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Location and Main Characteristics of Terminals and Wood Using Industry in the Finnish Side of Botnia-Atlantica Area

Forest biomass terminals are land areas where material can be stored, measured, fractioned, refined and otherwise processed. The main purpose of biomass terminals is to provide raw material for wood using industry including sawmills, pulp mills and energy production units. The location of terminals with relation to wood using industry and traffic connections is an important factor when considering the economy and performance of the raw material supply.

BIOMASS TERMINAL TYPES

Biomass terminals can be divided into several types. The most common categorization at the moment is division into Satellite terminals, Feed-In terminals, Industry terminals, Transhipment terminals and Fuel upgrading terminals.

Satellite terminals are large (ca. 10 ha) terminals located close to generous raw material resources with longer transport distances to end users. The main goal for this terminal type is to increase long distance supply and transport efficiency.

Feed-In terminals are located close to the user of the biomass. Like the name says, they are designed to feed the raw material into to wood user when needed. The size of the terminal is dependent on specific demand of the user.

Industry terminals are located at industry site and run by the wood user themselves.

Transhipment terminals mainly serve as a buffer to even out the variation between supply and demand of raw material due to seasonable and other factors. They are filled when demand is low and emptied during high demand, located usually close to good road network. Transhipment terminals are most common terminal type in Nordic forestry.

Fuel upgrading terminal is a new terminal type. It is otherwise similar to the satellite and feed-in terminals, but with some extra activity to refine/increase the value of raw material in the terminal.

Figure 1. *Biomass industry terminal (left) and satellite terminal (right) in Kokkola (Maanmittauslaitos ortokuva 2012).*

INDUSTRIAL USE OF FOREST BIOMASS IN THE AREA

Pulp mills

Two pulp mills, located in the Finnish side of Botnia-Atlantica area, use the major part of the roundwood in the area. This pulpwood consists of small diameter roundwood, but also low quality large diameter roundwood that can't be used in saw mills. The minimum top diameter of the pulpwood is in the scale of 6-8 cm, depending on the mill machinery and operational parameters.

Roundwood is transported mainly by truck and train, but some amount of wood and chips are also imported by sea. In addition, pulpwood is exported to Sweden and Central Europe by sea. Pulpwood is debarked and chipped at the mill. Mills also use chips formed as side streams at sawmills.

Sawmills

Good quality large diameter roundwood is used in sawmills. The minimum top diameter of the roundwood used in a sawmill depends on the mill machinery and the produced timber assortment, being in the scale of 10-15 cm.

There are several large sawmills (having annual roundwood use in the scale of 10 000-500 000 m^3) in the area, but also small scale mills having roundwood use less than 10 000 m^3. Roundwood is transported mainly by truck to the mill, classified according to the diameter and quality, debarked and sawn.

Energy production

Roundwood is used also in energy production and there are high umber of small scale heating plants in the area. These are small units producing heat for farms or small communities, for example. To guarantee the undisturbed operation of the process, small scale heating plants prefer the use of good quality roundwood.

Large Combined Heat and Power plants (CHP) are more tolerant of low quality fuelwood and are capable of using forest residues and stumps too. These produce heat to a district heating system and electricity to the national grid. Roundwood and logging residues from roundwood harvesting (such as unmerchantable tops, small sized trees, stumps and branches) are chipped in situ, at the road side or at the terminal.

Wood consumption

In 2014 the amount of roundwood used by forest industries in the area was approximately 5 550 000 m^3, of which 390 000 m^3 was imported. Total amount of roundwood used in heat and power generation was approximately 1 300 000 m^3 in the area in 2017 whereas forest chips (including small-sized trees, logging residues, stumps and large-sized timber not suitable for industrial use) were used approximately 1 000 000 m^3.

The procurement area of a big mill integrate has a diameter of 150-200 km but small scale heating plants and small saw mills buy their wood from neighbouring area and procurement area is 20-50 km at most. Large diameter roundwood is also transported from the area: There are no veneer mills utilizing large diameter logs in the area and these are transported to veneer mills located in neighbouring provinces, for example.

LOCATION

Location study methods and material

The location of terminals with relation to wood using industry and traffic connections was studied by means of route optimization methods in GIS. ArcGis network analyst extension was used to build up a road network and the closest facility tools to find out the nearest wood using industry plant, railway operating point, mainroad and harbor from the terminal. Solving the route optimization tasks returns the best routes from facilities to the terminal and the driving times and the along road distances of those routes.

In our study, we considered only the biggest terminals in the Botnia-Atlantica area. Also terminals, located interrelated with industry, are left out of from the location considerations.

In our location study material, there were six satellite terminals, two transhipment terminals, two forest fuel upgrading terminals and one industry terminal. Because there were only few other than satellite terminals in BA-area, we classified the other terminals to one group and made the comparisons with that group and the satellite terminals.

Satellite terminals were smaller and closer to industry

Biomass terminals were located on 3.3 kilometers average distance from nearest mainroad. Average distance to nearest railway operating point was 11.3 kilometers

Figure 2. Location of biomass terminals, industry facilities, mainroads, railways and harbors in the Botnia-Atlantica region.

Table 1. Biomass terminals closest distances to different facilities in the Finnish side of Botnia-Atlantica area. Class other terminals consist of Industry terminals, transshipment terminals and forest fuel updating terminals.

	Distance to (km)						Area (ha)
	Harbour	Main road	Railway	Sawmill	Pulp mill	CHP plant	
	Satellite terminals						
Average	55.3	2.1	10.5	19.5	72.6	43.9	3.8
Median	43.4	0.75	10.8	17.0	80.7	40.1	3.35
Stdev	44.9	2.8	7.3	15.1	49.5	29.9	2.0
Min	13.4	0.3	1.7	0.1	14.4	12.4	1.0
Max	131.9	7.4	19.9	46.6	141.1	92.4	7.0
	Other terminals						
Average	43.0	4.8	12.24	27.16	72.32	22.8	4.3
Median	57.5	3.7	17.2	22.3	77.6	23.0	4.0
Stdev	30.3	4.2	9	9.4	25.2	23.5	3.6
Min	2.9	1.0	1.7	20.9	39.4	0.7	1.0
Max	70.2	10.9	20.7	42.9	104.8	57.6	10.0
	All terminals						
Average	49.7	3.3	11.3	23.0	72.5	34.3	4.1

and to the closest harbor almost 50 kilometers. The average distance from terminal to closest sawmill, pulpmill and CHP plant were 23, 72.5 and 34.3 kilometers, respectively.

Satellite terminals were smaller in size than the other terminals types when it comes to average area of terminal. They were also located closer from nearest mainroads, railway operating points and harbors than the other terminal types, especially when it comes to the median distances. The average size on satellite terminals was 3.8 hectares whereas it was 4.3 hectares in the other terminals.

When considering the distances from satellite terminals to wood using industry, the satellite terminals were located closer from sawmills and further from CHP-plants than the other terminal types, but in the distances to nearest pulpmills, the differences were only minor.

Results of the location analysis in our study do not completely support terminal classification thet we presented in the beginning of this infosheet. The main reason behind this is that the presented classification is based on the terminal definitions in Sweden and it differs a little from the situation in Finland. Especially the sizes and the differences between the terminals are smaller in Finland than in Sweden.

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