### Northern ToSIA

# Assessing sustainability of forest based activities in rural areas of the Northern Periphery



#### ToSIA demonstration of EFORWOOD Scandinavian case study - adopted to Malå

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#### Outline of Case study

M2

Forest resources

M3 Forest to industry

#### M4/M5

Processing, manufacturing, distribution and consumption



## The case study location





The location of Västerbotten in Sweden, Scandinavian case study area (From http://www.regionfakta.com/StartsidaLan.aspx?id=1786).

# EFORWOOD

### Forest ownership





The proportion on ownership categories of forest land in Västerbotten, Sweden. (Data from NFI. http://www-riksskogstaxeringen.slu.se/).

#### Forest resources

Туре	Area, million ha
Forest	3,2
Protected (incl. water)	0,7
Total	5,5



# EFORWOOD

#### Forest resources

#### Areas

Forest type	Prportion inland, %	Inland, ha	Proportion coastal, %	Coastal, ha	Total proportion,	Total, ha
			_		%	
Pine <sup>1</sup>	39.3	730 799	49.3	649 523	43.4	1 380 323
Spruce <sup>1</sup>	27.6	514 170	13.4	176 761	21.7	690 930
Birch <sup>1</sup>	4.8	89 533	3.5	46 182	4.3	135 715
Other <sup>2</sup>	22.1	411 046	27.3	360 722	24.3	771 768
Lodgepole	3.9	72 798	2.3	30 017	3.2	102 815
pine <sup>1</sup>						
Bare ground	2.3	42 738	4.2	55 203	3.1	97 941
•						
Total, ha		1 861 083		1 318 408		3 179 491
			1 1 1 0	1 4 2004 61	• •	

<sup>1</sup>Pine, spruce, birch and contorta dominated forests (>70% of basal area) <sup>2</sup>Mixed conifer forests (No conifer species >70% of basal area) + Mixed forests (between 40% and 60% broadleaved trees)



#### The Treatments

Overview over management alternatives within the case study:

Stands	Unmanaged forest nature reserve	Close-to- nature forestry	Combined objective forestry	Intensive even- aged forestry	Dendro- biomass production
Pine		X	X	X	-
Spruce		X	X	X	- 2
Birch		58 · · · · ·	X		-
Mixed pine- spruce			X	X	-
Mixed pine- spruce-birch			X	X	- <u>-</u>



# EFORWOOD



The harvest

### Output from forest operations

	Shares			
Overall volume and share statistics	Saw- H logs v	Pulp wood	Fuelwood Total	
Final cut	55%	40%	5%	100%
Thinning	21%	74%	5%	100%
% of total sum	49%	46%	5%	100%
Final cut % of tot volume	93%	73%	83%	83%
Thinning % of tot volume	7%	27%	17%	17%



## **Operations in the Cases**

#### • In short

- Logging is performed by o dual machine system with harvester and forwarder.
- Pre commercial thinning is made by brush saw in motor manual operation.
- In addition to this special equipment is used for digging road building and biofuel harvest.

## Transports in the Cases

#### • In short

- The dominating mean of transportation are made with road vehicles (60 ton trucks with crane) for transport inside and out of case study area and railways, mostly out of area.
- Switches between road transport and rail are made at terminals. The wood is delivered to industries in Västerbotten and to industries outside - raw material driven case.
- Total volumes of wood and biofuel, means and distances shipped to individual industries for primary industrial use has been identified for 2005.





## **Processing Fine paper**

(ton)

- Fine paper production 680000
- Uncoated 430000 63%
- Coated 250000 37%
- Uncoated products 430000
- office paper 240000 56%
- Statement of account, letter paper, etc 190000 44%
- Coated products 250000
- Magazine, journals 225000 90%
- Brochure 25000 10%



## Solid wood chain

#### <u>Model Mills included in Scandinavian case study</u> Sawn timber

sawmill capacity 300 000 m<sup>3</sup> sawn timber output sawmill capacity 150 000 m<sup>3</sup> sawn timber output sawmill capacity 25 000 m<sup>3</sup> sawn timber output Panelpoducts (plywood and particle board) plywood mill capacity 100 000 m<sup>3</sup> plywood output particleboard mill capacity 120 000 m<sup>3</sup> particle board output

Prefabricated buildings

solid wood panels 120 000 m<sup>3</sup> panels output gluelam 75 000 m<sup>3</sup> gluelam output windows 100 000 units output wooden houses 15 000 units output

Furniture

Kitchen furniture 350 000 units output



### Solid wood chain

The wood chain in the Scandinavian case ends with the consumption of the products produced along the chain of processes beginning with the forest production in the Västerbotten region. The processes in M5 producer-consumer interaction are: 1. Distribution of the finished product from the producer to the end user 2. Use of the wooden products

3. Recovery and the end of life routes for the wooden products



#### The Bioenergy Flows



\*) from thinning and clearcutting









## First preliminary results obtained: Scandinavian Case Study EFORWOOD

#### 🕌 Tool for Sustainability Impact Assessment (ToSIA)

ToSIA			
	Welcome Data Preparation	Chain runs Comparison Analysis About	
New run	Select chain:	Process	Flow amount
× ToSia Run ScS >	Scandinavian General S 👽 🕕	Site preparation. Three years after final harve	1
		Young stand development with 1 pre-commer	5
	Select year:	Medium age stand development with first thin	70
	2005	Transport by 60t truck with crane to sawmill	9 242 147
	Calant reference futures	Final measurement and sorting at sawmill	9 242 147
	Select reference future:	1st thinning by medium harvester	109 037
	V (I)	Final measurement and sorting at CHP plant	462 107
	Select scenario:	2nd thinning by medium harvester	287 277
		Forwarding by medium forwarder	215 45
		3rd thinning by medium harvester	702 181
		Forwarding by large forwarder	526 636
		Transport by train to pulpmill	716 725
		Final measurement and sorting at pulpmill	6 984 233
		Final measurement and sorting at CHP plant	349 211
		Final felling by large harvester	15 905 99
		Forwarding by large forwarder	11 929 495
		Forwarding by large forwarder	270 154
		Medium age stand development with fertilizati	
		Medium age stand development with second t	70
		Adult stand development with fertilization (12	
		Adult stand development with third a€œthinni	58
		Adult stand development (seed trees) (Pine in	58
		Adult stand development (spruce in Vasterbot	63 58
		Site preparation: scarification: Planting 2.4x2	1/
		Toung stand development with pre-commersi	22
		Medium are stand do planment with first this	5/
	Calculate	A st thinning by medium hap restor	21 291
	Select visualisation ○ Table ○ Chart ⓒ Flow	Flow amounts by: Visualisation type:	

#### 🕌 Tool for Sustainability Impact Assessment (ToSIA)

ToSIA							
	Welcome Data Preparation	Chain runs Co	omparison /	Analysis About			
New run	Select chain:	Indicator	M2 - Forest re.	M3 - Forest to	M4 - Processi	M5 - Industry t	Chain total
X ToSia Run ScS >	Scandinavian General S 💌 🕕	1.1 - Gross v	-4 994 202,05	434 362 468,83	7 134 210 359		
		2.1 - Producti	14 429 670,0	384 879 546,85	11 902 458 39		
	Select year:	2.1.1 - Avera		0,0	6 440 713 274		
	2005	2.1.2 - Avera	1	0,0	818 765 563,43		
		2.1.3 - Avera	7 416 570,0	141 324 956,54	1 233 942 324		
	Select reference future:	2.1.4 - Avera	893 750,0	98 429 356,46	875 056 104,4		
	V ()	2.1.5 - Other	5 948 550,0	96 970 860,89	1 149 067 508		
		2.1.6 - Non-pr		48 026 393,38	557 582 781,54		
	Select scenario:	2.2 - Share of			51,33	25,86	38,59
	• •	3.1.1 - Import			0,0		0,0
		313 Import			0,0		0,0
		3.2.1 - Export			0.0		0.0
		3.2.2 - Export			0.0		0.0
		3.2.3 - Export			0.0		0.0
		3.3.1 Net tra			0.0		0,0
		3.3.2 - Net tra			0,0		0,0
		4.1.2 - Other		0,0	0,0	267 543 301,29	267 543 30
		4.1.2.1 - Othe		458 704,09	0,0	267 543 301,29	268 002 00
		4.1.2.2 - Othe		0,0	0,0		0,0
		4.2 - Volume		83 925 596,18	0,0	2 989,09	83 928 585
		4.2.1 - Volum		83 951 792,78	0,0	2 989,09	83 954 781
		4.2.2 - Volum		800,7	0,0		800,7
		5.1 - Number			0,0		0,0
		5.1.1 - Numb			0,0		0,0
		5.1.2 - Numb			0,0		0,0
		5.2 - Average		106 978,0	0,0		53 489,0
	Calculate	5.2.1 Avera		8,0	0,0		4,0
	Culoude	5.2.2 - Avera		10,0	0,0		ə, <b>u</b>
	Select visualisation						
	💿 Table 🔘 Chart 🔘 Flow	Indicator values	by:	Shown Indica	tors:		
		0- 0		Feenemie		~	

## Some results - economic

Division of "11.2.1 - Average wages & salaries per employee relative to country average [%]" per Module



## Some results - economic

Total production costs [EUR/m<sup>3</sup>] Production cost of material from FWC [EUR/m<sup>3</sup>] Raw material from outside FWC [EUR/m<sup>3</sup>] Labour cost [EUR/m<sup>3</sup>] Energy cost [EUR/m<sup>3</sup>] Other productive cost [EUR/m<sup>3</sup>] Non-productive cost [EUR/m<sup>3</sup>] Production value [EUR/m<sup>3</sup>ub] Net revenue [EUR/m<sup>3</sup>ub] Transport road [ton\*km] Transport distance road (loaded incl. backhaul) [km/vehicle] Transport distance road (loaded incl. backhaul) [km/m<sup>3</sup>ub]

Harvest	ing H	lauling and		
(II)	S	stacking (II)	Transport (II)	Sum (I)b
	2,78	2,78	4,37	9,92
	0,00	0,00	0,00	0,00
	0,00	0,00	0,00	0,00
	0,70	0,87	1,43	2,99
	0,56	0,47	1,14	2,17
	1,47	1,40	1,32	4,19
	0,04	0,04	0,48	0,56
	41,66	41,66	41,66	41,66
	38,89	36,11	31,74	31,74
nn	n	n	5 478,1	5 478,1
nn	n	n	137,6	137,6
			2,9	2,9

## Some results - social

Division of "10.2.1 - Employment male - % of total [%]" per Module



M2 - Forest resources management
M3 - Forest to industry interactions
M4 - Processing and manufacturing
M5 - Industry to consumer interactions

## Some results - social

	I	Hauling		
	Harvesting S	Stacking <sup>·</sup>	Transport	
	(II) (	(II) (	(II)	Sum (I)
Male persons employed [%]	90	90	81	86
Female persons employed [%]	10	10	19	14
Wages and salaries of male employees				
[EUR/m³]	0,42	0,52	0,85	1,79
Wages and salaries of female				
employees [EUR/m³]	0,38	0,47	0,78	1,63
Average wages & salaries per employee				
relative to country average [%]	52,3	59,2	52,3	54,6
Average wages & salaries per employee				
weighted by purchasing power parity				
[%]	64,4	72,8	103,1	80,1
Occupational non-fatal accidents				
[accidents/m <sup>3</sup> ub]	0,0000	0,0000	0,0000	0,0000
Occupational fatal accidents				
[accidents/m³ub]	0,0000	0,0000	0,0000	0,0000

## Some results - environmental

#### Division of "18.2.2.1 - Energy use - Direct fuel use - renewable fuel [MJ]" per Module



Division of "18.2.2.2 - Energy use - Direct fuel use - fossil fuel [MJ]" per Module



## Some results - environmental

	Harvesting (II)	Hauling Stacking (II)	Transport (II)	Sum (I)
Energy use of renewable energy [MJ/m <sup>3</sup> ub]	0,0	0,0	0,0	0,0
Energy use of non-renewable energy [MJ/m³ub]	22,9	9 19,1	. 37,1	79,1
Energy use of energy from the grid [MJ/m³ub]	0,0	) 0,0	0,0	0,0
Greenhouse gas emission [kg of CO2-equiv./m <sup>3</sup> ub]	1,7	7 1,4	2,7	5,9





## NORTHERN ToSIA Swedish Case Study

Tentative plans as discussed at kick-off meeting 26-27 February 09 and follow up



## Case study scope (tentative)

- Evaluating the effects on economical, environmental and societal values of forest management land use of the area used by Malå Sami village.
- Three different scenarios that affect forest management in the area were discussed:
  - 1. Nature conservation (key habitats and protective areas),
  - 2. Reindeer husbandry and
  - 3. The synergies between reindeer husbandry and forest conservation.



## System boundaries questions

- Should the value chain of pulp wood be added?
- What about the value added chain for reindeer husbandry?
- Two options?
  - 1. Narrow study variant without value chains.
  - 2. Another variant with the value chains from EFORWOOD and estimated for reindeers?
- Could the value added of reindeer production be assigned to the forest area?



## Identification of Indicators

- Several indicators to be used in Northern ToSIA for evaluating economic, environmantal and social impact of forestry and reindeer husbandry were discussed.
- An indicator which reflects the marginal utility for increasing the area of reserved land was mentioned.
- we should aim at a few indicators
- The chosen indicators should be indicators easily collected for the area.



## Potential indicators:

• <u>Economic:</u>

GVA, production cost, total production

• Environmental:

GHG emissions, energy use, forest resources, presence of lichens, biodiversity (coarse dead wood of pine and spruce, share of set aside areas)

• <u>Social:</u>

Employment, Wages and Salaries, An indicator that reflects economic activity in the area (e.g. road net work and number of ICA and/or COOP food supplier)