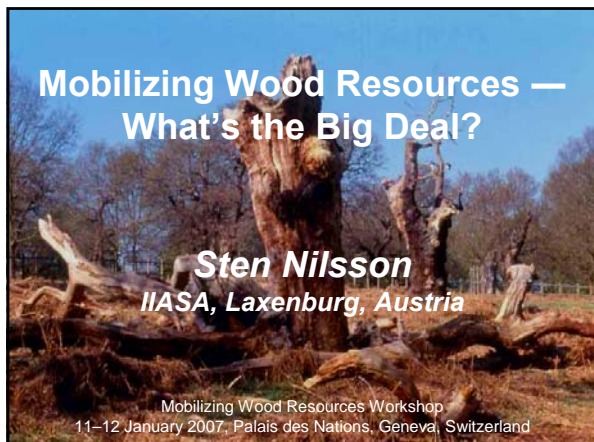


Mobilizing Wood Resources — What's the Big Deal?

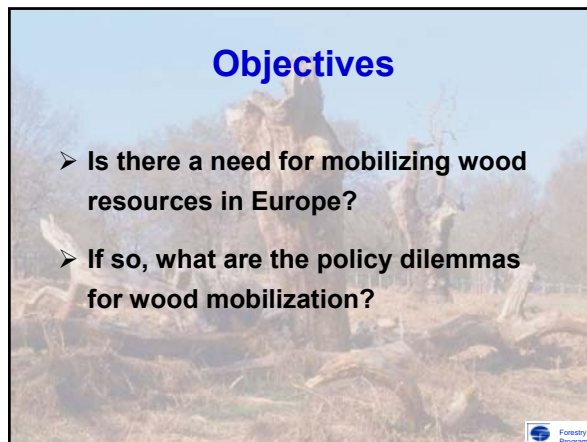
Sten Nilsson
IIASA, Laxenburg, Austria

Mobilizing Wood Resources Workshop
11–12 January 2007, Palais des Nations, Geneva, Switzerland

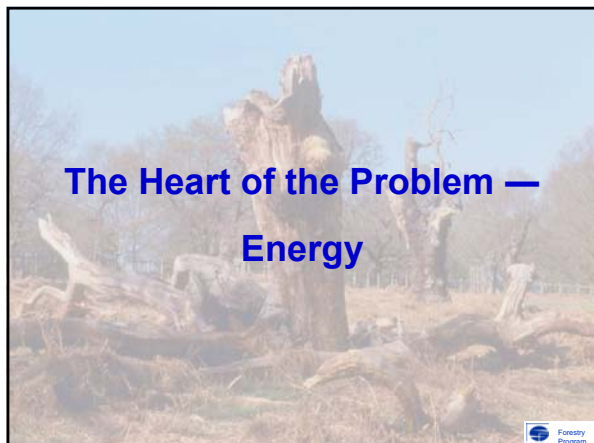


Objectives

- Is there a need for mobilizing wood resources in Europe?
- If so, what are the policy dilemmas for wood mobilization?



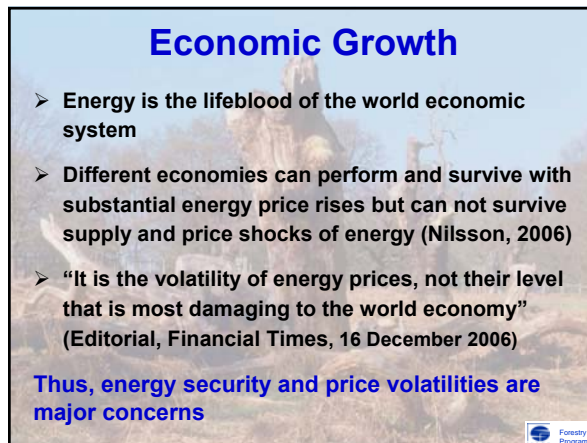
The Heart of the Problem — Energy



Economic Growth

- Energy is the lifeblood of the world economic system
- Different economies can perform and survive with substantial energy price rises but can not survive supply and price shocks of energy (Nilsson, 2006)
- “It is the volatility of energy prices, not their level that is most damaging to the world economy” (Editorial, Financial Times, 16 December 2006)

Thus, energy security and price volatilities are major concerns

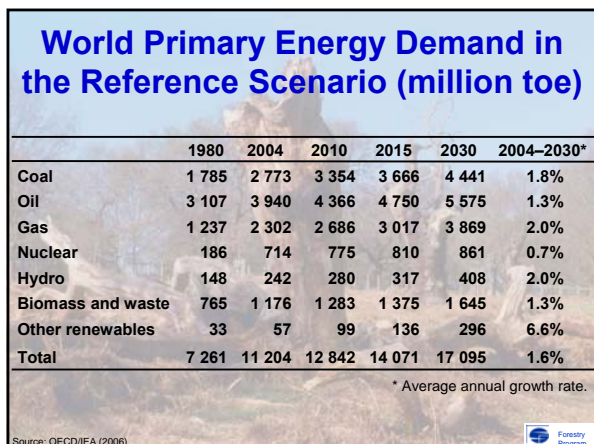


World Primary Energy Demand in the Reference Scenario (million toe)

	1980	2004	2010	2015	2030	2004–2030*
Coal	1 785	2 773	3 354	3 666	4 441	1.8%
Oil	3 107	3 940	4 366	4 750	5 575	1.3%
Gas	1 237	2 302	2 686	3 017	3 869	2.0%
Nuclear	186	714	775	810	861	0.7%
Hydro	148	242	280	317	408	2.0%
Biomass and waste	765	1 176	1 283	1 375	1 645	1.3%
Other renewables	33	57	99	136	296	6.6%
Total	7 261	11 204	12 842	14 071	17 095	1.6%

* Average annual growth rate.

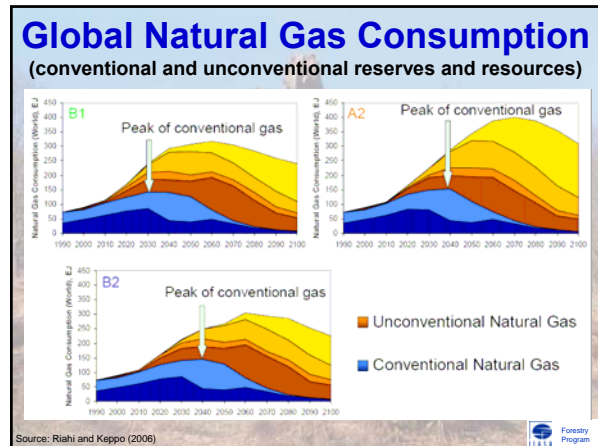
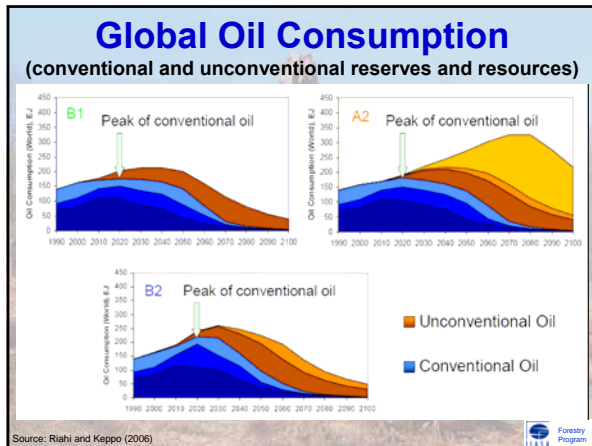
Source: OECD/IEA (2006)



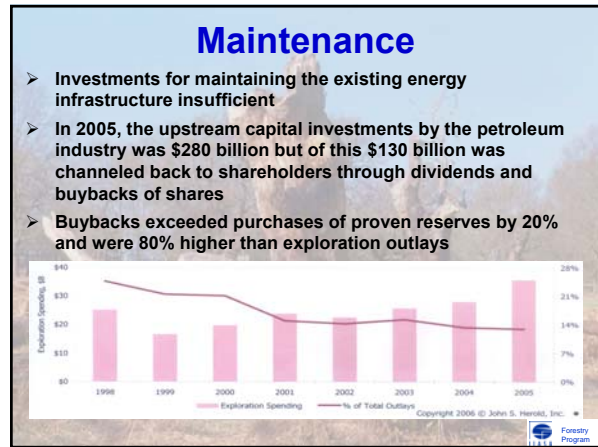
Constraints in Reaching Demanded Supply

- Limits to economically accessible resources
- Lack of financial resources for investments
- Lack of maintenance and efficiency of the energy systems
- Sabotage
- Energy used as a political pressure tool

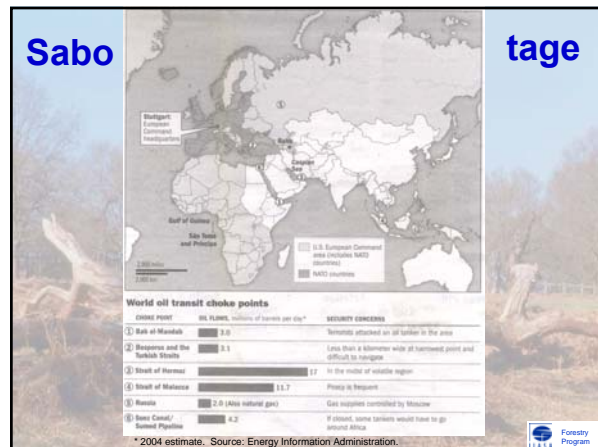




- ### Lack of Investment Funds
- Amount needed through 2030 — \$ 20 Trillion
 - One half to electricity industry and the other half to the fossils fuel industry
 - \$ 2.5 trillion in Europe
 - 80% of proven reserves of fossil fuels are concentrated in volatile regions



- Russia has neglected the investment needs for maintenance of oil and gas production since the late 1980s resulting in obsolete infrastructure and future decreased supply
- The Russian electric power system will have supply problems already in 2008 due to lack of replacement investments
- European electric power systems are bound to fall short in coming years due to aging generation and transmission equipment
- BP Texas City Refinery 2005; BP infrastructure in Alaska 2002, 2005 and 2006. Cost cutting in safety and maintenance
- Iraq
- Iran
- Nigeria, Christmas 2006



Total Final Energy Consumption in Pan-Europe in 2030 (million toe)

	Coal	Oil	Gas	Electricity	Heat	Bio-mass	Bio-fuels	Other Renewables	Σ
Industry	22	146	169	146	16	43			
Transport		486					32	16	
Households	5	71	166	152	48	33		5	
Services, Agriculture, Others	3	38	89	81	26	19		3	
Σ	30	741	424	379	90	95	32	24	1815
Renewables				49					
Nuclear				118					
Coal				117					
Gas				70					
Oil				20					
Others				5					

Calculated from: OECD/IEA (2006), EEA (2006a), Eurostat (2006), IEA Energy Statistics (www.iea.org)

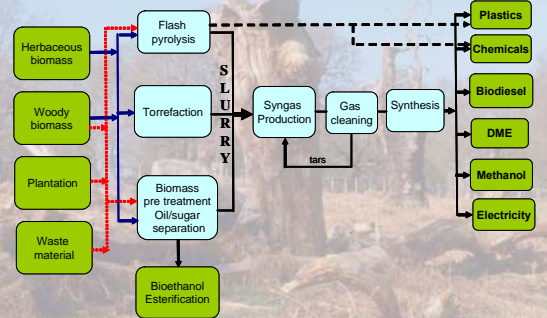
Policy Recommendation I

European countries and the EU are strongly recommended to develop overall energy policies and strategies based on integrated analysis of the triangle of economic growth, energy security, and climate and environment

Biomass Opportunities

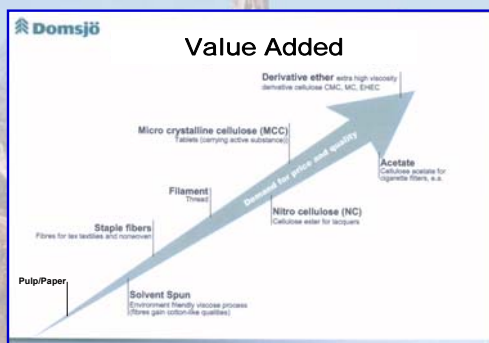
- Bioenergy: Electricity and Heat from Biomass
- Liquid Biofuels for Transportation
- Biogas
- Hydrogen
- Biorefinery

Integrated Biorefinery Approach



Source: Girard and Fallot (2006)

Value Added Production in Biorefinery

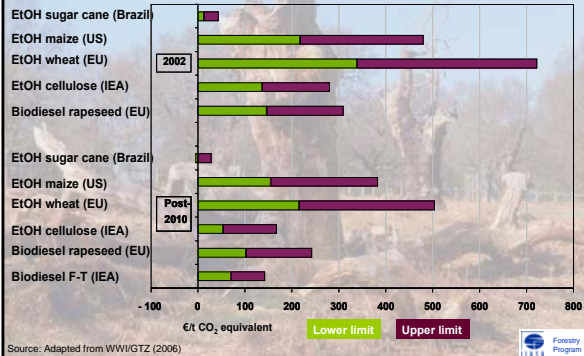


Source: Hildingsson (2006)

Competitiveness of Biofuels

Agriculture-based ethanol	~70\$/bbl
Brazilian ethanol	~50\$/bbl (including fuel economy penalty)
First generation biodiesel	Hardly competitive
Second generation (post 2010) biomass-to-liquid from forest biomass	~50\$/bbl
Second generation (post 2010) lingo-ethanol	~50\$/bbl

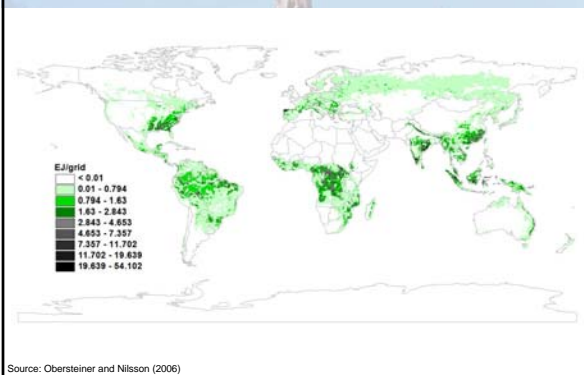
GHG Reduction Cost Expectations for 1st and 2nd Generation Biofuels



Policy Recommendation II

Europe should intensify research and development for production of alternative energy carriers. This is an important step in developing future energy security

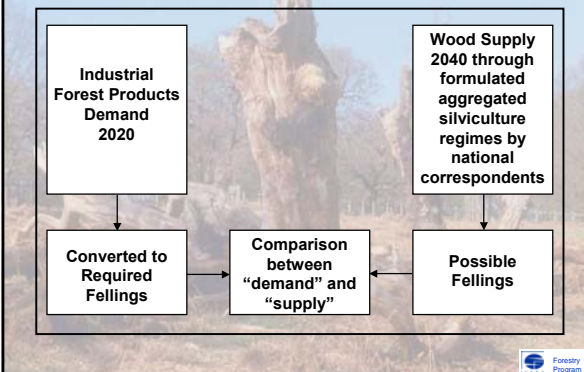
Internationalization of Bioenergy Trade



Policy Recommendation III

Europe should globalize its view on future bioenergy and investigate future import opportunities for different bioenergy sources

Main Models in EFSOS Analysis



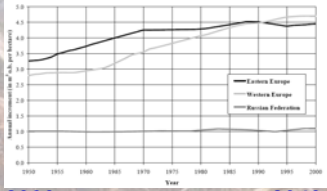
Wood Supply and Forest Dynamics on FAWS According to EFSOS

	2000	2030	2040
EU/EFTA			
Total Growing Stock (billion m ³)	16.2	20.0	20.5
Net Annual Increment (million m ³)	515.5	495.0	491.0
Fellings (million m ³)	348.5	416.0	438.0
Removals (million m ³)	260.0	311.0	327.0
Growing Stock (m ³ /ha)	157	190	194
Fellings/Net Annual Increment (%)	68	84	89
CEEC			
Total Growing Stock (billion m ³)	10.5	12.0	12.0
Net Annual Increment (million m ³)	269.0	244.0	239.0
Fellings (million m ³)	149.0	216.0	223.0
Removals (million m ³)	110.5	159.0	164.0
Growing Stock (m ³ /ha)	191	210	211
Fellings/Net Annual Increment (%)	55	89	93
Pan-Europe Fellings (million m ³ /year)	497.5	632	661

Source: Forestry Program

Under-utilization of Forest Resources

- Full utilization of net increment
2030 +105 million m³/year **2040** +70 million m³/year
- Increment/ha



2030 +160 million m³/year **2040** +240 million m³/year



Land Use Change

2030 +25 million m³/year **2040** +25 million m³/year



Policy Recommendation IV

Europe should carry out future relevant land use assessments and policies for Europe based on future demands on energy security, climate change/environmental demands and economic growth. At the same time analysis should be made on how to get socioeconomic supply to correspond to the theoretical potentials



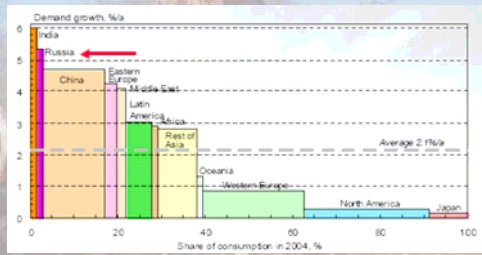
Harvest Biomass Residues

Pan-Europe **2030** 22 **2040** 22



Industrial Demand

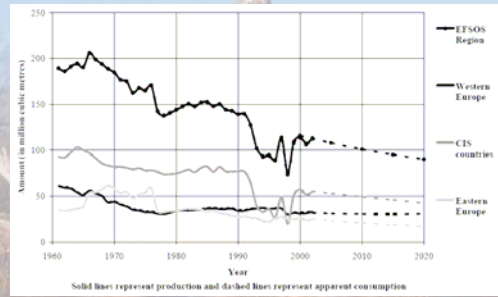
- Paper and paperboard consumption
EFSOS 2.3%/year 2000–2020



120 million m³/year less wood consumption than EFSOS



Wood Fuel Demand

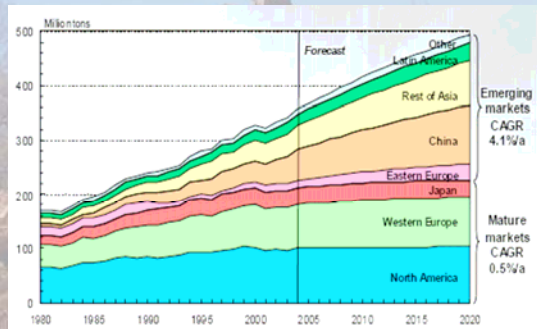


Current woodfuel consumption ~250 million m³/year instead of EFSOS estimate of 60 million m³

Source: Broadhead et al. (2005)



Globalization



Paper and Paperboard Development in China

Ningbo Xiaogang PM1	World's largest machine for white-lined chipboard
Shandong Chenming PM4	The world's largest newsprint machine. China has the 3 fastest newsprint machines in the world
APP/Gold Hong Ye	The world's 2 nd fastest tissue machine
Shandong Bohui	The world's largest folding boxboard machine
APP China Gold East at Dagang	Has set 6 world speed records for paper machines
APP Gold East in Jiangsu	Building the world's largest printing and writing machine

> Inexpensive loans and subsidies

Source: after Flynn (2006)

Impact of Globalization on Competitiveness of the European Forest Sector (EFSOS, UN, 2005)

Impact of Increased Globalization Compared to the Baseline					
	Area FAWS	Fellings	Production	Trade	Consumption
Western Europe	Unchanged	Higher	Higher	Higher	Higher
Eastern Europe	Higher	Higher	Higher	Higher	Higher

Possible Impacts of Globalization on the European Forest Sector

Impact Compared to EFSOS Baseline Scenario (UN, 2005)								
	Energy costs	Economic growth	Prices	Area FAWS	Fellings	Ind. Production	Consumption	Trade
Western Europe	Higher ^a	Higher ^b	Higher ^c	Higher ^d	Higher ^e	Lower ^f	Lower ^g	Higher ^h
Eastern Europe	Higher ^a	Higher ^b	Higher ^c	Higher ^d	Higher ^e	Lower ^f	Lower ^g	Higher ^h

- ^a The energy demand/supply will be very tight with high costs as a result.
- ^b In spite of high energy costs the globalization has a positive impact on the economic growth (WB, 2007).
- ^c Prices on both forest raw material and industrial products will increase due to energy costs and tight demand/supply on raw material.
- ^d Due to increased energy prices the rate of conversion of agriculture land will increase.
- ^e The fellings will increase due to increased prices and increased demand on bioenergy
- ^f The production of industrial forest products may decrease due to increased global competition.
- ^g The consumption of industrial forest products will be lower due to changed demographics and increased competition by globalization.
- ^h The trade of forest products will increase due to increased globalization.

Policy Recommendation V

Urgently, Europe should carry out solid assessments of the impact of globalization on the competitiveness of the European forest sector

Policy Recommendation VI

The ECE should carry out simplified yearly updates of the Pan-European wood balance through 2040

European Bioenergy Production

	2030	2040
Agriculture potentials	146	210
Waste potentials	125	128
Total	~270	~340



Policy Recommendation VII

Europe should carry out Pan-European analysis of the energy, cost, and climate efficiency of agriculture energy farming



Wood Balance

	2030	2040
Demand expressed as annual fellings (EFSOS, UN, 2005)	680	710
Over-estimated industrial demand	560	587
Sustainable fellings (EFSOS, UN, 2005)	630	660



Partial Energy Balance for 2030 and Pan-Europe (million toe)

Demand	Coal	Oil	Gas	Heat	Biomass	Biofuels	Other Renewables	Nuclear
Supply	147	761	494	90	95	32	30	118
Forest harvest residues					22			
Agriculture biofuels						32		
Short-term rotation forestry-agriculture					70			
Agriculture biogas			41					
Waste-biogas			35					
Waste			90	3				



Energy Security, Stabilization of Climate, Sustained Economic Growth

- 25% reduction of fossil fuels
- Half of this produced by additional geo-thermal, hydro, wind, solar and nuclear
- The rest by woodfuels
- 10% import
- Additional 400 million m³/year required



Story Line

Assumption	Need for Mobilization
1. EFSOS baseline scenario and environmentally compatible bioenergy from forest residues	Moderate mobilization of industrial roundwood is required. Some 50 million m ³ /year
2. As #1 but with less demand on industrial wood compared to EFSOS baseline scenario	No mobilization required
3. Contribution to the solution on economic growth, energy security and climate change/environment	Dramatic mobilization needed. Several hundreds of million m ³ /year



Wood Mobilization

- Generate a better knowledge of the utilization possibilities and increased utilization of the tree cover located outside forests
- Implement forest management regimes that give a more balanced development of the growing stock
- Intensified management resulting in more efficient utilization of the net annual increment and improved net annual increment per hectare
- Changed land use



Policy Recommendation VIII

Europe has urgently to cost out available wood mobilization options and assess the impact over time of the different measures



Policy Implementation: Policy Recommendation IX

It is obvious that Europe has to invest a substantial amount of resources in the future on solid investigations of the problem area of *economic growth, energy security, and stabilized climate and sustainable environment*



Policy Implementation: Policy Recommendation X

There is a strong need to identify who will be responsible for implementation of chosen policies and strategies for wood mobilization. What resources and authority will the implementers need in order to achieve results? Who will be held accountable for non-compliance of non-achievement? What arrangements will be made to monitor and assess performance?



Policy Implementation

“Forests can be made to produce fifty times their present volume of end products and still remain a permanently self-renewing source for raw materials... Only forests — no other raw material resource — can yield such returns” (Glesinger, 1949)

“There will probably be a rather substantial global shortage of industrial roundwood already in 2010. The shortage is driven by increased use of wood for bioenergy” (Nilsson, 1996)

