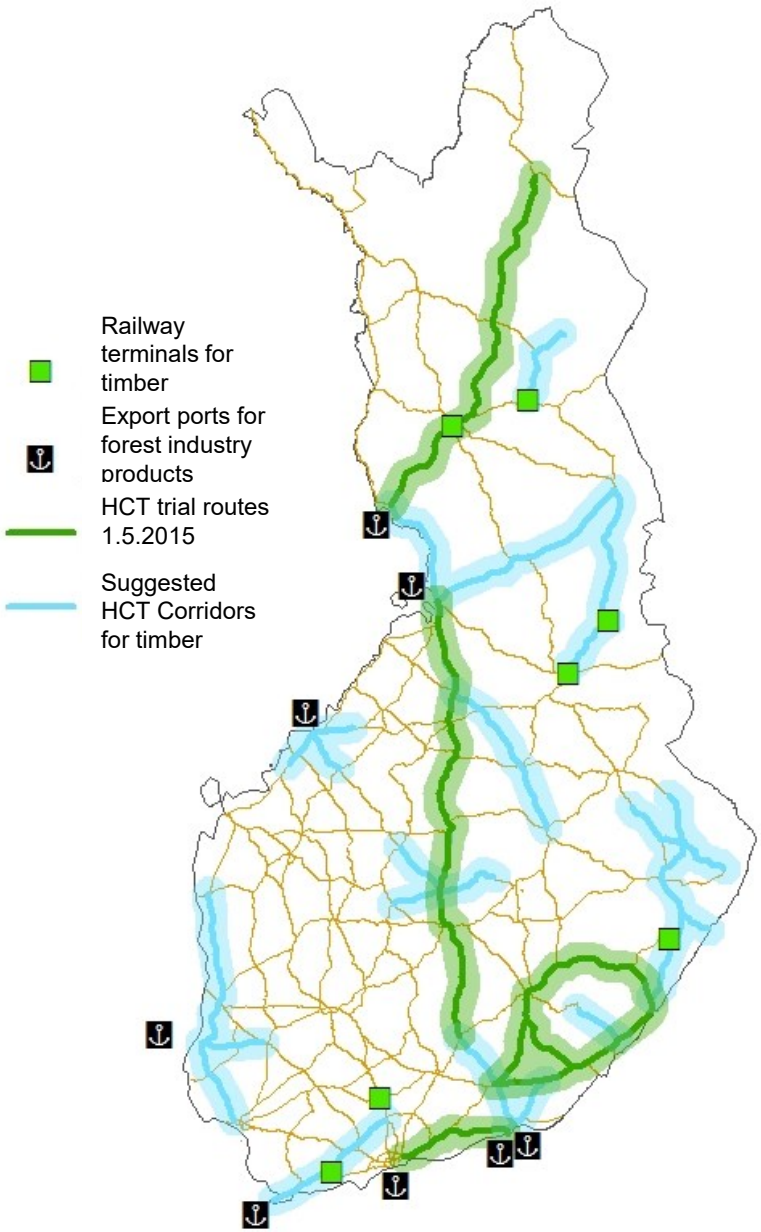
- Major clusters of forest industry
- Major transport volumes of industrial and energy wood
- Major export or import ports, railway terminals, or border stations used for forest industry transport
- Prerequisites of the Corridor for HCT transport

Wood demand in selected regions mill. m3/a



Preliminary suggestion for HCT Corridors of timber transport

- The suggestion requires further development with information about potential location of HCT terminals, and bearing capacity of roads and bridges



Recommendations for further actions

1. Further research in real driving and traffic situations
2. Recommendations for additional HCT trial routes and articulated vehicles for timber
3. Analyses of HCT Corridors for timber
4. Removal of infrastructure bottlenekcs along HCT Corridors