Tables and figures to Final report paragraph 4.1.3.

Table 1. *List of AFORE participants*

Participant		Participant organization name	Country
1	VTT	VTT Technical Research Centre of Finland	Finland
2	STFI	Innventia	Sweden
3	*KCL*	*merger with VTT in 2010*	*Finland*
4	UAVR	University of Aveiro	Portugal
5	Fraunhofer	Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung IAP	Germany
6	UH	University of Helsinki	Finland
7	Wood K plus	Kompetenzzentrum Holz	Austria
8	CERTH	Centre for Research and Technology Hellas	Greece
9	SINTEF	Stiftelsen SINTEF	Norway
10	PPIMC	Institutul de Chimie Macromoleculara PetruPoni	Romania
11	UTL	Technical University of Lisbon	Portugal
12	Södra	Södra skogsägarna ekonomisk förening	Sweden
13	CELBI	Celulose Beira Industrial	Portugal
14	SepRes	Separation Research	Finland
15	NATEX	NATEX Prozesstechnologie	Austria
16	*Granit*	*participation ended 2010, tasks moved to GreenValue*	*Switzerland*
17	Hte	hte AG The High Throughput Experimentation Company	Germany
18	Danisco	Dansico/DuPont	Finland
19	UMA	University of Maine	USA
20	Södra Cell	Södra Cellulose	Sweden
21	GRD	GreenValue	Switzerland

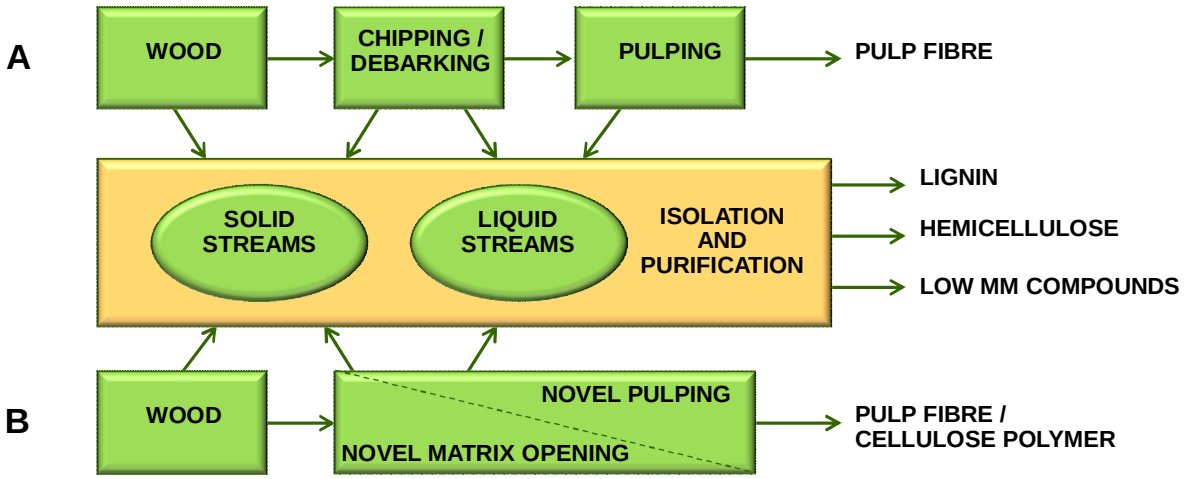


Figure 1 *The approach of the AFORE project.* ***A*** *indicates a conventional kraft pulp mill and* ***B*** *a novel wood biorefinery concept*

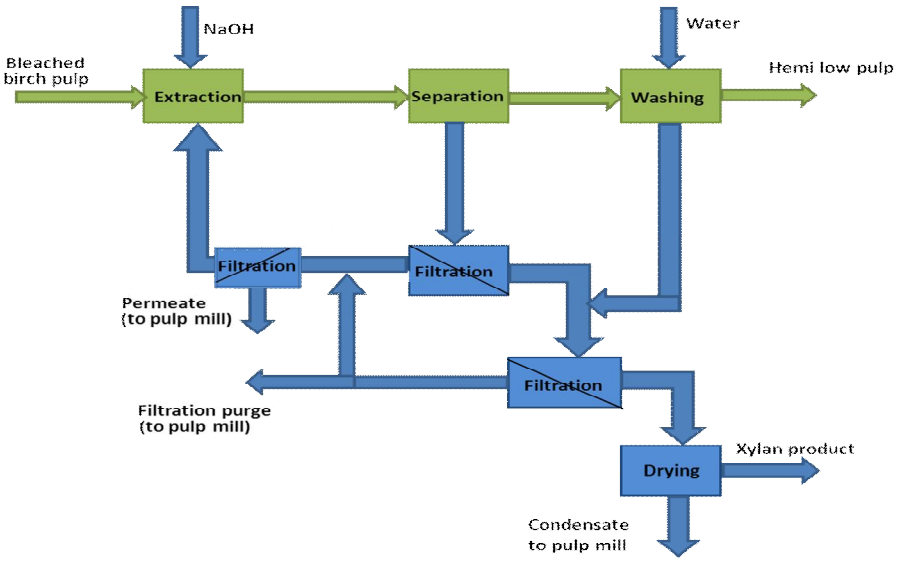
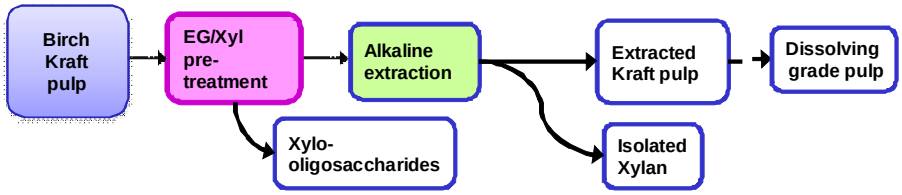


Figure 2. *Simplified process model of alkaline extraction of xylan from bleached birch kraft pulp*

Option 1: EG pre-treatment to enhance alkaline extraction to produce xylan
Option 2: Xylanase pre-treatment to produce XOS



Option 3: Xylanase post-treatment to produce XOS without compromising xylan extraction

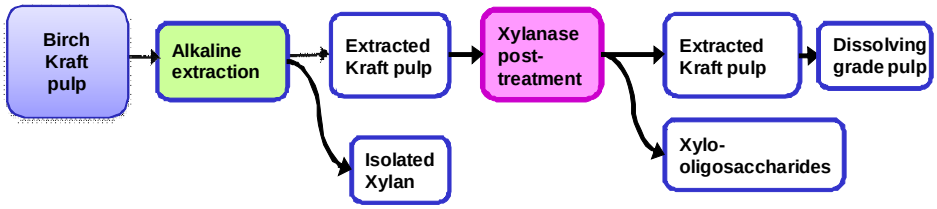


Figure 3 *Verified options of feasible enzyme-aided alkaline extraction of birch kraft pulp for xylan or xylo-oligosaccharide production*

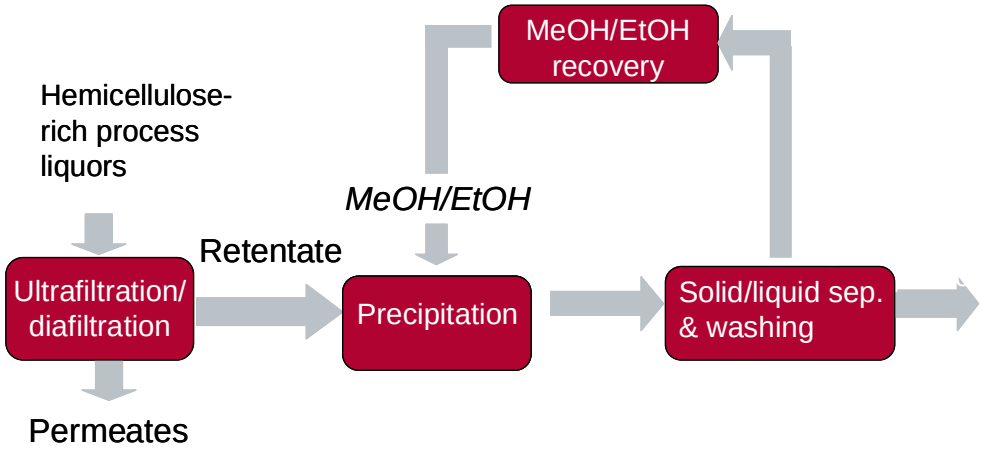


Figure 4. *A model of the process for separation of xylan from hardwood cooking liquor and its implementation to the kraft process*

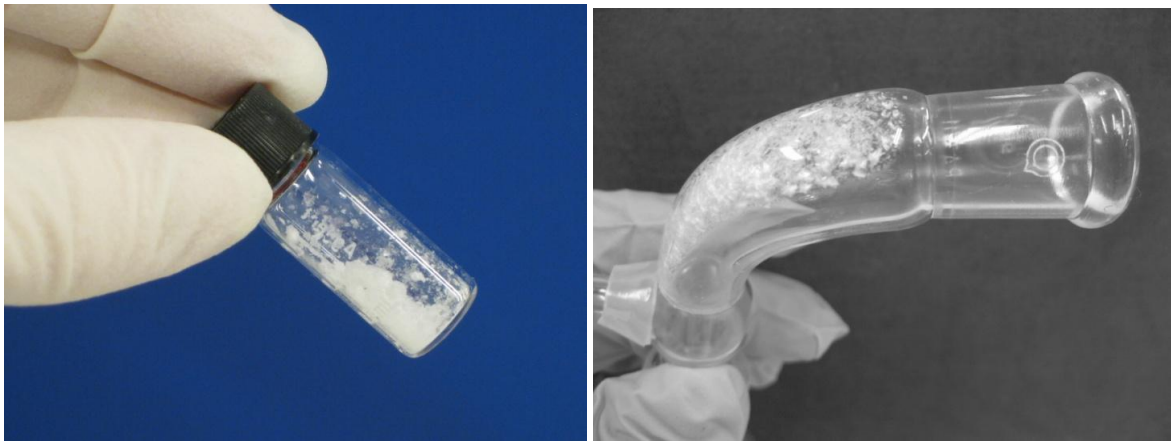


Figure 5 *Isolation of 92% pure 2-hydroxybutanoic acid from a birch black liquor fraction by distillation (crystallised before entering the receiving flask).*

Table 2. *Main triterpenic acids in Eucalyptus ssp. outer barks (g/kg of extract). * including the 3-acetyl derivative*

	E. globulus	*E. nitens*	*E. maidenii*	*E. urograndis*	*E. grandis*	*E. grandis x globulus*
Main Triterpenic acids	**21.3**	**21.6**	**8.4**	**4.5**	**5.1**	**5.2**
Betulonic acid	2.6	2.4	1	--	--	0.1
*Oleanolic acid	4.1	8.4	1.7	1.2	0.7	1.6
Betulinic acid	2.6	6.6	2	1.4	2.1	0.7
*Ursolic acid	12.1	4.2	3.6	1.9	2.4	2.9
Methyl morolate	--	1.0	0.2	0.2	0.4	3.2
Other Triterpenoids	1.5	3.0	0.2	--	0.1	0.1
Total Triterpenoids	**22.9**	**25.6**	**8.7**	**4.7**	**5.2**	**8.5**

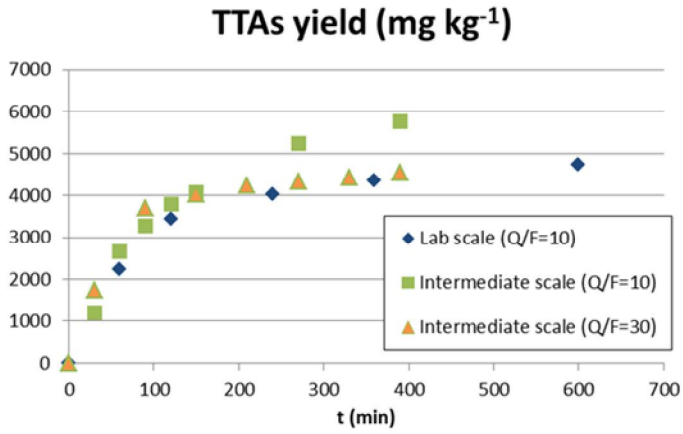


Figure 6 *Example of the extraction yields in scaling up the scCO2 extraction of triterpenic acids (TTAs) from eucalyptus outer bark and 80L/550bar pilot plant in NATEX laboratory*

Hardwood bark as a source of valuable components

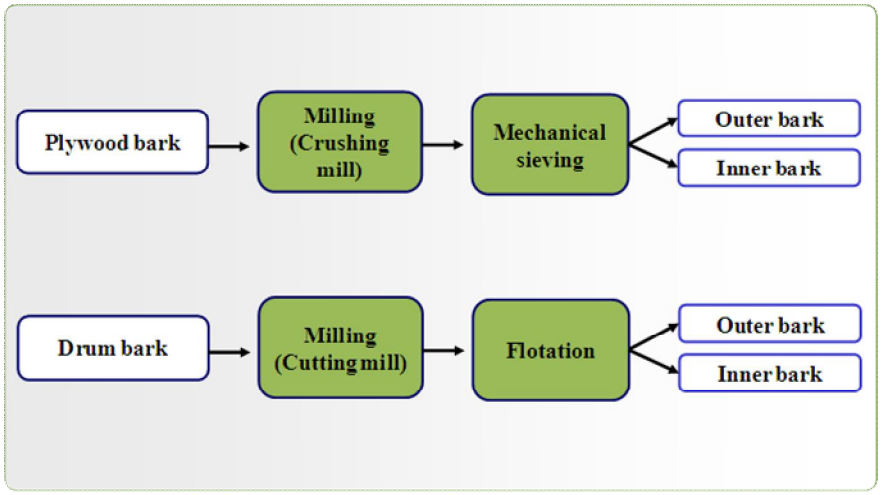


Figure 7 *Principle of the birch bark fractionation processes*

Figure 8 *Birch outer bark extracts*

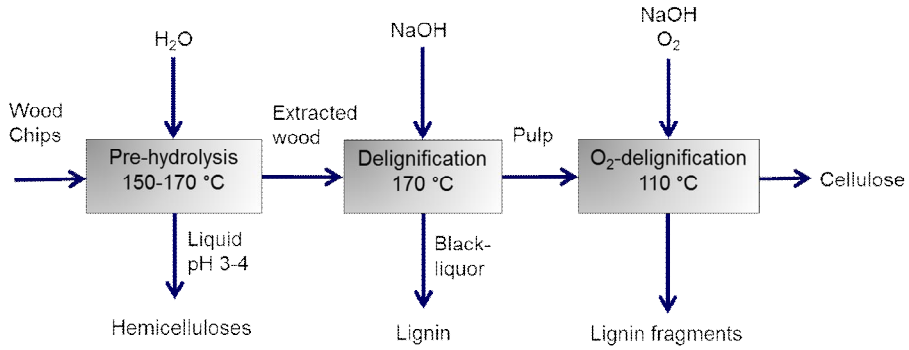


Figure 9 *Pre-hydrolysis soda cooking followed by harsh oxygen delignification - only three process stages; results in high purity cellulose pulp (>98% cellulose) at 37% yield when using Eucalyptus globulus pulp wood*

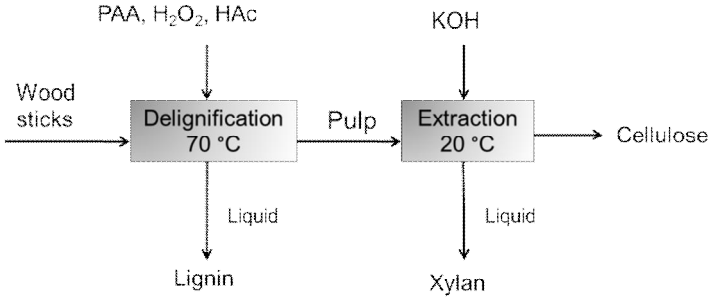


Figure 10 *WoodOx process, low-temperature oxidative delignification combined with alkaline extraction, produces cellulose pulp at high yield from wood reject, 0-2 mm thick. PAA= peracetic acid*

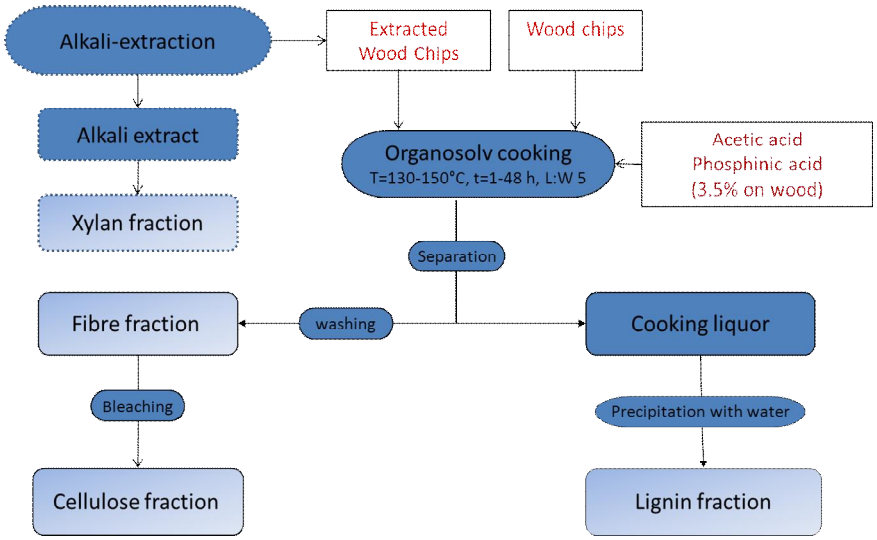


Figure 11 *The LGF organosolv cooking process for fractionation of wood chips to added value components*

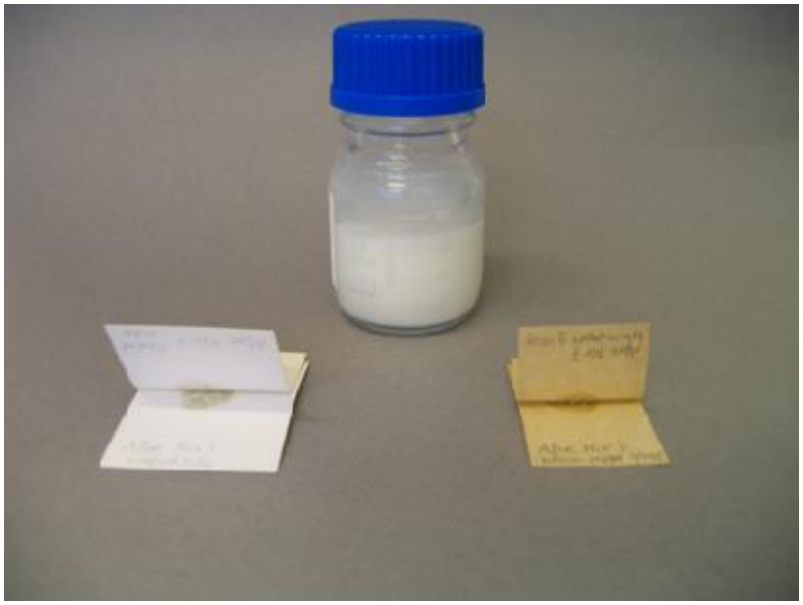


Figure 12 *Xylan hot melt glue samples in testing*

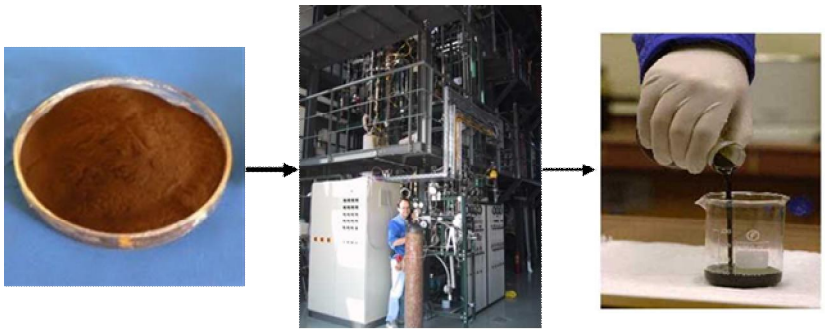


Figure 13*. The process of heterologous catalytic pyrolysis of kraft lignin to bio-oil*

Table 3 *Antioxidant activity of ascorbic acid and eucalyptus bark extracts (values expressed as mean ± standard deviation (n=3))*

	IC_{50} (µg/ml)
Ascorbic acid	2.01 ± 0.05
Methanol extract	3.50 ± 0.11
Water extract	23.22 ± 1.49
Methanol:water extract	3.06 ± 0.09

Table 4. *Summary of the market potential of possible AFORE concept products*

AFORE primary product	**Applications***	**Barriers**	**Incentives**	**pot. Volume [t/a]**	**pot. Value [€/t]**
Hemicelluloses	Packaging films current technology	limited applicability	rising oil price	4,000	1000
	Packaging films future technology	technical feasibility	rising oil price	300,000	1000
	Hydrogel soil improvement	durability, rising to surface	good properties	5,000	10000
	Microencapsulation niche strategy	registration & approval	good properties	500	8000
	Microencapsulation mass strategy	registration & approval	-	5,000	3000
	Food additive niche strategy	registration & approval	good properties	3,000	5000
	Food additive mass strategy	registration & approval	good properties	20,000	2000
Lignin	Kraft lignin (current use)	security of supply	rising oil price	50,000	500
	in phenolic resins of wood-based panels	security of supply, decreasing market	-	30	1500
	as platform chemical (biooil)	technical & economic feasibility	rising oil price	16,000,000	1500
	phenolic resin pathway	technical & economic feasibility	rising oil price	2,000,000	1500
	bisphenol A pathway	technical & economic feasibility	rising oil price	3,500,000	1500
Low MM compounds	Complexing agents high volume	unknown properties	biodegradability	15,000	800
	Complexing agents high value	unknown properties	biodegradability	500	4000
	Essential oils	limited demand/substitution	high quality/purity	500	20000
	Polyphenols for cosmetics	colour	high quality/purity	10	500000
	Triterpenic acids	registration & approval, other raw materials, consumers	good properties	100	130000

*Primary products to be used as such or after further modification