

# Delivery of sustainable supply of non-food biomass to support a resource-efficient Bioeconomy in Europe

S2Biom summer school, Athens, Greece, 17-20 May, 2016

## Case Study: Äänekoski Region in Finland

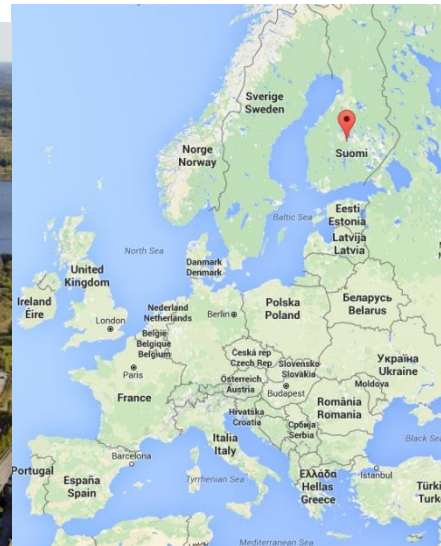
Presenter

Senior Scientist  
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# The Finnish Case Study

- We study utilisation of forest Biomass in the Äänekoski region (red mark in the map)
  - A smaller Pulp mill in Äänekoski is being shut down and a new Bioproduct mill (not using any fossil fuels) will be in operation in 2017.
  - The Impact on sustainability and harvest residues availability in the region is not well known and will therefore be studied in the S2Biom Finnish case study



- **The Sustainability impact of the new Bioproduct Mill in Äänekoski is studied**
  - Especially promising logistical concepts and harvesting technologies, which could significantly increase resource mobilization efficiency
    - integrated harvesting
    - whole tree harvesting and increased loading capacity of trucks to 94 tonnes
  - The following impacts for increased demand for pulpwood are studied:
    - Impact on stand age-class distribution
    - Increased supply of harvesting residues
    - Impact for fuel wood availability for CHP plant in the region

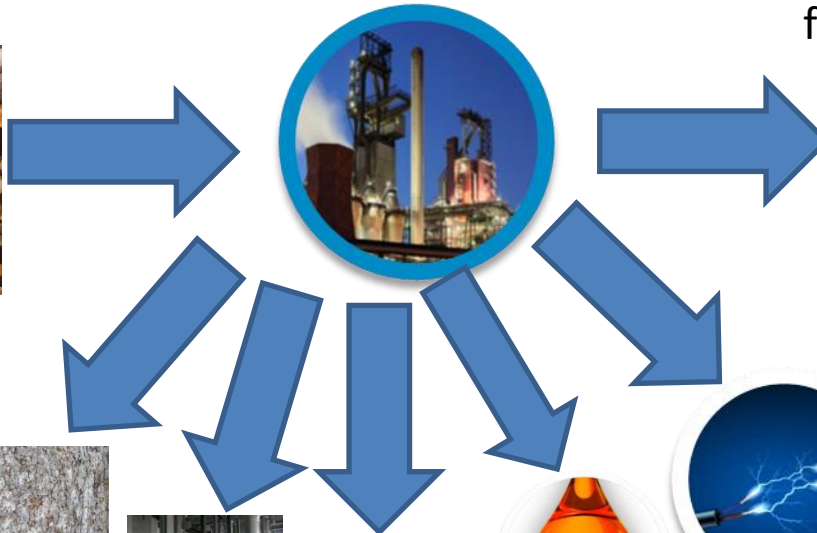
- **The data of the products and raw material for the Bioproduct mill is collected from public data.**
- **The data of forest biomass availability from biomass comes from LUKE (Natural Resources Institute in Finland)**
- **VTT will compute energy demand of the region based on its power plant database.**

- **Presently we have collected the needed data for modelling biomass availability in the region (potential and use), however we do not yet have results from modelling.**
  - Since this data is needed for a more quantitative analysis I will focus here more on based on qualitative results and describe the cases (Bioproduct mill and utilisation of Forest Biomass in the region).

# The Present Situation in Äänekoski

Pulpwood  
both softwood  
and hardwood  
2.3 milion m<sub>3</sub>

530 000 ton air dried bleached  
pulp (10 % moisture content per  
annum. Pulp is main raw material  
for cardboard, paper etc.



Residual  
bark



Excess  
haet



turpentine



Crude  
tall oil



Excess  
renewable  
electricity, with  
an electricity  
self- sufficiency  
of 131 %

# The New Bioproduct Mill

Pulpwood both softwood and hardwood  
6.5 milion m<sub>3</sub> or 2.7 million ton dry matter



Bleached pulp  
1300 000 ton/a,  
raw material for  
cardboard  
and paper.



Residual bark  
550 GWh/a ( the rest is  
gasified in the plant into  
synthesis gas used as fuel  
for the lime kiln instead of  
fossil fuels.



Excess electricity  
1050 GWh/a



Excess heat  
as  
steam or  
district heat  
640 GWh/a



Biogas  
20  
GWh/a



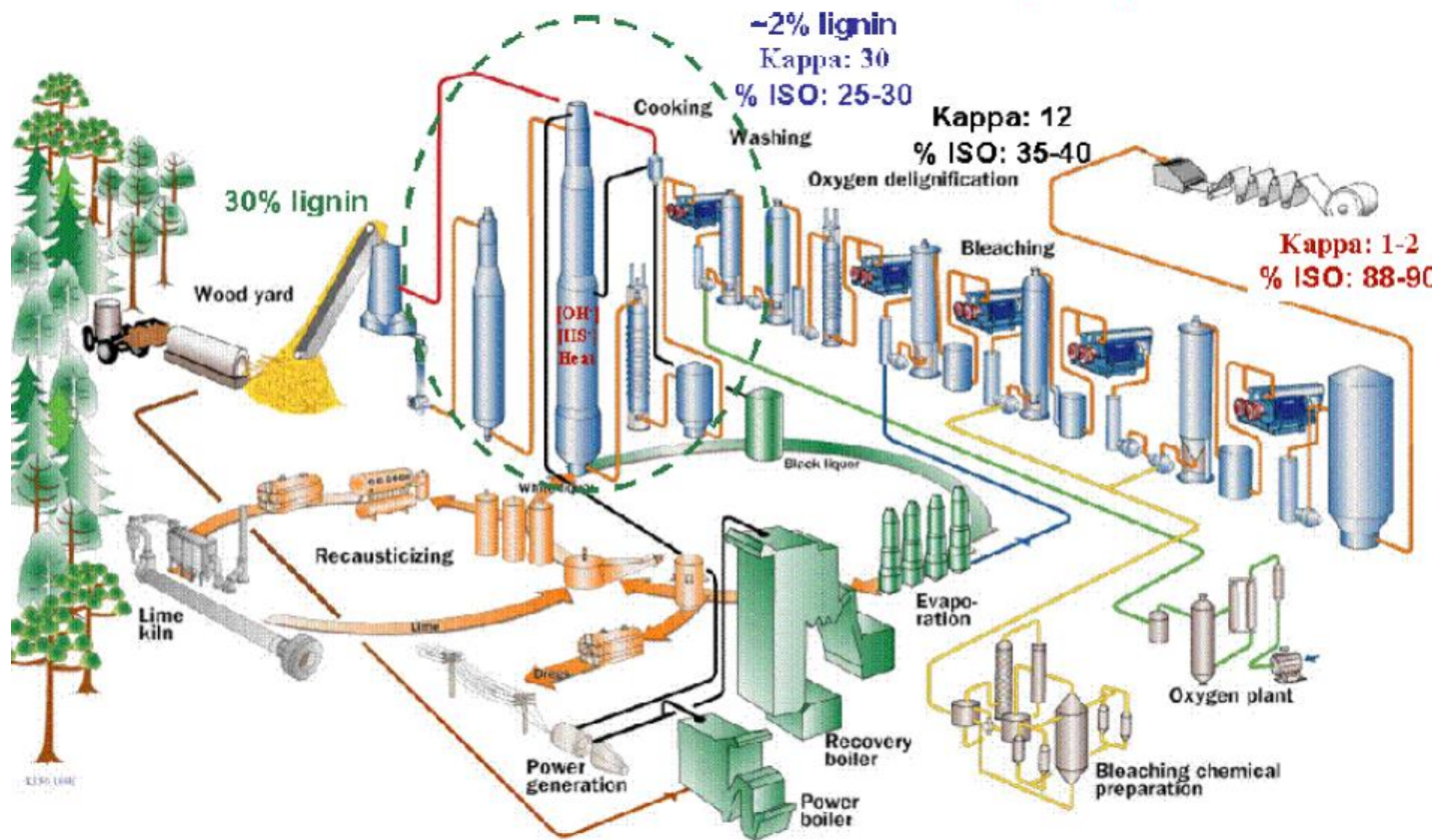
Wood  
turpentine  
3200 t/a



Crude Tall oil  
46000 t/a

# The Pulp Making Process in More Detail

- The Bioproduct mill employs the common Kraft Process illustrated in the figure below

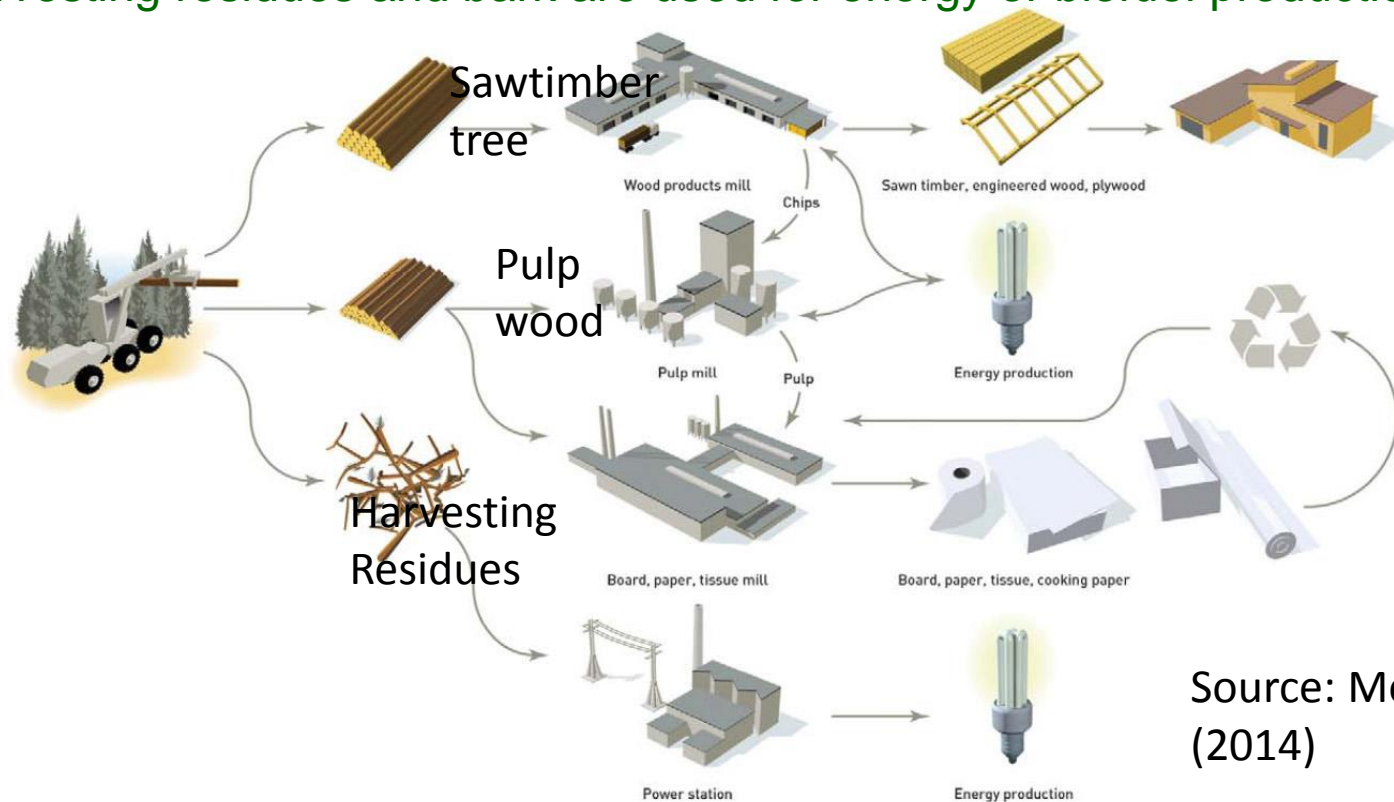


(Source: Kvaerner Pulping)



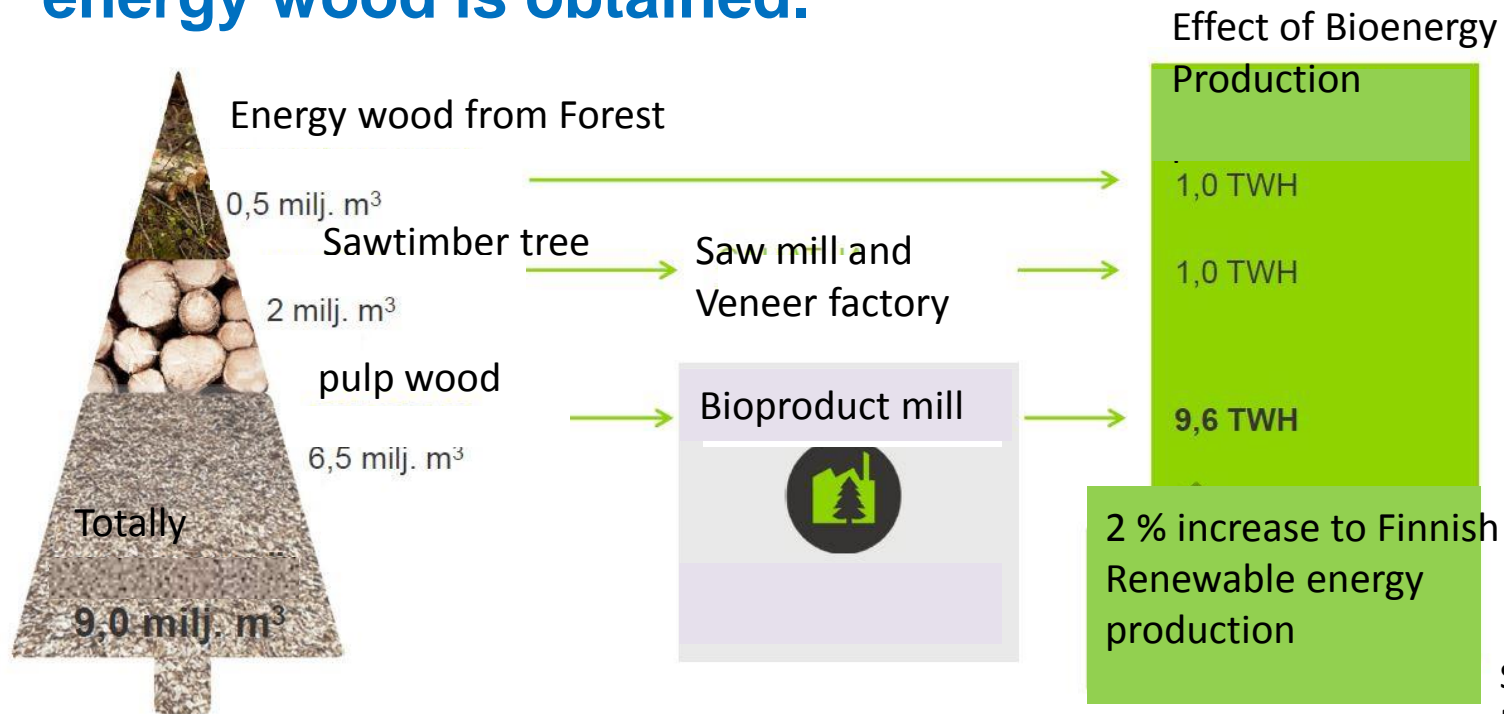
# The Value Chain of Forest to Products

- in the figure below the typical value chain in Finland of forest based products are illustrated.
- the most valuable part sawn wood is converted into timber,
- smaller diameter roundwood (pulpwood) is converted into pulp
- harvesting residues and bark are used for energy or biofuel production



Source: Metsägroup (2014)

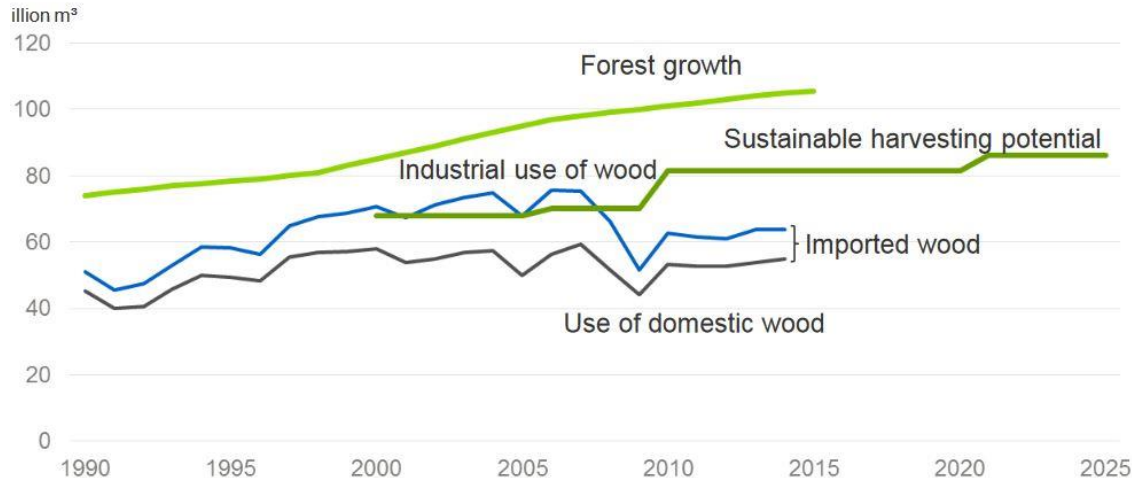
- Energy wood is usually obtained as thinnings of forest or by product in harvest of the whole forest, therefore when more forest is harvested more energy wood is obtained.



Source:  
Metsägroup (2014)

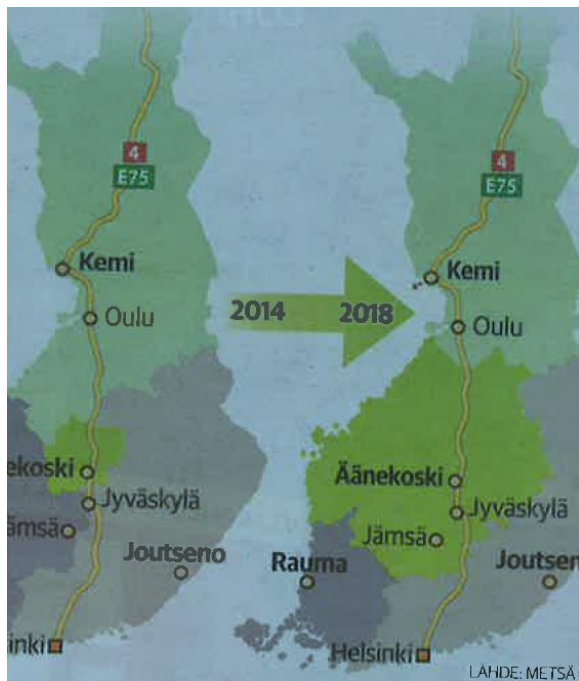
# Biomass Availability Prediction on a National Level

- The Studies conducted shows that there will be enough Forest Biomass 2030 in Finland.
- However the planned investment are using pulpwood not saw timber tree.
- The energy wood availability depends on thinnings and sawn wood and pulp wood use.



Source: Natural Resources Institute Finland 2015

- The harvest area will significantly increase (see below)



# Impacts of the Bioproduct Mill

Category	Existing mill	Bioproduct mill
Investment size	NA	EUR 1.2 billion
Pulp production	0.5 mill. t	1.3 mill. t
Resource demand	2.4 mill. m <sup>3</sup> /a	6.5 mill. m <sup>3</sup> /a
Truck supplied	1 440 000 m <sup>3</sup> /a	4 001 000 m <sup>3</sup> /a
Railway supplied	621 000 m <sup>3</sup> /a	1 451 000 m <sup>3</sup> /a
Number of trucks	103/day	260/day
Number of trains	1-2/day	4/day
Employment	1,000	2,500
Electrical self sufficiency	135%	240%
Truck transport distance	121 km	195 km
Imports	5%	NA
PEFC	93%	NA

Source: Šimunović (2015) EFI

# Possible Additional Future Products from the Bioproduct Mill Sidestreams

- besides planned products additional new products (shown in Figure) could be produced in new additional production units for the sidestreams.



- **Plan different policies to Enhance Biomass use for energy but avoid energy use of more valuable pulpwood.**
- **Evaluate how much potential is left to produce biofuels and Bioenergy from energy wood**
- **Evaluate Impact of other planned investments in Finland for Pulp wood availability.**

- Petteri Kangas, Screening the new process concepts for pulp mill retrofits with varying capacity constraints, Tappi Journal 15 vol 4, 2016
- Petteri Kangas, Sakari Kaijaluoto, and Marjo Määttänen, Evaluation of future pulp mill concepts – Reference, model of a modern Nordic kraft pulp mill, Nordic Pulp & Paper Research Journal, Vol 29 no (4) 2014
- <http://bioproductmill.com/> accessed 13.05.2016



# Thank you for your attention !!

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